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Plenary Speakers

Gustav Van Tendeloo	EMAT, R.U.C.A, Antwerp, Belgium
M. Alper Sahiner	Seton Hall University, USA
Masayuki Yamaguchi	Japan Advanced Institute of Science and Technology, Japan
Jiri Klemes	University of Pannonia, Hungary
Prabir Barooah	University of Florida, USA
Mohamed Bououdina	University of Bahrain, Kingdom of Bahrain
Scala Fabrizio	The Institute for Research on Combustion (IRC) of the Italian National Council for Research (CNR), Italy
Cengiz Ozkan	University of California, Riverside, USA

Invited Speakers

Taehoon Hong	Yonsei University, Korea
Lingai Luo	Universite de Nantes, France
Abd Halim Shamsuddin	Universiti Tenaga Nasional, Malaysia
Holger Schlör	Forschungszentrum Jülich, Institute for Energy and Climate Research,Systems Analysis and Technology Evaluation (IEK-STE), Germany
Doriano Brogioli	Universita' degli Studi di Milano-Bicocca, Italy
Chuanbao Cao	Beijing Institute of Technology, China
Lidija Čuček	University of Maribor, Slovenia
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PLENARY SPEAKERS

Energy Materials and Electron Microscopy: the Perfect Marriage

Gustaaf Van Tendeloo[1], Artem Abakumov[2]

University of Antwerp, Belgium

[1] e-mail: staf.vantendeloo@uantwerpen.be

[2] e-mail: artem.abakumov@uantwerpen.be

Energy materials embrace a wide range of applications including photovoltaics, fuel cells, photo/electrocatalytic water splitting, rechargeable batteries, supercapacitors, thermoelectrics, hydrogen storage materials.

A number of materials benefit from their nanostructured state. Important is to understand the processes occurring at a nanoscale or even an atomic scale. TEM is the right tool to do so. The technique is able to provide atomic scale information on morphology, structure, composition and electronic bonding.

Mn-oxides are known as excellent catalysts for photochemical water oxidation. We demonstrated the power of aberration-corrected STEM combined with EELS for atomic resolution mapping of the valence state of the Mn cations in the Mn3O4 spinel-type structure. The structure of a new perovskite-based polymorph of Mn2O3 has been directly visualized and charge ordering of Mn2+, Mn3+ and Mn4+ is detected by EELS.

Capacity and voltage fading are among the key issues defining applicability of Li-ion battery materials. A comparative HAADF-STEM study of the layered oxides Li-Ru-Ti-O and Li-Ru-Sn-O at different stages allowed establishing the cation migration pathways during charge-discharge processes and identifying the cation traps responsible for the degradation of the electrochemical performance.

In many cases energy materials can be difficult to study by TEM as they suffer from electron beam damage. Typical cases are the polyanionic cathodes for Li-ion batteries and complex light weight hydrides for hydrogen storage application. However we have successfully demonstrated that a reliable structure solution can be obtained of such materials as Li2CoPO4F and LiBH4, the lightest material which has ever been studied by TEM.

Keywords: electron microscopy, energy materials

Photocurrent Mapping of 3D CdSe/CdTe Windowless Solar Cells

Carlos M. Hangarter,[†,#] Ratan Debnath,[†,‡,§,#] Jong Y. Ha,[†,‖] **Mehmet A. Sahiner**,[⊥] Christopher J. Reehil,[⊥] William A. Manners,[⊥] and Daniel Josell[*,†]

[†]Materials Science and Engineering Division, Material Measurement Laboratory, National Institute of Standards and Technology,
Gaithersburg, Maryland 20899, United States
[‡]Department of Materials Science and Engineering, University of Maryland, College Park, Maryland 20742-2115, United States
[§]N5 Sensors Inc., Rockville, Maryland 20852, United States
[‖]Institute for Research in Electronics and Applied Physics, University of Maryland, College Park, Maryland 20742, United States
[⊥]Department of Physics, Seton Hall University, South Orange, New Jersey 07079, United States

This paper details the use of scanning photocurrent microscopy to examine localized current collection efficiency of thin-film photovoltaic devices with in-plane patterning at a submicrometer length scale. The devices are based upon two interdigitated comb electrodes at the micrometer length scale prepatterned on a substrate, with CdSe electrodeposited on one electrode and CdTe deposited over the entire surface of the resulting structure by pulsed laser deposition. Photocurrent maps provide information on what limits the performance of the windowless CdSe/CdTe thin-film photovoltaic devices, revealing “dead zones” particularly above the electrodes contacting the CdTe which is interpreted as recombination over the back contact.

Additionally, the impact of ammonium sulfide passivation is examined, which enables device efficiency to reach 4.3% under simulated air mass 1.5 illuminations.

Keywords: back contact, CdSe, CdTe, photovoltaic, 3D solar cells, SPCM

MATERIAL DESIGN OF SELF-HEALING POLYMERS BY INTERMOLECULAR INTERDIFFUSION

Masayuki Yamaguchi

Japan Advanced Institute of Science and Technology, 1-1 Asahidai, Nomi, Ishikawa 923-1292 JAPAN
(phone) 81-761-51-1621; (e-mail) m_yama@jaist.ac.jp

Dangling chains in a network polymer shows marked mobility and are found to be applicable to prepare a self-healing polymer, which has been desired for a long time to expand material life and reduce wastes. It is confirmed that an applied cleavage by a razor blade is healed at room temperature without any manual intervention. Because the healing occurs by molecular interdiffusion of dangling chains, the relation between the ambient temperature and the glass transition temperature decides the time required for healing. Therefore, a soft rubbery material whose glass transition temperature is lower than room temperature shows rapid healing. In this study, however, it is revealed that a weak gel whose tensile modulus is 100 MPa at room temperature, i.e., a leather-like material, shows autonomic healing even at room temperature in a relatively short time. Because the material has permanent network structure, it does not show macroscopic flow even after exposure to high temperature.

PROCESS INTEGRATION FOR ENERGY EFFICIENCY: CONCEPTS, TOOLS AND FUTURE STRATEGY

Jiří Jaromír Klemeš, Petar Sabev Varbanov

Centre for Process Integration and Intensification – CPI^2, Research Institute of Chemical and Process Engineering – MŰKKI, Faculty of Information Technology, University of Pannonia, Veszprém, Hungary; E-mail: klemes@cpi.uni-pannon.hu

Industrial and residential users in many regions consume large amounts of energy and as an unwanted side product release emissions and effluents. They should be evaluated and optimised by applying LCA methodology, which has been recently quantified by environmental footprints as carbon, nitrogen and water footprints. A number of studies are performed for improving the efficiency of production processes as well as of energy supply and utilisation, while reducing emissions of greenhouse gases, volatile organic compounds and other pollutants.

Usually reducing resource consumption in any processes – industrial or residential, is achieved by increasing the internal recycling and re-use of energy and material streams. The latter reduces the emissions simultaneously. There are several approaches to achieving such improvements, which include Mathematical Optimisation, Process Intensification and, most notably, Process Integration. The latter is a family of methodologies for combining several parts of processes or whole processes to reduce consumption of resources or harmful emissions. It started mainly as Heat Integration (HI) stimulated by the energy crises of the 1970's. HI has been developing in mutual cross fertilisation with the industrial implementations for the last forty years. From the beginning HI offered guidance based on thermodynamic principles and their understanding. However number of issues had not been considered and solved problems were simplified for the sake of easier and faster solutions.

A considerable research effort has been targeted to improving energy efficiency and it has been shown that heat recovery at the Total Site level can provide a high potential for energy savings in industrial, residential, business, services and even agriculture related areas. Total Site Heat Integration (TSHI) offers opportunities for additional heat recovery and cogeneration beside individual processes. The research area has enormously grown and many of the contributions are parallel to each other, sometimes using different assumptions and reaching different conclusions.

This contribution reviews the main achievements of PI to date and the future challenges stemming from these developments. The concepts discussed start with the integration strategy for saving energy – heat and power, achieved prominence as Heat and Power Integration, as well as TSHI. The examples of practical applications of such approach including modern PHEs (Plate Heat Exchangers) are given for cases of District Heating, high temperatures and pressures in ammonia production, other fields of chemical and petrochemical industries. Some potentially attractive suggestions for retrofit of TS heat exchanger networks have been listed as the conclusion of the presentation.

The presentation concludes with a highlight of the challenges to be tackled and a suggested vision for a strategy for future research and development. These include bringing more coherence to the concepts and tools used, potentially leading to open standards for Process Integration knowledge management.

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IMPROVING ENERGY EFFICIENCY AND GRID-FRIENDLINESS OF BUILDINGS

Prabir Barooah

Mechanical and Aerospace Engineering, University of Florida, USA, E-mail: pbarooah@ufl.edu

Buildings account for a large fraction of energy consumption and CO2 emissions worldwide, particularly in industrialized nations. Enhancing energy efficiency of buildings is a crucial step in reducing total energy use and improving the environment through emission reduction. A major reason for this inefficiency is the way buildings - and in particular their Heating, Ventilation and Air Conditioning (HVAC) systems - are operated and controlled. Smarter control of these processes is going to result in substantial reduction in energy consumption worldwide.

Buildings can also help the environment in another way: by providing demand side flexibility so that higher utilization of renewable energy sources (such as solar and wind) becomes possible. High penetration of intermittent and uncertain renewable energy sources will require additional resources for balancing generation and consumption of electricity other than the traditional spinning reserves. Buildings, by dint of their large thermal capacity and high use of electricity, can provide a significant portion of the required demand side flexibility.

In this talk we will describe our current work on these two fronts: (1) developing control-oriented technology for efficiency improvement that existing buildings can be retrofitted with at minimal cost, and (2) developing methods to enable HVAC systems to provide regulation services to the electric grid while causing negligible deviation in the indoor environment. For the first topic, we will discuss several aspects of the technology we have developed and demonstrated. These include not only the control algorithms, but also wireless sensor networks and software to enable third party sensors and algorithms to integrate with vendor-specific building equipment. For topic 2, we will first provide a broad overview of the operational aspects of the electric grid, and how buildings – or other flexible loads - can play a role in a sustainable energy future by helping the grid operate in a stable manner even when a large fraction of electricity generated comes from intermittent and uncertain renewable sources. We will then discuss some of the specific methods we have developed for making buildings provide ancillary services to the grid by controlling their fans, pumps and chillers.

MICRO-/NANO-STRUCTURED MATERIALS FOR HYDROGEN ENERGY

M. Bououdina [1, 2]

[1] Nanotechnology Centre, University of Bahrain, Kingdom of Bahrain

[2] Department of Physics, College of Science, University of Bahrain, Kingdom of Bahrain

Sustainable, renewable and clean energy sources attracted great attention due to the high oil prices, global warming, health problems, etc. Among other energy carriers, hydrogen (H_2) has been identified as a very promising.

Materials at the nanoscale offer diverse tuneable properties as a function of their size, shape and chemical composition due to strong quantum confinement effects and large surface-to-volume ratio. Therefore, Hydrogen Storage Materials (HSM) at the nanoscale regime attracted great attention in recent years due to their high-density reversible H_2 storage and improved thermodynamic properties (enhanced kinetics, reduced desorption/absorption temperature and better cycling).

In this paper, selected micro- and nano-structured materials will be presented and discussed in terms of synthesis method, characterisation and thermodynamic properties (hydrogen storage capacity, hydrogenation / dehydrogenation mechanisms, kinetics, etc): (i) Laves phase system where the kinetic can be improved by the precipitation of secondary phase; (ii) M-MgH_2 (M is a transition metal) nanopowders with improved kinetics due to the size reduction, doping as well as catalytic effect; (iii) effect of catalyst (Fe_2O_3 and NiO) on the formation of carbon nanostructures and their hydrogen proprieties and (iv) lithium reactivity with metal hydrides (i.e. NiTi) for a new generation of rechargeable Li-ion batteries; (v) some recent projects.

References: Handbook of Research on Nanoscience, Nanotechnology and Advanced Materials, Ed. M Bououdina & P. Davim, IGI, USA, 2014

CO_2 CAPTURE TECHNOLOGIES INVOLVING FLUIDIZED BED REACTORS: A REVIEW OF SORPTION-ENHANCED GASIFICATION, CALCIUM-LOOPING, CHEMICAL-LOOPING COMBUSTION AND OXY-FUEL COMBUSTION

Fabrizio Scala

Istituto di Ricerche sulla Combustione – CNR, P.le V. Tecchio, 80
80125 – Napoli, Italy; Tel: +39 081 7682969; Fax: +39 081 5936936, E-mail: scala@irc.cnr.it

Carbon capture and storage (CCS) is an attractive measure for mitigating global climate change due to carbon dioxide emitted from fossil fuel conversion. Possible routes to generate pure CO_2 suitable for sequestration include pre-combustion strategies where CO_2 is removed from the syngas produced in a gasification process, or post-combustion technologies where CO_2 is removed from the combustion flue gas. Sorption-enhanced gasification (SEG) and Calcium-looping (CaL) are two novel technologies that use Ca-based particles as a high temperature regenerable CO_2 sorbent, either from syngas or from combustion flue gas, respectively. A completely different approach is that used in Chemical-looping combustion (CLC), a technology that involves the use of a metal oxide as an oxygen carrier which transfers oxygen from air to the fuel, thus avoiding a direct contact between air and fuel. The common feature of these three technologies is the requirement to effectively transfer sorbent/carrier particles between two reactors, which is most easily accomplished with the use of two inter-connected fluidized beds. A fourth technology involving the possible use of fluidized beds is Oxy-fuel combustion (OFC), where the fuel is burnt in an environment containing pure oxygen and recycled flue gas. The use of oxy-fired fluidized beds offers fuel flexibility, the possibility of firing biomass in a CO_2-negative way, and may also permit the flue gas recycle to be reduced. The basic principles and the state-of-the-art of the above technologies are discussed, together with the major issues, technical challenges and current development status.

GRAPHENE MATERIALS FOR ADVANCED ENERGY STORAGE

Cengiz S. Ozkan

Professor of Mechanical Engineering, and Materials Science and Engineering
University of California Riverside, CA 92521 USA

Graphene is a one atom thick two-dimensional material that exhibits exceptional physical and electronic properties, and offers alternatives for applications in energy storage devices, nanoelectronics, spintronics, biosensors, and medicine. I will describe innovative approaches for the synthesis of hierarchical three dimensional graphene hybrid materials which possess characteristics including ultra large surface area, mechanical durability and high conductivity which are appealing to diverse energy storage systems. Rapid charging and discharging supercapacitors are promising alternative energy storage systems for applications such as portable electronics and electric vehicles. Integration of pseudocapacitive metal oxides with structured nanomaterials has received a lot of attention recently due to their superior electrochemical performance. In order to realize high energy density supercapacitors, we developed a simple and scalable method to fabricate graphene/MWNT/RuO_2 nanoparticle hybrid systems. Excellent capacitance retention and high charge-discharge cycles have been demonstrated. Next, I will talk about three-dimensional cone-shape carbon nanotube clusters decorated with amorphous silicon for lithium ion battery anodes. An innovative silicon decorated cone-shape CNT clusters (SCCC) is prepared by depositing amorphous silicon onto CCC via magnetron sputtering. The seamless connection between silicon decorated CNT cones and graphene facilitates the charge transfer in the system and provides a binder-free technique for fabricating lithium ion batteries. Very high reversible capacity and excellent cycling stability has been demonstrated. Such multi-scale engineered materials could have wide range implications to facilitate new technological innovations in energy storage.

INVITED SPEAKERS

SUSTAINABLE CONSTRUCTION MANAGEMENT SYSTEM IN CITY AS AN ORGANISM

Taehoon Hong

Yonsei University, Korea; E-mail: hong7@yonsei.ac.kr

The rapid growth of cities and subsequent industrialization has led to the rise of various environmental issues, such as global warming and depletion of resources. This research aims to develop the Sustainable Construction Management System in City as an Organism so as to minimize the carbon emissions over the building's life cycle. Toward this end, this research recognizes the building as an organism, and then reinterprets the whole life cycle, such as planning, design, construction, operation & maintenance, and demolition & disposal, from the perspective of "Urban Organism". By proposing 3 step mechanisms, Monitoring-Technology-Policy, this research develops carbon emissions monitoring system, various optimal technologies for minimizing carbon emissions during whole life cycle of a project and green building polices. In addition, web-based management system can be implemented based on various optimal technologies developed in this research.

This approach is a new paradigm for the sustainable urban construction, and an integrated management system from the perspective of the entire life cycle of the building.

SYSTEMS AND MATERIALS FOR THERMAL STORAGE OF SOLAR ENERGY

Lingai LUO

Laboratoire de Thermocinétique de Nantes (LTN-CNRS UMR 6607), La Chantrerie, Rue Christian PAUC, BP 50609, 44306 Nantes Cedex, France; E-mail : Lingai.luo@univ-nantes.fr

Thermal storage systems are essential components of energy efficient processes, especially when considering renewable energy sources which are often discontinuous or unsynchronized with the heat and/or cold needs. Furthermore, thermal storage systems are crucial components for solar energy applications due to its intermittent nature.

The aim of this presentation is, in the first part, to provide an insight into recent developments about storage technologies and materials, their classification, limitations and potential solutions for their application; and in the second part, to give a special focus on an innovative process using absorption cycles for long-term solar energy storage. Solar energy is stored in summer through desorption and heat is released in winter through absorption. The originality of this concept is to allow the solution to reach the crystallization point, which leads to the increasing storage capacity. A detailed dynamic model of the system has been developed for the simulation in order to evaluate the process performance and to optimize its design. A prototype of the system will be presented as well as experimental results in the process charging and discharging modes.

CURRENT DEVELOPMENT IN THE IMPLEMENTATION OF RENEWABLE ENERGY IN THE POWER GENERATION MIX IN MALAYSIA

Abd Halim Shamsuddin

Director, Centre for Renewable Energy, Universiti Tenaga Nasional, Malaysia; E-mail: AbdHalim@uniten.edu.my

The power generation mix in Malaysia is heavily dependent on natural gas and coal, with small contribution from hydro. The power generation sector has been identified to be one of the main contributors to the carbon emissions which is the cause of global warming and climate change. In order to diversify the power generation mix with clean source, the Government introduced Renewable Energy, RE, as the Fifth Fuel Strategy in the National Energy Policy in 2001. Small Renewable Energy Power Program, SREP, was introduce as a strategy with a number of incentives to promote the implementation of RE in the generation mix. However, SREP failed in the expectation to achieve the target set by the Government due several barriers. In 2011, the Renewable Act 2011 (RE Act 2011), was enacted with the Feed-in Tariff Mechanism, FiT, and a new agency, the Sustainable Energy Development Authority was established to facilitate the aggressive implementation of RE in the power generation mix. Malaysia has large resources and potential of RE in the form of biomass, solar and hydro, which would easily meet the target set in the power generation mix. This paper reports on the current status of RE contributions in the power generation mix in Malaysia and also addresses the barriers and challenges that need to be overcome for smooth implementation of RE in the power generation mix.

ANALYSING GORDON'S TRADE-OFF IN THE GERMAN ENERGY SECTOR

Holger Schlör*, W. Fischer, J-Fr. Hake

Forschungszentrum Jülich, IEK-STE, 52425 Jülich, Germany,
E–mail*: h.schloer@fz-juelich.de; Phone: +49 2461 616971

The aim of our paper is to make a contribution to the current science and policy discourse on the social design of the German energy transition (Energiewende). For this analysis, we use the Atkinson index as an inequality measure to analyse the distribution of income, consumption and energy expenses in Germany and identify Gordon's trade-off. Gordon refers to a basic problem of democratic societies namely that the constitutional guarantee of political equality of all citizens is contrasted with economic inequality, measured in income and consumption, as a result of market forces. Gordon characterized this economically as a trade-off between equality and efficiency, irrespective of the affluence of society.

The Atkinson index can contribute to scrutinizing and illustrating the trade-off with respect to the social discourse about inequality in the German Energiewende, since the index's epsilon parameter reveals the weighting of the inequality or equality of society. The epsilon parameter allows us to assess the distribution from the perspective of the whole of society or of social groups.

In the first part of our analysis we considered the real distribution of income, consumption and energy expenses, and in the second part we analysed the normative distribution of energy expenses in one energy reference scenario and two energy price scenarios. The results of applying the Atkinson index reveal the societal meaning of Gordon's trade-off for the German energy sector in the context of the German energy transition process (Energiewende).

Keywords: Gordon's Trade-off, Energiewende, Consumption and Energy Distribution, Atkinson Index.

CAPACITIVE AND ACCUMULATOR MIXING FOR THE PRODUCTION OF ENERGY FROM SALINITY DIFFERENCES

Doriano Brogioli

INSTM and Universita' degli Studi di Milano-Bicocca, Italy; E-mail: dbrogioli@gmail.com

The free energy associated to the salinity difference between two solutions (e.g. river and sea water) can be harvested in order to produce clean and renewable energy. Various techniques have been developed, including the "pressure-retarded osmosis" and the "reverse electrodialysis". A promising family of technologies, called "capacitive mixing" (capmix) or "accumulator mixing", has been recently introduced. It is based on couples of electrodes that are cyclically dipped into the two feed solutions. A current flow through the electrodes and its direction is cyclically switched, so that the salt ions are captured by the electrodes during the high-salinity step and are subsequently released during the low-salinity step: the mixing is mediated by the temporary storage of the salt in the electrodes. The tapped free energy appears as an increase of the electrical energy of the cell, i.e. in a voltage rise taking place upon the salinity change. Various electrode materials have been studied: activated carbons (like in supercapacitors), membrane-activated carbon assemblies, materials used in batteries (e.g. manganese oxide). Good performances have been obtained by adding functional charged groups to activated carbon particles, either by adsorption of charged molecules, or by coating the particles with polymers bearing the functional groups. The study of the potential rise upon salinity change, as a function of the charging state of the electrodes, sheds light on the involved physical processes.

ULTRATHIN NANOSHEETS OF METAL OXIDES SYNTHESIS AND THEIR EXCELLENT PERFORMANCE AS ANODE OF LITHIUM ION BATTERIES AND SUPERCAPACITOR

Chuanbao Cao*, Youqi Zhu

* Research Center of Materials Science, Beijing Institute of Technology, Beijing 100081, China, E-mail: cbcao@bit.edu.cn

Two-dimensional multicomponent transition-metal oxide nanosheets are the most promising candidate in energy storage/conversion devices. Their surface-enhanced properties and synergic effects are fascinating yet still underdeveloped. Here, we first report ultrathin 2D $ZnCo_2O_4$ nanosheets synthesized via microwave-assisted liquid-phase growth with post annealing. The well-defined nanosheets show a micron-sized planar area and ultrathin thickness, suggesting high surface atom ratio with unique surface and electronic structure, thus facilitate the charge transfer and enhance the overall electrochemical performances. The $ZnCo_2O_4$ nanosheets exhibit high lithium storage capacity, excellent cycling stability, and good high-rate capability. Importantly, we have extended the formation to other analogue nanosheets including binary and ternary transition metal oxides (NiO, $Ni(OH)_2$, Co_3O_4, $NiCo_2O_4$, and $CuCo_2O_4$) and make a possibility in exploring more unique properties and commercial applications. We use $Ni(OH)_2$ nanosheets fabricated the pseudocapacitive, and find that it exhibit a maximum specific capacitance of 4172.5 F g^{-1} at a current density of 1 A g^{-1}. Even at higher rate of 16 A g^{-1}, the specific capacitance is still maintained at 2680 F g^{-1} with 98.5% retention after 2000 cycles.

MULTI-OBJECTIVE BIOREFINERY NETWORK SYNTHESIS AT EU LEVEL

Lidija Čuček,[a] Mariano Martín,[b] Ignacio E. Grossmann,[c] Zdravko Kravanja[a]

[a]Faculty of Chemistry and Chemical Engineering, University of Maribor, Smetanova ul. 17, Maribor, Slovenia, lidija.cucek@um.si, zdravko.kravanja@um.si
[b]Department of Chemical Engineering, University of Salamanca, Salamanca, Spain, mariano.m3@usal.es
[c]Department of Chemical Engineering, Carnegie Mellon University, Pittsburgh, USA, grossmann@cmu.edu

Current environmental concerns such as GHG emissions and climate change have led to an increasing interest in the development of a renewable-based energy supply [1, 2]. Amongst these sources, biomass is an interesting alternative for reducing our dependency on crude-based fuels for the transportation sector [3]. Biofuels could be produced in a near carbon-neutral manner if their production were to be considered within the whole supply network on a proper scale rather than as an isolated process with substantial environmental burdens [4].

In this contribution a multi-objective optimization biorefinery supply network is performed by considering both economic and environmental objectives. Several biofuels' production technologies are considered such as biochemical, thermochemical, thermo-biochemical, oil extraction and transesterification processes for producing bioethanol, biodiesel, hydrogen, Fischer-Tropsch diesel, and green gasoline [5]. A biorefinery supply network also accounts for different biomass sources such as corn, wheat, corn stover, wheat straw, miscanthus, algae, and cooking oil. In previous work, multi-period synthesis of an optimally-integrated biorefinery supply network [6] was performed from an economic perspective and applied to a case study of the EU [7]. In this work it is extended to multi-objective multi-period synthesis, which enables simultaneous evaluations of the economic and environmental impacts of a biofuel's supply network. The concept of total effects by applying total footprints or total sustainability index has been used, thus accounting for both, burdening and unburdening effects [8] on the environment. Economically- and environmentally-optimal solutions are obtained by accounting for optimal planning of raw materials harvesting and supply, and biofuels' production. The results show a selection of the most sustainable biomass and waste, production technologies, and biofuels for each particular region, country, and for the EU as a whole.

Keywords: Biorefinery Supply Network, Biofuels, Sustainability, Multi-objective synthesis, European Union

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ON THE FUTURE PROSPECTS OF LONG-TERM ELECTRICITY STORAGES

Reinhard HAAS*, Amela AJANOVIC

Energy Economics Group, Vienna University of Technology, 1040 Wien, Austria; Tel.: ++431 58801 370352, E-mail*: haas@eeg.tuwien.ac.at

In the next decades increasing amounts of electricity from intermittent renewable energy sources (RES-E) like wind and solar in electricity systems are expected. To balance electricity supply and demand over time it is very likely that new – especially long-term storages – are needed.

The core objective of this paper is to investigate what are the market prospects of such long-term-electricity storages like pumped hydro, and power-to-gas- technologies (PtG) like hydrogen and methane up to 2030. Our method of approach is based on dynamic technological learning for the development of investment costs and efficiencyof long-term storages based on quantities for technologies described in IEA (2011).

The results are: Up to 2030 decreases in the prices of PtG technologies will take place due to learning effects. For large pumped hydro storages the costs will rather increase mainly due to a lack of sites with reasonable costs and lack of acceptance. By 2030 under most favourable learning conditions the costs of hydrogen and methane for 2000 fulloadhours per year will be between 0.15 EUR/kWh and 0.20 EUR/kWh. Efficiency of pumped hydro will remain at about 80%, efficiency of hydrogen will increase from 60 to 70% and of methane from 48% to 60% under favourable conditions.

The major conclusions are: For PtG it will become hard to compete in the electricity markets despite high technological learning potentials. Yet, given the lack of environmentally benign fuels for mobility hydrogen and methane from renewables might become an alternative for fueling cars.

REGULAR SESSIONS

ID-3

Microstructural and Mechanical Characterization of Silica Intended for the Photovoltaic Application

A. Kefaifi[a,b], T. Sahraoui[b], A. Kheloufi[a], N. Drouiche[a]

[a] Centre de Recherche en Technologie des Semi-conducteurs pour l'Energétique (CRTSE). 2, Bd Frantz Fanon BP140, Alger-7 merveilles, 16027, Algérie Tel: +213-21-43-35-11

[b] Université SAAD DAHLAB de Blida route de SOUMÂA BP 270 Blida (09000) Algérie

E-mail: kefaifi_22@yahoo.fr

Abstract

The mineral enrichment, the reduction of silica by carbon and purification of metallurgical grade silicon are three subsequent stages for producing grade silicon for the photovoltaic cells manufacturing. In the present work, a study of silica (the raw material) has been conducted. Quartz and sandstone were used in order to perform a metallographic characterization. Using an optical microscope, it revealed the defects existing in the silica structure, such as inclusions and micro cracks.

Sampling the hardness of Vickers demonstrated and confirmed the existence of the beforehand imperfections which cause bursting of silica and produce fine particles in the furnace during the Carbothermic process. The results allowed the identification of a correlation between the microstructure, the mechanical properties and the behavior of silica at a high temperature when the application of an electric arc furnace during the Carbothermic process took place.

Keywords: Silica, Microstructure, Inclusions, Micro cracks, Micro hardness, PV

ID-4

PCM-Cold Storage System: An Innovative Storage Tank Technology for The Improvement of Charge And Discharge Kinetics

M. De Falco[a], G. Deliso[a], F. Tedeschi[b], D. De Blasiis[b], A. Zaccagnini[c]

[a] Upgrading Services S.p.A., via Dante Alighieri 142, 70122 – Bari, Italy, marcello.defalco@upgradingservices.it, +393476809041

[b] Centro Laser S.c.a.r.l., Str. Prov. per Casamassima km 3, 70010 – Valenzano (Ba), Italy

[c] Labor S.r.l., via Giacomo Peroni 386, 00131 – Rome, Italy

Abstract

Developing and installing devices able to store cold energy for air conditioning application would allow storing the electrical energy fed to the air conditioning systems, thus managing the load peaks profiles during summer months and leading to the de-coupling of cold production, by means of electricity driven air conditioning system, and cold loads required by the users.

The paper presents an innovative Phase Change Materials (PCM) based cold storage tank by which the cold energy is stored changing the phase of an organic material from liquid to solid and, thanks to an optimized heat exchanging system, the charge and discharge phase time is short, allowing to increase the charge and discharge power.

The innovative cold storage tank is presented and a 5 kWh prototype is described in detail. Some experimental results, as the energy stored, the charge/discharge cycle times, the charge and discharge power versus time, etc., are reported and assessed, demonstrating the technology potentialities.

The system can be applied in small/medium air conditioning systems, mainly for domestic applications, allowing a crucial reduction of electricity consumption and a better management of production/consumption energy flows.

Keywords: Cold Storage, PCM, energy efficiency, energy storage, smart grid.

ID-5

Adsorption of Methyl Red from Aqueous Solutions by Algerian Bentonite Clay

K. Boudouara, M. Ghelamallah, A. Bellifa, N. H. Khemliche

Laboratoire de Matériaux, Applications et Environnement, Faculté des Sciences et de la Technologie,
Université de Mascara, BP 305 Route de Mamounia, Mascara 29000, Algeria.
E-mail: gh_madani@hotmail.com

Abstract

The synthetic organic dyes are discharged into the effluents during their production and fabrics manufacturing process. They are very visible in wastewaters due to their strong color at very low concentrations and in consequence, the color is one of the most obvious indicators of water pollution. The environmental damage of colored effluents is associated with their toxicity.
Adsorption processes using suitable adsorbent have shown high removal efficiency and many economical, ecological and technological advantages. Based on their adsorption performance, bentonite-type Algerian clay from Mostaganem (N.W. Algeria) has been first acid-activated and characterized by powder X-ray diffraction, FT-IR spectroscopy, scanning electron microscopy (SEM) and specific surface area. The acid-activated clay (AAC) was employed as adsorbent for the removal of methyl red from aqueous solutions using adsorption method. The influence of several parameters (kinetics, contact time, sorbent amount, adsorbate concentration, and pH) on the adsorption capacity was evaluated and discussed.
The Freundlich and Langmuir adsorption models were applied to experimental equilibrium data and the isotherm constants were calculated. The results indicated that the adsorption was favorable at lower pH. Freundlich model provided the best fit to the experimental data with high correlation coefficient (R^2= 0,985). The monolayer adsorption capacity of Mostaganem bentonite found to be 2.0 $mg.g^{-1}$. It was seen that pseudo-second order equation describes the adsorption kinetics. The results indicated that this bentonite-type clay is favorable to be used as an economical adsorbent for the removal of methyl red dye.

Keywords: Removal; Bentonite Clay; Methyl Red; Activation; Adsorption

ID-6

Adsorption of Methyl Orange from Aqueous Medium by Bentonite and Active Carbon

A. Bellifa, M. Makhlouf, M. Ghelamallah, Z. H. Boumila,

Laboratoire de Matériaux, Applications et Environnement, Faculté des Sciences et de la Technologie, Université de Mascara, BP 763 Route de Mamounia, Mascara 29000, Algeria.

E-mail: abellifa@yahoo.fr

Abstract

Adsorption of methyl orange (MO) from aqueous solution by active carbon and bentonite-type Algerian clay was investigated. The bentonite-type Algerian clay from Maghnia has been acid-activated (HCl) and characterized by X-ray diffraction, TGA-TDA, FT-IR spectroscopy and specific area. The efficiency of these adsorbents for the uptake of MO was examined by adsorption isotherms. The influence of several parameters (kinetics, contact time, sorbent amount, adsorbate concentration, and pH) on the adsorption capacity was investigated.

The results indicated that the MO adsorption equilibrium of active carbon is lower than that of bentonite (3 h/ 1 h), whereas adsorption yield with active carbon is better than that of bentonite. The adsorption capacity of bentonite is lower than that of active carbon. Frendlich and Langmuir models provided the best fit to the experimental data with high correlation coefficient only for active carbon. Adsorption of MO followed a pseudo second order kinetic model. Negative values of free energy ΔG indicated spontaneity of the adsorption of MO.

Keywords: Adsorption, active carbon, Bentonite Clay, Methyl Orange.

ID-7

GGA-PBEsol+TB-MBJ Studies of SrxPb1-xS Ternary Semiconductor Alloys

Y. Benallou[a*], K. Amara[b], B. Soudini[c].

[a*]Communications Technologies Laboratory, Electronic Department, University Taher Mouley of Saida, 20000, Algeria. E-mail: benallou06@yahoo.fr

[b]Laboratoire Physico-Chimie, Physics Department, University Taher Mouley of Saida , 20000, Algeria.

[c]Applied Materials Laboratory, Electronic Department, University of Sidi Bel Abbes,22000, Algeria.

Abstract

In this paper, we report a density functional study of the structural, electronic and elastic properties of the ordered phases of SrxPb1-xS ternary semiconductor alloys namely rocksalt compounds: PbS and SrS and the rocksalt-based compounds: SrPb3S4, SrPbS2, and Sr3PbS4. These First-principles calculations have been performed using the full potential linearized augmented plane wave method (FP-LAPW) within the Generalized Gradient Approximation developed by Perdew–Burke–Ernzerhor for solids (PBEsol). The calculated structural parameters like the lattice parameters, the bulk modulus B and their pressure derivative B' are in reasonable agreement with the available experimental and theoretical data. In addition, the elastic properties such as elastic constants (C_{11}, C_{12} and C_{44}), the shear modulus G, the Young modulus E, the Poisson's ratio v and the B/G ratio are also given. For the electronic properties calculations, the exchange and correlation effects were treated by the Tran-Blaha modified Becke-Johnson (TB-mBJ) potential to prevent the shortcoming of the underestimation of the energy gaps in both LDA and GGA approximations. The obtained results are compared to available experimental data and to other theoretical calculations.

ID-8

Cost-Effective Electrocoagulation Process for the Remediation of Fluoride from Pretreated Photovoltaic Wastewater

B. Palahouane[a], N. Drouiche[a*], S. Aoudj[a], K. Bensadok[b]

[a]Centre de Recherche en Technologie des Semi-conducteurs pour l'Energétique (CRTSE). 2, Bd Dr. Frantz Fanon P.O. Box 140,

Algiers-7 merveilles, 16038, Algeria. E-maill[*]: nadjibdrouiche@yahoo.fr; drouichenadjib@crtse.dz

[b]Laboratoire de Génie des Procédés et de l'Environnement, FGMGP, USTHB, Alger, Algeria

Abstract
Electrochemical method was carried out to remove fluoride ions from pretreated photovoltaic wastewater using an electrocoagulation technique, and using aluminum sheets as a working electrode. The effects of key operating parameters such current density, number of electrodes and pH were investigated. Number of electrodes, pH and current density were found to be optimum at 1 cm, 7, 18.51A/m^2, and 3 respectively. An operation cost including sacrificial electrode materials and electrical energy requirements was also performed for the treatment process. Under the experimental conditions energy consumption was determined as 0.32 KWh/F. The results show that the electrocoagulation can be applied to photovoltaic wastewater post-treatment.

Keywords: Electrocoagulation; Fluoride; Aluminum electrode; Operation costs.

ID-9

Influence of Covering Material on the Greenhouse Microclimate: Comparative Study Glass - Polyethylene

S. Bezari[a*], S. M. A. Bekkouche[a], A.Benchatti[b], S. Fakiri[b]

[a] Unité de Recherche Appliquée en Energies Renouvelables, URAER, Centre de Développement des Energies Renouvelables, CDER, 47133 Ghardaïa, Algérie. E-mail[*] : bezarisalah@yahoo.fr

[b] Département de Génie Mécanique, Université Amar Telidji-Laghouat, Route de Ghardaïa, B.P 37G Laghouat, 03000, Algérie

Abstract

The solar irradiation is considered as an important source of energy because its greenhouse effect. This consists of the radiation effect carried by the solar spectrum which can easily penetrate in a shelter.

The greenhouses are usually covered with a material (i.e, glass or plastic) that have the ability to transmit light that provides essential energy for plant growth and production. Intensity, duration and spectral distribution of light affect plant response.

The wall material is the essential element of the greenhouse. Its principal function is to insure the greenhouse effect in the more possible suitability fashion by permitting the light. The synthesis materials are characterized specially by their relative instability with respect to time. The event is occurred by alteration of the optical characteristics following the photo-degradation and by weakening of the mechanical characteristics closed on the wall exterior surface under different shapes (tears, delaminating, etc…).

The analysis of the greenhouse's cover different types have been realized and then have been showed that the electromagnetic energy is inversely proportional to its wave length, that means the ultraviolet rays are the principal cause of the material alteration. The short ultra-violets are more absorbed by the atmosphere than the long ones. The last are the main factor of the material oldest. This result is validated by a normal incidence and the is extended to all possible orientations then is spatially integrated in way that gives a values of infrared proprieties, applied at a real greenhouse project.

Keywords: Greenhouse, Solar Energy, Material, Polyethylene, Glass

ID-10

Modeling of Dielectric Permittivity of Oxidized Porous Silicon and Non-Oxidized

S. Fakiri, K. Rahmoun

Department of Physics (Renewable Energy), University AbouBekr Belkaid.
B.P 230, Tlemcen, 13000, Algeria. E-mail: souhila-physique@hotmail.fr

Abstract
In this work we have studied and modeled the dielectric permittivity of porous oxidized and non-oxidized silicon to improve the performance of a porous silicon dielectric. We present an analytical solution that allows the prediction of the dielectric permittivity and the refractive index using a series-parallel structure capacity based on the model of Vachon and Cran. The comparison between different cases is made in order to select the fit model. It is found that oxidation enhanced the material stability. The results are in good agreement to that of experience.

Keywords: Porous silicon, Porosity, Degree of oxidation, Modeling, Low dielectric constant.

ID-11

Numerical Simulation Instationnaire of Turbulent Forced Convection in À Rectangular Control Provided with the Porous Baffles

F. Fakiri

Laboratory of energetics and Thermic Applied (ETAP) (Faculty of technology has), University AbouBekrBelkaid.B.P 230, Tlemcen, 13000, Algeria

E-mail: fakiri.fethallah@yahoo.fr, fakiried1@hotmail.fr,

+213 (0) 5 55 48 20 58

Abstract

A study was performed to extract average coefficients of heat transfer evenly heated in a rectangular channel provided with porous baffles and vanes. The baffles were mounted alternately on the top and bottom walls. The coefficients of heat transfer and pressure losses for a fully developed turbulent flow and heat transfer have been maintained for the various types of angle (15 °, 30 ° and 45 °) with a constant thickness and reports hydraulic diameters (D_h / h = 1/3 , 2/3) . The Reynolds number (Re) ranged from 20000 to 50000. Une comparison was made between the porous baffles nail 0 ° and the baffles of porous different type angle. The uncertainties associated with the highest number of Nusselts, the coefficients of friction were of 5 % and 7% respectively. The procedure has been validated by comparing the data of a channel provided with baffles (D_h / h = 1/3, 2/3) with those in the literature. The use of the porous baffles accomplished dimensions slight heat transfer compared to heat transfer in a channel with baffles angle 0 °. However, improving the transfer of heat per unit increase the number of pores and a decrease with the increase of angle, work permits optimized parameters for good solar collector has air planes.

Keywords: Porous Medium, Horizontal Canal, Heat Transfer and Material Model Darcy- Forchheimer - Brinkman Forced Convection, Finite Volumes.

ID-13

Promotion and Implementation of Bioenergy for a Better Environment

A. M. Omer

Energy Research Institute, Forest Road West, Nottingham NG7 4EU, UK

Abstract

There is strong scientific evidence that the average temperature of the earth's surface is rising and this may be attribute to increased concentration of carbon dioxide (CO_2), and other greenhouse gases (GHGs) in the atmosphere as released by burning fossil fuels. One of the chief sources of green house gases is burning of fossil fuels. Biogas from biomass appears to have potential as an alternative energy source, which is potentially rich in biomass resources. In the present paper, current literature is reviewed regarding the ecological, social, cultural and economic impacts of biogas technology. In this article an attempt has been made to give an overview of present and future use of biomass as an industrial feedstock for production of fuels, chemicals and other materials. However, to be truly competitive in an open market situation, higher value products are required.

Keywords: biomass resources, biogas application, sustainable development, environment.

ID-14

Nano Sensors to Detect Cd(II) in Blood Medium by Cyclic Voltammetry

Muhammed M. Radhi, nawfal k Aldmalooji, baqir k abed, sajid H Alwan
Health and medical technology college-baghdad, Iraq; E-mail: mmradhi@yahoo.com

Abstract
An electrochemical investigation of cadmium species has been carried out by using cyclic voltammetry (CV) at different modified glassy carbon electrodes (GCE). The modified CNT/GCE, C_{60}/GCE and modified activated carbon (AC) on GCE as AC/GCE were used as working electrodes in CV. One application of these electrodes is detection of Cd(II) ion in blood medium using CV technique. Electrodes response was obtained for the oxidation and reduction peaks of Cd(II) ion in blood medium at modified CNT/GCE, C_{60}/GCE, and AC/GCE. A well-defined oxidation and reduction current peaks appeared at -0.54 and -0.67V versus Ag/AgCl with a current enhancement and peak potential shift toward higher potential due to nano materials (CNT and AC) comparison with C_{60}/GCE and bar GCE. Besides that, the presence of CNT or AC on the GCE in blood media caused an increase of the oxidation and reduction current peaks of Cd(II) ion (current enhancement) by about five times compared to the use of other modified electrodes.

ID-15

TRANSPORT COEFFICIENTS FROM FIRST-PRINCIPLES (FP-LAPW) CALCULATIONS

O.Arbouche, S.Kessair, K.Ammara, Y.Benallou

Université of Saida Dr Tahar Moulay Algeria

Abstract

We present a method of modeling transport coefficients from first-principles calculations. We introduce the transport distribution that contains all electronic information and from which transport coefficients can easily be calculated. We use this method to analyze Sb_2Te_3 and calculate its transport coefficients for a comparison with experiment. The transport distribution gives an improved insight into the relationship between transport properties and electronic structure and is a valuable tool in the search for improved thermoelectric materials.

ID-16

Numerical Study of Flow and Heat Transfer inside an Insulated Container Equipped With a Phase Change Material

F. Aitlahbib[a,b], H. Chehouani[a]

[a]LP2M2E Laboratoire de Procédés Métrologie et Matériaux pour l'Energie et Environnement, Université Cadi Ayyad, FSTG, Département de Physique Appliquée, Marrakech, Morocco.

[b]Compagnie minière des Guemassa, Groupe Managem, Marrakech, Morocco.

faical.aitlahbib@live.fr, chehouani@hotmail.fr

Abstract

One of the challenges that come daily is the preservation of hot drinks and meals. Many packaging solutions already exist in the market such as food insulated containers, but their effectiveness in terms of temperature conservation is limited. The use of thermal energy storage by incorporation of phase change materials (PCM) in packaging materials could be possible solution in heat retention. A system that has been called KWS (Keeping Warm System) may be seen as an insulated box with one or more walls containing PCM is proposed. A general model of this configuration can be seen as an enclosure having an “active wall” played by the presence of the melting PCM. Thus, the solidification of the PCM will generate a latent heat inducing a natural convection air flow inside the cavity. Despite of the practical and scientific interest of this subject, there are few reports regarding the effect of the active wall generated by PCM on the fluid behavior inside a cavity. The aim of this work is to investigate numerically the coupled flow and heat transfer in air inside a square enclosure with one vertical side in contact with a phase change material. We examine the influence of the latent heat on the streamlines and isotherms in the air filled cavity. The averaged Nusselt number at both cold and hot sides of the cavity will be presented. The comparison with the case without latent heat shows that heat retention is five times more efficient by the presence of PCM.

ID-17

Exergy Parametric Study Of Monoxyde Oxydation In Moist Air

F. Souidi*, T. Benmalek, B. Yssaad, S. Djedjig

Faculty of Physics, University Science and Technology Houary Boumedienne (USTHB), Algeria.

E-mail*: sou_fer@yahoo.com

Abstract

To predict the rate of useful work in CO oxydation, temperature ,velocity and mass rates profiles of different species are desirable. In this context, a mathematical modeling of laminar premixed flame in a stagnation point flow has been achieved by numerical solution of the boundary layer equations using a self made code. The general mathematical description consists of a coupled set of differential equations based on conservation principles. Similarity transformations are introduced to convert the original partial differential equation (PDE) set into a simplified ordinary differential equation (ODE) set. The chemical kinetic mechanism for the combustion of the fuel which is the mixture of carbon monoxide, oxygen and water vapor is modeled by 30 elementary independent reactions which incorporate (09) nine chemical species: CO, O, CO_2, O2, H_2O, H, H_2, HO_2 and OH. The governing system of equations is solved by the finite difference method. The main result we arrived at,is that for all the paramerters we considrerd, the exergy variation as the system is forced to its inlet condition, is negative and hence work can be obtained, this work is maximum, were the transformationn reversible. However, due to execive irreversibility, this exergy is completely destroyed and a minimum work should be delivred to the system to force it to its initial state.

Keywords: CO reactional mechanism, exergy, entropy, irreversibility

ID-18

Computational Study On Intermolecular Charge Transfer Complex Of 2,2'-Bipyridine With 3,5-Dinitrosalicylic Acid

M. Fatiha

Laboratory of computational chemistry and nanostructures,
Department of Material Sciences, Faculty of Mathematical,
Informatics and Material Sciences, University of 08 Mai 1945 BP 401 Guelma, Algeria.
E-mail: fatiha_madi@yahoo.fr

Abstract

Charge transfer complex of 2,2'-bipyridine with 3,5-dinitrosalicylic acid was investigated by DFT/B3LYP level of theory Electronic structures were investigated by TD-DFT method and the descriptions of frontier molecular orbitals and the relocation of the electron density were determined. Besides ^{1}H NMR chemical shifts were computed at B3LYP/6- 311+G(2d,p) level of theory by Gauge-invariant atomic orbital (GIAO) in DMSO as a solvent using the polarizable continuum model (PCM).

The obtained calculations were compared and discussed with experimental results.

ID-19

Numerical Simulation of the Wake Rotor of Horizontal Axis Wind Turbines under Yawed Conditions

B. Noura[a], I. Dobrev[b], R. Kerfah[a], A. Zaaraoui[a]*

[a]Laboratory FIMA - University of Khemis - Miliana, Ain- Defla, Algéria. E-mail[*]: nourabelhadj@yahoo.fr
[b]Laboratory dynamyfluid ENSAM Arts et Métiers Paris Tech, France

Abstract
The aerodynamics of horizontal axis wind turbine remains a difficult area for research, yet it is crucial for wind energy. The operating conditions depend on several factors such as wind direction and velocity. It is impossible for the wind turbine to have the axis permanently aligned toward the wind direction, and hence, the flow is often yawing. Under these conditions, the flow is very complex and it is very difficult to obtain the performance of the wind turbine.
The yaw wake and the lack of existing velocity behind the wind turbine affect the energy production and the mechanical integrity of wind turbines downstream in the wind farms. Indeed, during the normal operation of the horizontal axis wind turbine, it appears at the downstream of the machine a wake. This sheet is a free vortex formed by two essentially vortex begin one near the axis of the rotor, the other at the blade tip. This blade tip vortex plays an important role in the aerodynamics of the turbine. They produce a very complex flow field with strong gradients. These vortices are also the major source of instability. The study of the development of the yaw wake downstream of the turbine is therefore necessary for the design of wind farms.
This article presents a modeling of the unsteady flow around a wind turbine under yawed conditions. The wind rotor modeled is of a commercial wind turbine i.e. Rutland 503 of the Company Marlec. The rotor has three blades. The diameter of this wind rotor is 50 cm with a hub of 13.5 cm in diameter. The chord line is 6.8 cm and 4.8 cm off the tip of the blade. The blades are untwisted and are fitted with a constant pitch angle of 10 °. These parameters were taken accurately and digitized for three blades with the hub of the rotor. The geometrical calculation fields defined above were used for the generation of a structured grid. 14 millions elements are used in the zones of the grid. The approach Detached Eddy Simulation (DES) with the SST turbulence model is used in the modeling of the flow. The solutions are obtained using the fluent solver which uses finite volume method. The simulations are made for a wind speed of 9.3 m and speeds of rotation of the rotor of the wind turbine in 1300 and yaw angle is 0° and 30 °. The results illustrate perfectly the tip vortex development from the blade and tip vortices. The yaw wake downstream the rotor is compared with experimental results obtained from wind tunnel measurements. In the laboratory of the ENSAM Paris-Tech experimental works was completed for the exploration of the flow around the Rutland 501 rotor.
The purpose of these simulations is to obtain information about the wake velocity field for the wind turbine under yawed conditions in order to calculate its aerodynamic properties. The estimate exactly of the aerodynamic loads and improved understanding of the instatinnarity environmental of the Horizontal Axis wind Turbine.

Keywords: Horizontal Axis Wind Turbine, Unsteady Three-Dimensional, Flow in yawed, Detached-Eddy Simulation

ID-20

Evaluation of Electrocatalytic Activity of Gold-Graphene/Titania Nanotubes towards Oxidation of Borohydride

A. Balčiūnaitė, A. Zabielaitė, J. Vaičiūnienė, A. Selskis, L. Tamašauskaitė-Tamašiūnaitė, E. Norkus

Center for Physical Sciences and Technology, A. Gostauto 9, LT-01108, Vilnius, Lithuania, tel: +370 52661291, E-mail: balciunaite.aldona@gmail.com

Abstract

Fuel cells are actively investigated as an attractive energy sources for cleaner power generation. One type of alkaline fuel cells - direct borohydride fuel cells (DBFC) are being developed for portable power supply. Since borohydride is used as fuel, the development of catalyst having reasonable costs and a high activity towards the oxidation of borohydride is industrially vital.

This work is focused on the fabrication of gold-graphene modified titania nanotube arrays as electrocatalysts for the oxidation of borohydride in an alkaline medium. The graphene modified titania nanotubes were obtained through in situ electrochemical reduction of a graphene oxide dispersion by cyclic voltammetry followed by electroplating of gold nanoparticles. The morphology, structure and composition of the prepared catalysts were examined by means of Field Emission Scanning Electron Microscopy and Inductively Coupled Plasma Optical Emission Spectroscopy. Evaluation of electrocatalytic activity of gold-graphene/titania nanotubes towards oxidation of borohydride was carried out by means of cyclic voltammetry and chronoamperometry.

It has been determined that the gold-graphene/titania nanotubes exhibited an enhanced electrocatalytic activity towards borohydride oxidation as compared to that of unmodified titania nanotubes and that modified with gold nanoparticles and seem to be promising anode material for DBFC.

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ID-21

Methanol and Ethanol Electro-Oxidation on the Graphene Supported Platinum-Copper Nanocomposites

J. Jablonskiene, A. Balciunaite, J. Vaiciuniene, V. Pakstas, R. Kondrotas, L. Tamasauskaite–Tamasiunaite, E. Norkus

Center for Physical Sciences and Technology, Savanoriu ave. 231, LT-02300 Vilnius, Lithuania
jol.jab@gmail.com

Abstract

In recent decades, low temperature fuel cells, such as direct ethanol fuel cells (DEFCs) and direct methanol fuel cells (DMFCs), have attracted much attention as alternative power sources for portable electronic devices due their unique properties including low operating temperature, easy transportation and storage of fuel.

In this work, the graphene supported platinum (Pt/G) and platinum-copper (PtCu/G) nanocomposites were prepared by means of microwave synthesis. The morphology, structure and composition of prepared catalysts were characterized by Transmission Electron Microscopy, X-ray diffraction and Inductively Coupled Plasma Optical Emission Spectroscopy. Electrocatalytic activity of catalysts towards the electro-oxidation of methanol and ethanol were determined by means of cyclic voltammetry and chronoamperometry.

It has been determined that graphene supported platinum-copper nanocomposite exhibits much higher electrocatalytic activity and stability towards methanol and ethanol electro-oxidation as compared with those of the Pt/C and Pt/G catalysts. The present work provides a promising strategy to design and fabricate the highly efficient graphene- based electrocatalysts for DEFCs and DMFCs applications.

ID-22

Recovery of High Purity Silicon by Recycling SoG-Si Wastes

T. Ouslimane, F. Kerkar, M. Sidali, N. Boutouchent-Guerfi, O. Bouchelaghem, N. Drouiche

Centre de Recherche en technologie des Semi-conducteurs pour l'Energétique (CRTSE). 2, Bd Dr. Frantz Fanon P.O.Box140, Algiers – 7 merveilles, 16038, Algeria

Abstract

During the last two decades and, particularly, in recent years, the photovoltaic sector has increased interest in the recovery of solar grade silicon (SOG). In order to further develop related technologies and to find suitable commercial applications for its recovery, it is essential to understand the current scientific know-how and advances. This review paper copes with recently published scientific articles in which the recovery of solar grade silicon has been studied. In addition, this review paper provides an updated picture of the current understanding of the theory behind the employed technologies. The techniques discussed were divided into six categories, which are: (i) alloying process, (ii) hydrobromination, (iii) supercritical water, (iv) electrophoresis and gravitational settling, (v) directional solidification, and (vi) centrifugation.

Keywords: Kerf loss; silicon carbide; silicon recovery; photovoltaic, electric field, centrifugation.

ID-23

First Principles Study of Copper Halides: Phase-Transitions Effect

S. Louhibi-Fasla*[a,b], H. R. Djabri[a], H. Achour[a]

[a]Laboratoire de Micro et de Nanophysique LaMiN – ENP d'ORAN, BP 1523, El M'Naouer, 31000, Algérie
[b]Laboratoire de Recherche en Technologie de Fabrication Mécanique -LaRTFM ENP d'ORAN
*fasbenplast@yahoo.fr

Abstract
The aim of this work is to investigate the structural phase-transitions and electronic properties of copper halides. Our calculations were performed within the PLW extension to the first principle FPLMTO method, which enables an accurate treatment of all kinds of structures including the open ones. Results are given for lattice parameters, bulk modulus and its first derivatives in five different surface phases, and are compared with the available theoretical and experimental data. In the zinc-blende (B3) and PbO (B10) phases, the fundamental gap remains direct with both the top of VB and the bottom of CB located at Γ.

Keywords: Copper Halides, FPLMTO, Electronic Properties, Phase Transitions.

ID-24

Prospects of Wind –Diesel Generator –Battery Hybrid Power System – A Feasibility Study in Algeria

D. Saheb-Koussa ,M. Koussa

Centre de Développement des Energies Renouvelables, CDER, 16340, Algeries , Algeria
Tel: 213 21 901503 ; E-mail: d.saheb@cder.dz

Abstract

The present work analyzes the conditions under which it makes sense to add wind turbines or a battery bank to a diesel power system. The wind energy resource data are collected from the weather station at the Renewable Energy Development Center of Bouzareah in Algeria. The hybrid system analysis has shown that for 10 households consuming 37 kWh/yr, the cost of energy is 1.771 USD/kWh and produces 23,243 kWh/yr in which 73% of electricity comes from wind energy. From this study, it's clear that the optimized hybrid system is more cost effective compared to the Diesel Generator system alone where the NPC and COE are equal respectively to 304,143 USD and 1.771 USD/kWh and 801,483 USD and 4.668 USD/kWh . The lowest NPC results in the shortest breakeven distance of 28.6 kms. In addition to the feasibility of this system, it can reduce the emission of the CO_2, SO_2 and NOx respectively from 55,674 to 10,150, 112 to 20.4 and 1,226 to 224 kg/yr. Investments in autonomous renewable energy systems should be considered particularely in remote areas. They can be financed in the framework of the National Energy Action Plan of Algeria.

ID-25

Thermodynamical Properties of GaN

H. Achour, S. Louhibi-Fasla, F.Mana

[a, b,c] Ecole Nationale Polytechnique d'Oran, BP 1523, El M'Naouer, 31000 Oran, Algeria.
[a]hafidaachour@yahoo.fr

Abstract

Gallium nitride (GaN) and other nitrides of thegroup III elements are important materials for thefabrication of various semiconductor devices suchas short- wavelenght light-emitting diodes (LEDs), laser diodes and optical detectors, as well as for high temperature, high power, and high-frequency devices [1-7].

Through the quasi-harmonic Debye model, in which the phononic effects are considered, the dependences of the volume, the bulk modulus, the variation of the thermal expansion α, as well as the heat capacity C_v are successfully obtained in the whole range from 0 to 30 GPa and temperature range from 0 to 1000 K.

Keywords: GaN , Quasi-harmonic Debye model, Thermodynamic properties.

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ID-26

Design and Manufacturing of Prepreg Layer Used in Wind Turbine Blades' Composite

M. Hoor, S. Rezanejad, H. Jodat

Ceramic and Polymer Department, Niroo Research Institute, Tehran, Iran; E-mail: mhoor@nri.ac.ir

Abstract

Wind turbine blades are manufactured using advanced composite materials as prepregs due to their specific properties and their flexibility for component construction. Their specifications depend on type, percentage and orientation of the fibers, type of matrix or resin, bond strength between fibers and matrix and selection of proper manufacturing parameters including cure temperature/time.
Following the study on different types of prepregs used in wind turbine blades' composite, in this research, the main aim is manufacturing of prepreg based on anhydride cured epoxy resin system by use of unidirectional E-glass fibers.
Based on thermal results, the onset curing temperature would be 110 ^{o}C. The effect of processing conditions on four essential properties of prepreg – i.e. flow ability, adhesion, and flexibility and storage time – were investigated upon changing precure time and temperature. For this reason, prepreg specimens were made by precure at 100, 110 and 120 ^{o}C for 5, 10 and 20 minutes. Physical and rheological tests have been performed on specimens to evaluate their properties. The B-Stage measure tests showed at least one month storage ability at room temperature for produced prepregs.
Mechanical tests including tensile and bending showed acceptable results for the constructed composite material. The final tensile Strength for a four ply unidirectional E-glass epoxy composite was 1042 Mpa and the modulus was 33 Gpa for tensile and 25 Gpa for bending tests.
According to all those results, anhydride cured epoxy / E-glass prepregs could be a good candidate for wind turbine blade production.

Keywords: Prepreg, Wind Turbine Blade, Epoxy – Unidirectional E-Glass, Anhydride

ID-27

Magnetoelectric Effect in Piezoelectric Films: Experiments and Modelling

R. Belouadah[a], D. Guyomar[b], B. Guiffard[c]

[a]Département de physique, Université de M'sila, PB 116 Ichebilia - M'sila Algérie. E-mail: r_belouadah74@yahoo.fr

[b]Laboratoire de Génie Electrique et de Ferroélectricité, Institut National des Sciences Appliquées de Lyon,

8 rue de la Physique, 69621 Villeurbanne Cedex, France.

[c]IETR UMR CNRS 6164, Université de Nantes, 2 rue de la Houssinière, BP 92208,

F-44322 Nantes cedex 3, France.

Abstract:

The magnetoelectric ME materials has dielectric polarization induced by the magnetic field or induced magnetization under an electric field. A strong ME affect requires the simultaneous presence of magnetic moments and electric dipoles. In the last decades, extensive research has been conducted on the magnetoelectric (ME) effect in single phase and composite materials.

This article reported the results obtained with two samples, the first is mono layer of PVDF bi-stretched and the second is the multi layer PVDF bi-stretched with the Polyurethane filled with micro particles magnetic Fe_3O_4 (PU+2% Fe_3O_4). Compare with non ME material like Alumina, a large ME polarization coefficient for the two samples was obtained. The piezoelectric properties of the PVDF and elastic proprieties of Pu+2% Fe_3O_4 give a big linear ME coefficient of the multi layer PVDF/(Pu+2% Fe_3O_4) than in the monolayer of PVDF.

Keywords: Magnetoelectric Effect, Polymers, Magnetic Particles, Composites, Films

ID-29

Design and Simulations of a Modular Pumped-Storage Scheme

W. C. Schleicher, A. Oztekin

Mechanical Engineering and Mechancis, P.C. Rossin College of Engineering and Applied Science, Lehigh University, Bethlehem, Pennsylvania, 18015

Email: alo2@lehigh.edu

Phone: (610)7584343

Abstract

Renewable energy sources such as wind and solar power are playing an increasing role in global economies; however, issues with their power intermittency makes them hard to schedule them to the power grid. Pumped-storage is a proven utility-level energy storage scheme that is paired with these renewable energy sources to ease these intermittency issues, but ideal locations for pumped-storage schemes are hard to come by and require huge capital investments. A novel solution scales the size of these systems and uses a dedicated elevated storage tower as the upper reservoir for the scheme. This manuscript identifies potential applications for a modular pumped-storage scheme and provides a preliminary system design. A pumped-turbine design is presented and characterized for its designed operating range using finite volume Reynolds-averaged Navier-Stokes equations with turbulence modeling.

ID-30

Lithium Titanate Based Battery – Evaluation of Parameters Change During Cycle Life

N. Omar, Y. Firouz, H. Gualous, P. Van den Bossche, Th. Coosemans, J. Van Mierlo

Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussels, Belgium

Université de Caen Basse Normandie, Cherbourg-Octeville, France

Corresponding author: noshomar@vub.ac.be

Abstract

Motor vehicles powered by the internal combustion engine (ICE) are significant contributors to air pollutants and greenhouse gases linked to global climate change. Rising petroleum prices and environmental concerns have spurred the development of various types of clean energy transportation systems such as Hybrid Electric Vehicles (HEVs), Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs). In urban traffic, due to their beneficial effect on environment, electrically propelled vehicles are an important factor for improvement of traffic and more particularly for a healthier living environment. PHEVs are particularly interesting, combining electrical and ICE drive and providing the user both a considerable pure electrical range and an extended range with the ICE. Range accelerating power and life cycle however are critical aspects for the energy storage technology with few current battery technologies meeting these often concurrent objectives.

In the proposed article, an extended life cycle analysis has been carried out regarding the evolution of the electrical parameters of lithium titanate based battery (16Ah). The investigated parameters are the energy density, power density and discharge rate capabilities. Then, based on the hybrid pulse power characterization test, the parameters of the FreedomCar battery model during cycle life have been determined and evaluated. Based on the proposed study, the FreedomCar battery model has been optimized. The mentioned model is able to predict the evolution of the varying parameters, which further can be related to the state of health of a battery.

ID-32

An Experimental Study of a Horizontal Axis Savonius Type Wave Energy Converter System

M. Tutar[a,b], I. Veci[a]

[a]Department of Mechanical and Manufacture
Mondragon Goi Eskola Politeknikoa
Loramendi 4, Apartado 23, 20500 Mondragon, Spain
[b]IKERBASQUE, Basque Foundation for Science, 48011, Bilbao, Spain

E-mail: mtutar@mondragon.edu www.mondragon.edu

Abstract

An experimental study of energy conversion efficiency of a small Savonius type wave energy conversion system prototype is conducted. Experimental wave tank (EWT) tests are performed in an experimental wave flume (EWF) for specified values of flow physics and turbine blade geometry conditions. Once validated against the theoretical data due to Stokes Wave theory for no-rotor flow case(s), the experimental simulations are extended to investigate the overall performance of the prototype over a very large range of wave height, wave period, submerged-level for a 3-bladed configuration in the context of optimization of a design of a small scale Savoniuos rotor.

From the experimental results obtained and validated against the theoretical formulation with no-rotor flow case, it can be concluded that the flow characteristics is strongly dependent upon differing wave propagation conditions and energy conversion rate can be increased with a proper combination of selected wave height and period for the investigated parametric value range as well as the submerged positioning.

ID-34

Stainless Steel as Bipolar Electrode Plate Material for PEM Fuel Cells

S. Kuyucak

Department of Natural Resources Canada, Canmet MATERIALS
183 Longwood Road South, Hamilton, Ontario, Canada L8P 0A5
+1 905-645-0777, SKuyucak@NRCan.gc.ca

Abstract

Proton exchange membrane (PEM) fuel cells generate electricity by reacting hydrogen and oxygen. A thin, bipolar electrode material provides a medium for electron exchange with the electrolyte, alternately serving as anode at the hydrogen-rich side and cathode at the oxygen-rich side. Stainless steels have sufficient corrosion resistance to qualify as bipolar plate. However, the protective chromite layer increases the contact resistance, the battery's internal resistance; and thus, decreases the electrical efficiency of the fuel cell. A heat-treatment is proposed and investigated via simulation by ThermoCalc / Dictra, and experimentally, to generate a sufficient quantity of conducting carbides that breach the protective layer. Once sufficient decrease in area specific resistance is achieved, carbide growth is arrested, and a subsequent heat-treatment is needed at a higher temperature to restore the corrosion resistance by filling-in the Cr-depleted layer (sensitization) around the carbide particles.

ID-35

New Determined Thermal Conductivities of Some Topsoil's Using Improved Block Method

Onifade, Y. Sikiru[a], Akinyemi, O. Dewumi[b]

[a]Federal University of Petroleum Resources, Effurun. PMB.1221, Warri, Nigeria

fadezebra10@yahoo.com, ysonifade@mail.fupre.edu.ng +2347068341740

[b]Federal University of Agriculture, Abeokuta. PMB. 2240, Abeokuta, Nigeria

akinyemi@physics.unaab.edu.ng) +2348062937241

Abstract

Knowledge of the thermal conductivities of the topsoil layer is of great importance in studying energy and mass exchange processes occurring across the soil surface. However their determination In situ is extremely difficult, especially for the top soil layer, due to the non-homogeneity of natural soils caused by changes in their water content, texture and structure. Thermal Conductivities of clay, loam and sand soils were determined using improved Block method with and without the use of Thermal Interface Material (TIM). KD2 Thermal Properties Analyzer was used to take instantaneous measurement of thermal conductivities with and without the use of TIM for validation. The results show increase with the application of TIM which follows the same trend with KD2 results .Thermal conductivity increases from 0.68 W/ mK to 0.85W/mK , for clay, 0.18WmK to 0.34WmK for loam and 0.34W/mK to 0.39W/mK for sand with Block method while 0.66W/mk to 0.84W/mK for clay, 0.17W/mK to 0.30W/mK for loam and 0.28 WmK to 0.33W/mK for KD2 analyzer.

Keywords: Thermal Conductivity, Block method, KD2 Thermal Properties analyser, Topsoil Thermal Interface Material, Thermal gradient.

ID-36

Structural Calculations for High-Pressure Phase Transition in NiO

M. Ammar[a], O. Arbouche[a], Y. Azzaz[b]

[a]Electronics Department, University of Saîda
[b]Physics Department, University of Sidi Bel-Abbes, 22000, Algeria

Abstract

We report total energy and electronic structure calculation for the NiO ground state of the B4 (wrtzite), B3 (zinc blende), B1 (rocksalt), B2 (CsCl), cinnabar, cmcm, NiAs, C2221, and Imm2 structures. Were investigated using a first- principles total energy calculations based on the full-potential augmented plane wave plus local orbitals (FP LAPW+lo) method, within employed the local spin density approximation (LSDA). The equilibrium transition pressure from B3 to B1 is egual PT1= 2.67 Gpa. We predict that the B1 phase of NiO will transform to the B2 (cesium chloride) structure at PT2 = 398 GPa. Along with previous work, we now have enough theoretical results to support a different systematics of the high-pressure phases of NiO compounds.

Keywords: DFT, LSDA, pressure transition, metal transition, NiO alloy

ID-38

Conceptual Study of Fuel Cycle with Advanced METMET and Composite Fuel for Thermal Reactors

A. Savchenko, Z. Petrova, G. Kulakov, K. Lipkina, S. Ershov, A. Kozlov, E. Mainikov, K. Konova

A.A. Bochvar Institute of Inorganic Materials (VNIINM)

123060, P.O.BOX 369, Rogova St. 5A, Moscow, Russia, E-mail: sav-alex111@mail.ru, +7-905-519-1326

Abstract

To accomplish a further qualitative ramp in novel generation fuel development and to provide for the competitiveness of electric power production we suggest to replace the container design fuel rod, the possibilities of which are practically exhausted, to dispersion type fuel elements (high uranium content fuel, U-Mo, U-Nb-Zr, U_3Si with Zr alloy matrix).

The primary advantages of novel fuel for application in thermal reactors are high uranium content (25-50% in comparison with the standard UO_2 pelletized fuel rod), low temperature of fuel (<500 ºC, cold fuel), the extension of burn-up (100 MW*d/kgU) and serviceability under transient conditions.

Due to high uranium content and hence intermediate neutron spectrum the main economically significant characteristics for PWR's can be improved:

1. Larger quantities of generated plutonium (~2.5-3 times higher).
2. Increasing of fissionable plutonium isotopes up to 75-78% in spent fuel (harder neutron spectrum).
3. Increasing the breeding ratio up to 0.7-0.8 (by reducing the hydrogen-to-heavy metal ratio).
4. The prolongation of the campaign will be more than 30% in effective days (up to 500 additional effective days).
5. Increasing the time between refuelling, in other words, increasing the Unit Capacity Factor (UCF). In this case instead of a year or a year and a half fuel cycle at two year cycle becomes feasible.

On the basis of METMET fuel composite $U\text{-}PuO_2$ fuel (an analogue of MOX) can be fabricated where depleted uranium alloy and dioxide plutonium powder have initially separate arrangement. Due to this while reprocessing one can separate of newly generated fissile plutonium from burnt one without chemical processes, which simplifies the closing of the nuclear fuel cycle. Thus, novel concept on the basis of composite fuel for thermal and fast reactors can practically replace the existing one based on dioxide uranium and MOX fuel and can implement the closed U-Pu cycle using only thermal reactors.

ID-39

Possibility of Closing Fuel Cycle with Composite Fuel in Fast Reactors

A. Savchenko, A. Vatulin, G. Kulakov, K. Lipkina, S. Ershov, Z. Petrova, A. Kozlov, E. Mainikov, K. Konova

A.A. Bochvar Institute of Inorganic Materials (VNIINM)

123060, P.O.BOX 369, Rogova St. 5A, Moscow, Russia

sav-alex111@mail.ru +7-905-519-1326

Abstract

A possibility is considered for use in fast reactors in place of the base container type MOX or metallic U-Pu-Zr fuel, the dispersion type fuel elements (composite of metallic high uranium content fuel, U-Mo or U-Zr with PuO_2 powder distributed in Zr alloy matrix).

Basic approach to fuel element development - separated operations of fabricating uranium meat fuel element and introducing into it Pu or MA dioxides powder, that results in minimizing dust forming operations in fuel element fabrication. According to new fuel element design a framework fuel element having a porous uranium alloy meat is filled with standard PuO_2 powder of less than 50 micron fractions prepared by pyrochemical or other methods. In this way a high uranium content fuel meat metallurgically bonded to cladding forms a heat conducting framework, pores of which contain PuO_2 powder.

Proposed combined fuel features higher characteristics in comparison to metallic or MOX fuel.

A possibility is demonstrated of fabricating coated steel claddings to protect from interaction with fuel and fission products when use standard rod type MOX or metallic U-Pu-Zr fuel.

Novel approach to reprocessing of combined fuel is demonstrated, which allows to separate uranium from plutonium as well as the newly generated fissile plutonium from burnt one without chemical processes with repeated use in fast, PWR or CANDU reactors, which simplifies the closing of the nuclear fuel cycle.

Basing on proposed design a novel concept “Ultra-High Burn-up Metallic Inert Matrix Nuclear Fuel” has been developing now at LLNL (USA) in cooperation with A.A. Bochvar Institute. The proposed fuel form consists of actinide nuclear fuel particles, metallic or oxide, coated by a thin layer of Zr-based alloy metallurgically bonded with cladding (zircaloy or ferritic steel) with retained porosity to accommodate fuel swelling.

ID-40

Inert Matrix Fuel with Metallic Matrix to Achieve Ultra-High Burn-up In Thermal or Fast Reactors

A. Savchenko, A. Vatulin, G. Kulakov, K. Lipkina, S. Ershov, S. Maranchak, Y. Konovalov

A.A. Bochvar Institute of Inorganic Materials (VNIINM)
123060, P.O.BOX 369, Rogova St. 5A, Moscow, Russia, sav-alex111@mail.ru +7-905-519-1326

Abstract

For the incineration of excess Pu and MA using existing LWRs or fast reactors, inert matrix fuels (IMF) have been proposed for use in a 'Once Though Then Out' (OTTO) concept. Instead of ceramics inert matrix of pelletized design that features low serviceability and dust forming route of fuel element fabrication, the usage is made of dispersion type fuel element with metallic matrices metallurgically bonded with cladding.
Dispersion type fuel elements with metal matrices that as distinct from the traditional pelletized fuel elements have a number of advantages. They are a low temperature of a fuel centre, high irradiation resistance, feasibility of extended burn-ups (100 MW·d/kg U and higher). Technologic merits also involve the applicability of PuO_2 powder as an initial one or YSZ or PuO_2 granules to manufacture dispersion fuels not resorting to subsequent dust-forming operations of pellets manufacturing, such as granule crushing, powder filtration, powder blending, pressing, sintering, grinding.
One of the versions of dispersion type IMF that now is under development at A.A Bochvar Institute is a fuel element having a heat conducting metal matrix and an isolated arrangement of PuO_2 in a fuel minielement. This fuel element version is a mostly unified one. It is technologically simple to fabricate, allows the use of both aluminium and zirconium matrices, more fully meets the "Rock Fuel" requirement and might be used in both thermal and fast reactors.
The main distinction and advantage of such a fuel element consist in the fact that PuO_2 is separately arranged in fuel minielements that in their turn are placed inside a fuel element. The space between the fuel minielements and the fuel cladding is filled with an Al alloy matrix (for thermal reactors) or a Zr matrix alloy (for fast or thermal reactors) using impregnation or capillary impregnation methods. Iron based matrix alloy can be also implemented for fast reactors in this design.
The advantage of this design lies in the fact that the number of the main dust-forming operations in the fuel element fabrication is reduced to a single one, viz., filling minielements with powder or granules. The other operations, viz., minielement sealing (second end welding), fuel element assemblage, impregnation with a matrix alloy, are carried on in clean zones. Aside from this, the fuel-free space of a minielement served to accommodate swelling of fuel. The fuel of a minielement is protected against the interaction with a matrix and with a coolant.
Fuel element simulators of similar designs with inert aluminium matrix, in which UO_2 was used in place of PuO_2 were successfully in-pile tested under PWR conditions up to the burn up of 100 MW•d/kg U and fuel element simulators with inert zirconium matrix clad in stainless steel reached the burn-up of 200 MW•d/kgU with the temperature of steam up to 600°C.
This fuel could result in high single cycle TRU burn fraction, reduced fuel throughput and long transmutation core cycles – all factors that could improve burner reactor economics.

ID-41

Many Kinds of Energy Source in Our Surroundings at Home

Takashi Yoshikawa

7-1 Kasugaoka, Nabari-shi, Mie 518-0459, JAPAN

Kinki University Technical College

+81-595-41-0111

yoshikawa@ktc.ac.jp

Abstract

We are studying the Energy Harvesting in our surroundings at home. In the 1st stage, our aim was to supply the energy to the sensor terminal that communicates to other terminals wirelessly (sensor network nodes). The average energy consumption for each terminal is estimated about 100uW regarding to be used as HEMS (Home Energy Management System) terminal. In our previous study, we have experimented and concluded the satisfaction obtaining more than 100uW average energy whole day by solar energy and thermal-electro energy. We can understand the status of slow change of room condition in this stage. But if we would know the human movement between the rooms, the period of data transmission is too long (3min.). In the next stage, our aim is to shorten the transmission period less than 10sec enough to monitor the human movement more precisely. In order to get much energy from our surroundings, we have tried to use vibration energy caused by the human step on the floor, the hydroelectric power generation from the water pipe, the ventilation wind at kitchen. As the result we have succeeded in getting much power as 34mW from the water pipe experiment. Moreover we have tried to use magnetic energy from the light bulb driven with inverter. In this measurement we can get the average power as 7mW. In this way, we can go forward to the next stage. In this paper we will discuss the way of design and experimental results for each power generation method.

ID-43

Modeling and Simulation of Wind Energy Chain Conversion

Samir BELLARBI[a], N. KASBADJI MERZOUK[b], A. MALEK[a]

a Centre de développement des énergies renouvelables EPST/CDER, Bouzareah, Alger, Algeria
bUnité de développement des équipements solaires/ EPST/CDER, Tipaza, Algeria
E-mail: s.bellarbi@cder.dz

Abstract

Alongside the substantial market for wind genera-tion of high power systems grows smaller power (about 100W to several kW) which is especially dedicated to remote sites. The chain of energy conversion is very different from those of great power, they are often based on the use of a three-phase alternator with permanent magnets debiting directly through a rectifier diodes in a generally electrochemical battery low voltage (12–48 V). In this article, we propose a model of the con-version chain, few conventional, for the estimation of energy production.

Keywords: Wind turbine generator; Synchronous generator; Permanent magnetic; Continuous source; Fuzzy logic; Simula-tion.

ID-44

Performance Analysis of Experimental Frigorific Air Conditioning System Using HFO-1234yf as a Refrigerant

M. Direk[a], C. Tunckal[b], F. Yuksel[c]

[a,b]Yalova Community Colleage, Yalova University, Yalova, Turkey

[c]Energy Systems Engineering, Yalova University, Yalova, Turkey

Abstract

As stated by the Montreal Protocol, the use of chlorofluorocarbon (CFC) and hydrochlorofluorocarbon (HFC) refrigerants will be discontinued due to their hazardous nature. Some EU countries have pushed the date back earlier and are working on the design of a new AC system using natural refrigerant. They have begun to research more environmentally friendly refrigerants rather than continue to use the harmful CFC and HFC refrigerants, while HFO-1234yf has also recently been under focus.
In particular, the European Union's regulations specify that beginning on January 1, 2011 new models, and as of 2017, all automobiles fitted with air conditioning systems cannot be manufactured using greenhouse gases that have global warming potentials (GWP) greater than 150. With minor system modifications HFO-1234yf could be implemented in existing air conditioning systems using R-134a. Consequently, it has a GWP of 4 and is widely being considered as a possible replacement for R134a in automotive applications. It is estimated that the R1234yf performance can match or even better that of R134a with correctly designed and tuned components.
This study aims to evaluate the frigorific air conditioning system using HFO-1234yf as a refrigerant. The determined performance parameters were the change of the mean air temperature in the in the conditioned room as a function of time and the change of the air temperature at the evaporator outlet as a function of time. Air flow has been introduced to the conditioning room for 60 m for each performance tests.

ID-45

Adsorption of Two Dyes Used In the Industry of the Textile by Local Clays

Z. Dali-Youcef

Laboratory of materials LABMAT ENPO BP 1523 EL M NAOUER ORAN ALGERIA

Tél / Fax : 041 41 69 16 / E-mail : zohra_dali2002@yahoo.fr

Abstract

Many industries, such as textile, paper, plastics, food, cosmetics, use dyes in order to color the products. The discharge of dye house wastewater into the environment is aesthetically displeasuring, impedes light penetration, damages the quality of the receiving streams and may be toxic to food chain organisms and to aquatic life [1]. A number of processes, like flocculation, chemical coagulation, precipitation, ozonation, and adsorption [2,3] have been employed for the treatment of dye bearing wastewaters.

Adsorbents containing sediments of stopping were prepared, by thermal activation at 300°C, by acid activation with ammonium chloride and by the intercalation of surfactant $C_{16}H_{33}N(CH_3)_3Br$ (HTAB). The materials are used in the adsorption of the red and yellow dyes used in the industry of the textile.

The isotherms of adsorption of dyes showed the large affinities of adsorbent-adsorbates, especially with HTAB pillar of vase. The method used for elimination of two dyes is described; columns are used in order to study the phenomenon of adsorption with respect to the dyes, comparable with that which exists in approximately lies natural. Columns of various diameters are used, the use of broad column of diameter: 14cm X 10 cm, increases the holding capacity of the dye.

Keywords: Adsorbents, activation, dyes, elimination, industry of the textile

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ID-46

Properties of an Eco-Concrete Formulated With Solid Industrial Waste

M. L. Benmalek

University of Guelma, Civil Engineering and Hydraulic Laboratory, Algeria

Tel: 00 213 72 71 02 50

bmalek2@yahoo.fr

Abstract

Exploitation of aggregate quarries in Brittany (west of France) generates important quantities of solid wastes which have been tipped out in the nature for a long time and constitute now a serious environmental problem. The choice has been made to transform them into insulating lightweight concrete. The lightening has been achieved by adding treated wood aggregates of dimensions 3 to 8 mm. In this paper, authors give results of an experimental work using five types of mineral wastes as raw materials in manufacture of a lightweight concrete. They differ in their mineral compositions, densities, extracting process and their colors. The physical, mechanical, and thermal properties have been studied. The elaborated concretes ranged in class II or class III in the RILEM functional classification. Their thermal conductivities have been found to depend of the water content and agree well with the recommended relationship of the ACI. In addition to that, the microstructure examined by electron microscopy has shown a very good adhesion matrix-wooden aggregate. The experimental results of the investigation show that the performances acquired by these environmental concretes are similar to the ones of the usual lightweight materials with satisfactory compressive strengths (in hydrous equilibrium state). The ensuing analysis serves to suggest the possibility of manufacturing insulating and load-bearing concretes using little energy (no burning and no autoclaving).

ID-47

Elaboration And Characterization of Dye Sensitized Solar Cell DSSC's

M. Melouki[a], M. Adnane[a], S. Hamzaoui[c], C. Denis[b]

[a]University of Sciences And Technology, Mohamed Boudiaf Oran"Usto"Algerie.
[b]MCF-HDR Laboratoire Interdisciplinaire Carnot De Bourgogne ICB Université De Bourgogne
Email: melouki.mohamed@gmail.com

Abstract

The dye-sensitized solar cells or solar cell type called Grätzel offers an alternative concept technically and economically credible today for photovoltaic devices. The aim of this project and realize that cell with a tremendous return. The first steps in this work and to make transparent conductive thin layers with low resistance of SnO_2: F and TiO_2 layers according to SPRAY method and the method of Dr. BLADE respectively. After that what is the use of organic dye and the preparation of the cathode and against the mounting of the solar cell. The characterizations of thin films and of our cells and organic dye that is optically and electrically, and also spectral. We present the current state of land, new concepts of nanocrystallins dye-sensitized solar cell, and the prospects for the future development of technology.

Keywords: GRATZEL, solar cell, thin films, SnO_2, TiO_2, BLADE, spray, dye-sensitized.

ID-48

Waynergy Vehicles - An Innovative Pavement Energy Harvest System

F. Duarte[a], A. Ferreira[b], J. Champalimaud[c]

[a]Department of Civil Engineering, University of Coimbra, Rua Luís Reis Santos, 3030-788 Coimbra, Portugal, uc2013127588@student.uc.pt

[b]Director, Pavement Mechanics Laboratory, Department of Civil Engineering, University of Coimbra, Rua Luís Reis Santos, 3030-788 Coimbra, Portugal, adelino@dec.uc.pt

[c]Director, Waydip, Parkurbis - Parque de Ciência e Tecnologia da Covilhã, 6200-865 Covilhã, Portugal, joao.champalimaud@waydip.com

Abstract

At the present time there is a need to change the paradigm in electrical energy generation due to the increasing cost of fossil fuels and their adverse effects on the environment. It has become increasingly evident that fossil fuels used to generate energy are not unlimited and that their use is harmful to the environment due to the greenhouse effects. Electrical energy must be increasingly generated using renewable energy sources, preferably where it will be consumed, in order to reduce the costs of transport and distribution.

Energy is mainly consumed in cities, although it is almost always produced outside cities. Therefore, to reduce transport and distribution costs, we must take advantage of all the energy that can be produced inside the city, near the point of consumption. It is here that pavements have an important role to play. In cities people and vehicles move almost everywhere on pavements, and every time they move they release kinetic energy to the pavement, which is not usually captured or used for anything, but which could be converted into electrical energy. Furthermore, there are plenty of pavement surfaces in cities which could be used to install systems capable of capturing kinetic energy and converting it into other types of energy.

This paper describes a new pavement energy harvest system, called Waynergy Vehicles, developed in Portugal by the Waydip Company in collaboration with the Pavement Mechanics Laboratory of the University of Coimbra. A Waynergy system for vehicles was installed in a pavement of the Engineering Faculty of the University of Beira Interior, which allowed us to test the electric energy generation at this location. During a peak hour, between 01 p.m. and 02 p.m., one verified that the Waynergy system was able to generate 77,800 Joules or 21.6 Watt-hours.

A system of electrical energy produced by the movement of the huge number of vehicles on our roads will enable us to produce a large amount of energy, reduce the consumption of fossil fuels and thus improve the quality of the environment. With a growing need to minimize the carbon footprint, pavement energy harvest systems are feasible solutions for people to engage with sustainability and low carbon initiatives.

Keywords: Electrical Energy, Pavement Energy Harvest System, Road Pavement

ID-49

Economic and Technical Study of Hybrid Renewable Energy System for Rural Electrification

M. Amara[a], O. Arbouche[b], R. Mezian[a], A. Bouanan[a]

[a]University Taher Mouley of Saîda 20000, Algeria
[b]Applied Materials Laboratory, University of Sidi Bel Abbes, 22000, Algeria

Abstract

This paper studies the technique economic and environmental analysis of hybrid system (wind –photovoltaic-diesel).the study is based on modeling ,simulation and optimization of renewable energy system for GSM base station site in djelfa Algeria with a daily load of 48KWh/d,solar radiation for the system was obtained from nasa meteorology and solar energy website a location of 34°04N latitude , 03°15 E longitude and the altitude 1144 m with annual average solar radiation of 3,84Kwh/m2/day and The wind speed varies seasonally from (3.2–5.6) m/s. The hybrid energy system is a combination of wind solar, diesel generation and batteries. Hybrid optimization model for electric renewable Homer software issued for the analysis of sizing and sensitivity performed in order to obtain the most feasible configuration of a hybrid renewable energies system.

Keywords: Hybrid Power System, Djelfa, Rural Electrification, Homer, Carbon Emissions

ID-50

Removal of a Textile Dye by Pillared Clay

N. Dali, F. Zahaf, R. Marouf, F. Ouadjenia

Laboratory of Materials, Applications and Environment (LMAE), University of Mascara B.P. 763 Mamounia Street 29000, Algeria

E-mail: reda_marouf@yahoo.fr.

Abstract

The clays in general and bentonites in particular have an important role in our daily lives, and they have wide applications in many industrial sectors such as, drilling, foundry, ceramics, paint, pharmaceuticals, cement, etc.. The bentonites can also be used as an adsorbent to remove various organic or inorganic pollutants in the aqueous solution [1, 2].

Despite significant physicochemical properties that have this type of clay, they can be substantially improved by a structural change inserting of the pillars such as hydroxy- aluminium ions.

The pillaring of the clay lies in their intercalation between layers of big mixed metal poly-cations in order to obtain microporous materials, rigid structure, with a large interlayer spacing [3].

In this study we used an original Mostaganem bentonite (western Algeria) as adsorbent to remove dyes from the textile industry. Several analytical techniques were used to identify the samples before and after treatment, such as XRD, BET, SEM, and DTA. The preparation of the bentonite was made by its purification, followed by an intercalation of hydroxy-aluminum species.

The results obtained show that after intercalation the specific surface area of the sample increases significantly and the amount of dye adsorbed by the treated clay was far superior to that of the raw clay.

Keywords: Bentonite, Intercalation, Dye, Adsorption

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ID-51

Catalytic Reforming of Methane over Ni/La_2O_3 and Ni/CeO_2 Catalyst Prepared by Sol Gel Method

N. Yahi[a,b], S. Menad[b], I. Rodriguez -Ramos[c]

[a]Université Bouira, Algerie

[b]Laboratoire de Chimie appliqué et de génie chimie, Université Mouloud Mammeri, UMMTO, Tizi-ouzou, Algerie.

[c]Instituto de Catálisis y Petroleoquímica. CSIC, Campus Cantoblanco. 28049, Madrid, Spain

norayahi@yahoo.fr

Abstract

Carbon dioxide reforming of methane (CH_4 / CO_2) has received considerable attention. Dry reforming of methane permits to obtain syngas with a H_2/CO ratio near to one which is more suitable for the Fischer - Tropsh synthesis of long chain hydrocarbons [1-2].

The supported Ni catalysts were popular for use in this reaction for their high activity and low cost [3]; however, these catalysts deactivate easily due to coke deposition and metal sintering which will cause plugging of the reactor. The activity as well as the stability of catalysts containing nickel, depends strongly on the nature of the support [4-5], percentage in active phase [6], the nature of the metal additive [7] and on preparation method. In the present work, we have prepared tow catalysts: Ni/CeO_2 and Ni/La_2O_3 with Ni-loading close to 15 %wt were synthesized by sol gel method. Once these samples are calcined at 973 K, and in situ reduced under hydrogen flow at 873 K were tested as catalysts for the dry reforming of methane. The crystalline structure and surface properties of these catalysts were investigated by X-ray diffraction (XRD), temperature programmed reduction (TPR), transmission electron microscopy (TEM) and N_2 adsorption-desorption isotherm measurements. The main objective of this work is the development of more efficient catalysts to produce syngas (H_2+CO) from methane and carbon dioxide. The obtained results show that Ni/CeO_2 sample prepared by sol gel exhibits superior catalytic activity in comparison with Ni/La_2O_3 catalyst but Ni/La_2O_3 catalyst is found more resistant to carbone deposition.

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ID-52

Temporal Assessment of Wind Energy Resource in "Adrar" (South Of Algeria); Calculation and Modeling of Wind Turbine Noise

N. Ghellai[b], M. Benmedjahed[a], Z. Bouzid[b], A. Chiali[c]

[a]Research Unit of Renewable Energies in the Sahara / Adrar Algeria

[b]Division of New Materials, Systems and Environment, Unit Research in Materials and Renewable Energy, DNMSE-'URMER'. University of Tlemcen, B.P. 199, Algeria

[c]Preparatory School of Sciences and Technics of Tlemcen

E-mail: na_ghellai@yahoo.fr

Abstract

The objective of this work is to evaluate the wind resource on the site Adrar in southwestern of Algeria. The hourly data used in this study span a period of 5 years. The parameters considered are the speed and direction of wind. For this purpose, the most energetic and frequent speed as well as the Weibull parameters to plot the wind rose were evaluated. Treatment focuses on coverage, the average monthly rate, annual average speed and average speeds by sector and their frequencies, to optimize site selection for future wind farm. The southern site "Adrar" is favorable for large ZWD (zone of wind development), why it was decided to investigate the possibility to set up a wind farm of 9 MW consisting of fifteen wind turbine VERGNET GEV HP with nominal power (800kW). Next, its noise was calculated and then modeled. The results obtained are (k = 2.06 and A = 7.4m / s) to 10 m above the ground with an average wind speed of 6.5 m / s. Our simulation of the noise propagation for wind farm shows that noise level is estimated around 38 dB (A) at a distance of 220 m from the nearest turbine. We can conclude that these noise levels have no effect on health and comply with the Algerian standard.

Keywords: Wind, Weibull, Power, Wind Farm, Noise.

ID-53

Metastable Solid State Transformation in Cu-Al Alloy Elaborated By High Frequency Fusion

Kebbache[a,b], M Y. Debili[b], S. Lallouche[c]

[a]University Constantine1, Laboratory LM2S,
[b]Universitybadji-Mokhtar Annaba, Laboratory LM2S
[c]University Babeazoir Alger, Laboratory LM2S

Abstract
In this work, we studied an alloy Cu-13.5%Al. We used a technique of very effective and not polluting elaboration which is based on the fusion under high-frequency induction with primary vacuum (HF), from fine powders of copper(99,99 %) and of aluminum (99,99 %), what allowed us to obtain a transition to a metastable phase not predicted by the equilibrium phase diagram of the binary system Cu-Al which is similar to a martensitic transformation At the same time as a Hume-Rothery Cu_9Al_4 phase. The use of various techniques of characterization such as the x ray diffraction, the optical microscopy as well as the scanning differential thermal analysis allowed to confirm the existence of a non equilibrium phase responsible for the consequent increase of the Vickers microhardness.

Key words: Cu-Al, induction fusion, martensitic transformation, Hume rothery

ID-54

Physicals And Electrochemical Properties of $ZnIn_2S_4$ Thin Films Grown By Electro-deposition Route

I. B. Assaker, M. Gannouni, R. Chtourou

Laboratoire Photovoltaïque, Centre de Recherches et des Technologies de l'Energie Technopole borj cedria, Bp 95, hammamm lif 2050, Tunisie

E-mail: ibtissem.ben-assaker@laposte.net

Abstract

We present a new work on the development of electrodeposition route for synthesis of ternary $ZnIn_2S_4$ alloy. These thin films were grown onto (ITO)-coated glass substrate from an acidic plating bath containing Zinc (II) Chloride ($ZnCl_2$), Indium Chloride (*$InCl_3$*) and sodium thiosulfate ($Na_2S_2O_3$) at room temperature. Prior to the deposition, a cyclic voltammetry study was performed in binaries (Zn-S, In-S) and ternary ($ZnIn_2S_4$) systems. The influence of various deposition potentials on structural, morphological, optical, and electrical properties of samples was investigated. The X-ray diffraction patterns of the samples demonstrate the presence of the major crystalline phase of the $ZnIn_2S_4$ at applied potential of -1050 mV versus Ag/AgCl. Energy *band gap* of the samples determined from optical measurements *has been estimated* in the range of 1.90 - 2.50 eV. From atomic force microscopy (AFM) and scanning electron microscopy (SEM) analyses, it was found that the surface morphology, grain size and roughness were strongly influenced by varying the deposition potentials. The electrochemical impedance spectroscopy data have been modelled using an equivalent circuit approach. The flat-band potential and free carrier concentration have been determined from Mott–Schottky plot and are estimated to be around -0.72 V and 1.46×10^{17} cm^{-3} respectively. The film was n-type semiconductor.

Keywords: $ZnIn_2S_4$, Thin film, cyclic voltammetry, Effect of applied potential, electrochemical impedance spectroscopy.

ID-55

GASFLOW Analysis for the HySIM Hydrogen Refueling Benchmark

J.R. Travis[a], D. Piccioni Koch[b]

[a]Engineering & Scientific Software, Inc., 2128 S. Ensenada Circle, Rio Rancho, NM 87124, USA

[b]Steinbuch Centre for Computing (SCC), Karlsruher Institut fu¨ r Technologie (KIT), Postfach 3640, 76021 Karlsruhe, Germany

E-mail addresses: daniela.piccioni@kit.edu (D. Piccioni Koch)

Tel.: +49 721 608 46760

Abstract

Cryo-compressed hydrogen vessels for automotive application were simulated by means of the GASFLOW Simulation Code by using real gas equations of state for hydrogen based on Leachman's NIST model and a modified van der Waals Model. The hydrogen tank systems here considered are those based on hydrogen storage concepts developed by the Bayerische Motoren Werke (BMW) Group and produced by the Lawrence Livermore National Laboratory (LLNL) and the Structural Composite Industries (SCI). In order to validate the GASFLOW simulations, the data and the simulation results provided in the frame of the HySIM project were used. The GASFLOW simulations show good agreement with data as well as with the HySIM simulations. The two real gas equations of state, Leachman's NIST and modified van de Waals used in this study produced nearly identical results.

Keywords: Cryo-compressed hydrogen storage, Real gas equation of state for hydrogen, CFD simulation code

ID-56

Double-fed Asynchronous Generator Modeling and Simulation

S. Bellarbi, D. S. Koussa

Centre de développement des énergies renouvelables, Bouzareah, Alger, Algerias.bellarbi@cder.dz

Abstract

This article has for objective the study by fuzzy logic simulation optimized by double-fed asynchronous generator (DFAG) with stator flow directed simile by MATLAB / SIMULINK. The system consists a horizontal wind turbine coupled with DFAG piloted through rotor by two three-phase static converters to PWM in double bridge, for maximized the power supplied with various wind speeds, we used a speed regulator classic, then a speed regulator fuzzy logic. At first, a modeling of the wind speed, the wind turbine. Afterward, a model of the double-fed asynchronous generator commanded by MPPT for two scenarios: with and without fuzzy logic.

Keywords: Wind speed, wind turbine, DFIG, PWM converter, classical and fuzzy Regulation

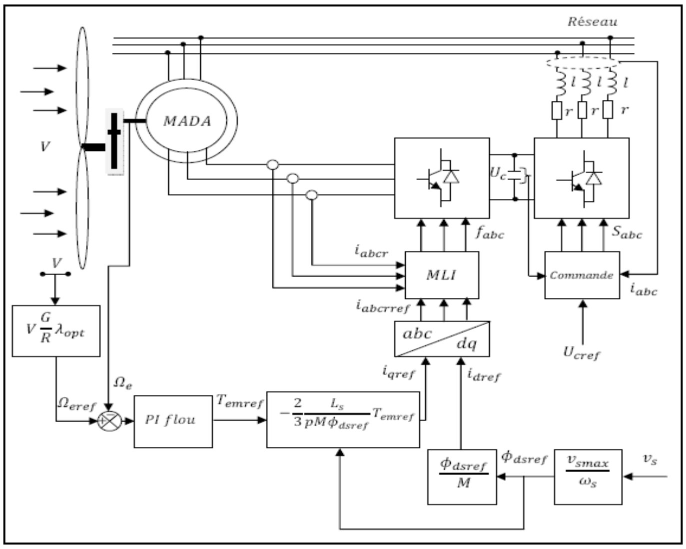

Figure 1. General structure studied

ID-57

Study of Improving the Availability of a Water Distribution Network

D. Boumelita, N. Debbache, A. Kharouati, N. Djouamaa

Laboratory of Automatic and Signals, Badji Mokhtar University Annaba, BP12, Annaba, 23000, Algeria
bm.djamila@yahoo.fr, NDebbache@univ-annaba.org, k.aicha23@yahoo.fr, dj.nora@yahoo.fr

Abstract
Water is a common good and valuable preserve is an act of civic responsibility and a duty to future generations. The unavailability of one of the organs that carry water to all subscribers of a drinking water system is a recurring problem. This article offers an analysis of the reliability of a hydraulic system that depends on the state of the pipeline and network configuration. A study of the availability of a water supply system is proposed in this work concerns the city of El Hadjar. The objective is to ensure availability of drinking water to all subscribers of the network. Modeling system is established using the Epanet software. We calculated indices hydraulic criticality through the entire network to measure the effect of the unavailability of a driving operation of the network. A modeling reliability diagram is also proposed. Based on the modeling of this network, we propose to make structural and material improvements to ensure better availability of our resources.

Keywords: Availability, Reliability, water distribution network, Reliability block diagram.

ID-58

Hydrogen Production from Methanol Electrolysis

S. Menia, F. Lassouane, H. Tebibel, A. Khellaf

Centre de Développement des Energies Renouvelables, CDER, B.P. 62, Route de l'Observatoire, 16340, Bouzareah, Algiers, Algeria

[*1]e-mail: s.menia@cder.dz; phone number: + (213)21901503

Abstract

Hydrogen is considered as the most promising energy carrier for providing a clean, reliable and sustainable energy system. It can be produced from a diverse array of potential feed stocks including water, fossil fuels and organic matter.

Electrolysis is the best option for producing hydrogen very quickly and conveniently.

Water electrolysis with a proton exchange membrane (PEM) as a source of hydrogen production has recently gained much attention since it can produce high purity hydrogen and can be compatible with renewable energies. Besides the water electrolysis, aqueous methanol electrolysis has been reported in several studies. The aqueous methanol electrolysis proceeds at much lower voltage than that with the water electrolysis. As a result of the substantially lower operating voltage, the energy efficiency for methanol electrolysis can be higher than that for water electrolysis.

Keywords: Hydrogen, Electrolysis, Methanol.

ID-59

Regeneration of Peel of Peas (*Pisum Sativum*) after Zinc Adsorption

S. Menia, A. Abbaci, N. Azzouz

Laboratoire des Interactions Matériaux Energie Environnement, University of Jijel, B.P. 98, 18000, Jijel, Algeria
E-mail: sabah.menia@yahoo.fr; phone number: + (213) 771257623

Abstract
The dissemination of heavy metals such as zinc in the environment caused a contamination of groundwater and rivers. In order to curb this phenomenon, it becomes essential to develop a method to remove these toxic materials. Among these techniques, we have adsorption on bio sorbents; these materials are efficient, inexpensive and abundant.
In our study, we have adsorbed/desorbed zinc on peel of peas. The obtained results we learn that the elimination of zinc by our adsorbent is done by ion exchange and the substrate can be regenerated with hydrochloric acid.

Keywords: Heavy Metals, Zinc, Adsorption, Peel Of Peas.

ID-60

Structural Properties of Chalcopyrite Materials

M.Ouledali[a,b], B. Amrani [a], S. Louhibi-Fasla[c],

[a]Laboratory of Physics of Thin Films and Materials for Electronics (LPC2ME), University of Oran Es Senia,Algeria.
[b]Institute of Science and Technology, Department of Materials Science,
University Centre of Tamanrasset, Algeria.
[c]Laboratory of Micro and Nano-Physics (LaMiN), ENPO, Oran, Algeria

Abstract
Using the first principles ab initio method of the full potential linear augmented plane waves (FPLAPW), the structural properties of chalcopyrite Cu(In, Ga)Se_2 type I-III-VI2 are investigated. These materials have recently shown great interest and applications such as photovoltaic conversion. This study will be based on the theory of density functional (DFT), which although imperfect, tends to establish itself as the standard for the energetic predictions in the community of sciences materials. The results obtained were compared with experimental data from the literature.

Keywords: Ab initio calculations, optoelectronic properties, chalcopyrite, Cu (In, Ga) Se_2, photovoltaic conversion

ID-61

The GSM Microwave Field Influence on Vitamin C and Polyphenols from Celery

M. L. Soran, M. Stan, I. Lung, M. R. C. Truşcă

National Institute for Research and Development of Isotopic and Molecular Technologies, 67-103 Donat street, 400293 Cluj-Napoca, Romania, Tel: +40264584037

E-mail: loredana.soran@itim-cj.ro

Abstract

The mobile telephony swept around the world, from the young to the old people, but the effect of this on living organisms is unknown. In this work we focused on influence of GSM microwave field (860-910 MHz) on vitamin C and polyphenols from celery. The extracts for vitamin C determination were obtained by sonication, using 8% (v/v) aqueous acetic acid and those for polyphenols determination were obtained by sonication with ethanol + water (60:40, v/v).The vitamin C was determined by HPLC and total polyphenols were determined by spectrophotometric method with Folin-Ciocalteu reagent. The no significant variation was observed for amount of total polyphenolic compounds, in irradiated plants comparing with those non-irradiated. Based on HPLC analysis, it was found that the largest increase in the amount of L-ascorbic acid was recorded in celery iiradiated with GSM (211%).

Acknowledgment: The authors would like to express appreciation for the support of the Romanian National Authority for Scientific Research, CNCS – UEFISCDI, project number PN-II-RU-TE-2011-3-0283.

ID-62

Electricity Consumption Reducing by Use the Application UPT 210

M.R.C. Truşcă*[a], Ş. Albert[a], M.L. Soran[a], M.I. Abrudean[b]

[a] Datacenter Department, National Institute for Research and Development of Isotopic and Molecular Technologies, ROMANIA.

[b] Department of Automation, Technical University of Cluj-Napoca, ROMANIA.

E-mail: Radu.Trusca@itim-cj.ro

Abstract

Industrial and computer systems development has increased in recent years and, consequently, increased environmental pollution, living systems are directly affected by these changes. Because most systems that use high technologies require special working conditions, monitoring and controlling them is important, without neglecting the pollutants involved. Temperature is an important parameter in the operation of computer systems, industrial and research, maintaining it between certain values to ensure their proper functioning being important. Computer systems are designed to work best when the ambient temperature is in the range 20 – 23°C. The temperature is maintained constant in this range, regardless of amount of heat released by computer systems or external temperature, using air conditioning complex automated equipments. We tried to minimize energy consumption by modifying the temperature of the monitored system, depending on environmental parameters.

In this work we designed a data logger software that stores and graphically displays in real time the measured electrical values of a three-phase system using an Algodue UPT 210 digital meter and the environment temperature of the DC or the equipment temperature, using a microcontroller ATmega32 type from an electronic board "AVR_NET_IO" completed with an adaptation electronic circuit needed to connect all sensors. Using this system, the energy economy was up to 50%.

Keywords: Energy Consumption, Environment, Monitoring, Temperature.

Acknowledgment: The authors would like to express appreciation for the support of the Romanian National Authority for Scientific Research, CNCS – UEFISCDI, project number PN-II-RU-TE-2011-3-0283.

ID-63

Passive Cooling of Housing by Natural Ventilation

R. Kharchi, K. Imessad,

Centre de Développement des Energies Renouvelables,CDER,
BP. 62 Route de l'Observatoire Bouzaréah, Alger, Algérie
Tel :+(213)21901503
E-mail : k_razika@hotmail.com

Abstract

The building's form and thermal characteristics largely govern the amount of energy consumed by a building. To avoid major flaws of the design, an architect needs to include the evaluation of the building's energy consumption in the earlier stages of the design process. If energy efficiency is not adequately considered during these stages, higher operating cost will accrue over the life of the building.

In recent years, scientists, engineers and architects designed successful innovative buildings that use passive cooling techniques, such as natural ventilation.

The house studied is a pilot project undertaken jointly by the Centre for Development of Renewable Energies (CDER) and the National Centre for Studies and Research of integrated building (CNERIB) under the MED-ENEC project (Mediterranean Energy Efficiency in Construction structure).

The house subject of study is 65 m² surface area, located in the Algiers region characterized by a Mediterranean climate with relatively mild winters and hot, humid summer.

This work is to study the comfort inside the house in the summer without air conditioning, ventilation only is considered.

Numerical simulation is made under TRNSYS, the results compared with measured values are inconclusive.

Keywords: bioclimatic housing, natural ventilation, TRNSYS, energetic efficiency in the building

ID-64

Use of Intelligent Tools for Security Features of a System

A. Kharouati, D. Boumelita, N. Djouamaa, Y. Menasria, N. Debbache

Université Badji Mokhar - Annaba BP12, Annaba, 23000, Algérie- Laboratoire d'Automatique et Signaux d'Annaba. E-mail : k.aicha23@yahoo.fr, bm.djamila@yahoo.fr-dj.nora@yahoo.fr, y_menasria@yahoo.fr, NDebbache@univ-annaba.org

Abstract

This work aims to study the dependability of a control system of a volume based on the use of safety instrumented systems (SIS) tank. The approaches of stochastic Petri nets are used to model the behavior of the system. SIS systems are used to carry out the safety function. The parameters of the security operation are then treated: reliability, availability and safety indicators both the probability of dangerous failure (PFD) and the probability of safe failure (PFS). The methodology used in this work is based on the modeling of the conventional system and the system with distributed intelligence. We chose the smart instruments to transform probabilities of dangerous failures probabilities of safe failures. The software simulation tool is GRIF (Interactive Graphics for Reliability)

ID-65

ANALYSIS AND TREATMENT OF MSW LEACHATE BY THE REEDS

Fatima Ouadjenia, Reda Marouf

University of Mascara, Algeria. E-mail*: fatouadj2@yahoo.fr

Abstract

The objective of this study is to determine the physicochemical parameters of leachate generated by municipal solid waste in Mostaganem city, located in Western Algeria. These effluents were the subject of a natural treatment by the reeds Arundo donax. The results of analysis show that the leachate is characterized by the presence of the organic and minerals pollutants in strong concentration. We also raised the presence of heavy metals in considerable quantity. The concentrations of all elements analyzed after the treatment decreased. The reeds could resist to the aggressive medium, they developed more by keeping their physical aspect with the appearance of new buds, stems and roots.

ID-66

Enhanced biogas production from anaerobic co-digestion of solid waste by thermo-chemical pre-treatment

W. Maamir[a], Y. Ouhabil[a], H.Z. Li[b], S. Poncin[b], K. Bensadok[b]

[a] Laboratoire de Génie des Procédés et Environnement, Université des Sciences et de la Technologie Houari Boumediene, BP 32, El-Alia, 16111 Bab-Ezzouar, Alger, Algeria

[b] Laboratoire Réactions et Génie des Procédés, Université de Lorraine, CNRS, 1, rue Grandville, BP 20451, 54001 Nancy Cedex, France

Tel.: +213-776-146-002

e-mail: kbensadok@yahoo.fr

Abstract

Anaerobic digestion is considered a competitive source for the production of renewable energy as far as efficiency and cost are concerned. However, the utilization of lignocellulosic biomass for biogas production via anaerobic digestion has not been widely adopted because the complicated structure of the plant cell wall makes it resistant to microbial attack. The aim of this study was to investigate the effect of alkaline pretreatment of olive mill solid wastes (OMSW) on their co-digestion with olive mill waste waters (OMWW), under different conditions in order to enhance biomethane production at mesophilic temperature. Alkaline pretreatment of OMSW was performed using 0.1 m NaOH solution at different temperatures. Cattle manure was used as inoculum. After 30 days of digestion, the best improvement in the yield of biogas production was achieved by pretreatment at 70°C for 60 min, giving a methane yield of 400 mL/g dry matter (DM), while pretreatment at 25 and 100°C was not effective in improving the biogas production. Furthermore, at the optimal conditions, the removal of DM and organic matter (OM) were respectively 70% and 81%.

ID-68

Towards Improving the Performance of a Compact Solar Water Heater

N. El Mahallawy, M. A. Sewafy

The German University in Cairo, Egypt

E-mail: Nahed.elmahallawy@guc.edu.eg, Mohamed.ashraf.sewafy@gmail.com

Abstract

Due to the Energy resources shortage in recent years in Egypt and due to the importance of finding an alternative energy supply used in domestic and industrial applications, it is the purpose of this work to investigate new compact design of solar water heaters.

This paper presents a new compact design of solar water heater where the absorber plate is in direct contact with a phase change material (paraffin wax) acting as a heat storage. Aluminum fins are embedded in the paraffin in order to improve the conductivity of the wax. The absorber plate is composed of two aluminum sheets joined together by roll bonding process designed to allow suitable passage for the water without the need for pipes and to minimize the overall thickness of the traditional absorber plate. Moreover this design eliminates the need of a large size water tank which takes large space and has a high production and maintenance cost.

In order to improve the absorption ability of the collector a Fresnel lens was used to concentrate the sun rays on the absorber plate and an oil layer was added on the absorber surface. The temperature was monitored throughout the wax and in the water under different conditions. The results indicate that the Fresnel lens had a slight effect on the water temperature while the oil layer had a much larger effect reaching 10% of the temperature rise in the water.

ID-69

Electrical Power System Instability and Chaos

N. Eric[a] and Y. Uyaroğlu[b]

Department of Electrical & Electronics Engineering, Faculty of Engineering, Sakarya University
54187, Esentepe Campus, Sakarya-Turkey
E-mail: [a] vickessy@gmail.com, [b] uyaroglu@sakarya.edu.tr

Abstract
The principal objective of this paper will be to deeply describe, discuss and study an approach to chaotic oscillation in power systems and relationships between chaos and various power system instability modes. The basics of the mathematical theory will be introduced and then specific applications to power system engineering problems will be discussed. The applications will encompass modeling and simulation, control, and measurements where the

Lyapunov exponents for the strange attractors will be calculated.. We will present, illustrate and discuss that by using a three-bus simple system, three routes i.e route of cascading period doubling bifurcation, torus bifurcation route and directly initiated by large disturbance route may cause chaos in power systems. This paper will show us the true that chaos in power systems is in fact caused by the injected energy introduced by some kind of disturbances. By also using a simple system, we will illustrate that chaos lead power system to voltage collapse, angle divergence, or voltage collapse with angle divergence oscillation. This paper will strongly show us that chaos in power system is very likely to be an intergrade existing in the transient stage after a large disturbance. In order to prevent the happening of power system instability incidents effectively, it will be necessary to keep up on the studying of chaotic phenomena in power systems. This paper will be helpful to understand the mechanisms of various instability modes and to find effective anti-chaos strategies in power systems.

ID-70

Fuel switching and system expansion for District Heating in Gjakova, Kosovo

M. Muhaxheri[a], K. Muhaxheri[b*], R. Alushaj[c]

[a] Faculty of Mechanical Engineering, the University of Prishtina, Kosovo

[b] EU funded EEM Project, Republic of Kosova

[c] Faculty of Mechanical Engineering, Polytechnic University of Tirana, Albania

E-mail: muhaxheri_m@yahoo.com

Abstract

In the context of German financial cooperation with Kosovo a program has been agreed upon between the Kosovo and the German government with the aim to improve the district heating system in Gjakova. The program started in 2009 with the elaboration of a study report "Improvement of District Heating in Kosovo, February 19th 2009" with the main objective to prepare a larger investment and institutional reform program (the "project") for three cities in Kosovo. Part of this program was study performed to identify possibilities for fuel switching and system expansion for District Heating in Gjakova, Kosovo.

Similar to other parts of the East European energy sector the district heating system in Gjakova has suffered from lack of (re-)investments and strategic planning since the 1980s. Some parts of the piping network, substations and control equipment are close to the end of their normal technical lifetime resulting in high inefficiencies, water and heat losses in particular.

Moreover, the Gjakova District Heating system was designed to operate on heavy fuel oil, and the price of the fuel has risen significantly over recent years to make the operation of the plant uneconomic. All indications are that this trend will continue in the future. Currently the company does not operate at full capacity, having in mind high cost of fuel. The design capacity of the plant is 38 MW, and the plant presently operates at only 20 MW. The main task of this project was to switch the DH fuel source from heavy fuel to a fuel that is cheaper and environmentally friendly, and to expand the DH Company in Gjakova and its network and heat distribution operations to serve more customers in the light of expected DH demand growth.

In this paper will be presented results of the identification study performed with the main task to identify available fuel sources - such as HFO, coal, lignite, gas, biomass, biofuel and municipal waste - in Gjakova and surroundings including cost assessment (unit prices) of fuel options expressed in EUR/MWh, existing and future heat market as a reasonable basis for the optimal size of the plant size and configuration as well as possible DH network expansion.

Furthermore, this paper will contain identification of the current status of the existing distribution network, including hydraulic modelling of the network, and recommendation on the rehabilitation of existing DH network including budget estimates as well as DH network expansions based on identified heat market including budget estimates.

Key words: *IS*, heat market, fuel source, waste, pipe network

ID-71

Design and Control of aTwo-axis Solar Tracker with Arduino

Z. Bouzid, N. Ghellai

Materials and Renewable Energy Research Unit, University of Tlemcen, Algeria
E-mail : bzd.zakaria@gmail.com, na_ghellai@yahoo.fr

Abstract
To optimize the amount of received radiation by a conversion solar energy system, we often use systems that follow the sun. This type of process is often called "solar tracker" and it will place the collection system at the best position in relation to the position of the sun (perpendicular if possible).
Arduino, which is an open source printed circuit board (PCB) containing a microcontroller, can perform and automate many tasks ranging from simple control of home lighting to the design of complex robots. We, in our work, we chose to take advantage of the possibilities offered by this PCB to control and design a solar tracker to optimize the amount of radiation received by photovoltaic panels. Ease of programming of the Arduino board greatly facilitates the control part, and the system designed has a metal structure providing strength and wind resistance. To increase the amount of captured energy, we chose to follow the sun on two axes, which significantly optimized power production compared to fixed panels. The proposed system is a low cost solution for small installations.

Keywords: solar energy, solar tracker, Arduino, photovoltaic, Algeria, optimization

ID-73

Modeling and Characterization of Graphene Nanosheets Based of Activated Carbon from Marine Posidonia Oceanicafor Supercapacitor Application

N. Boukmouche[a], N. Azzouz[a], L. Bouchama[a], J. P. Chopart[b], A. L. Daltin[b]

[a] Laboratory of the Interactions Materials-Environment, University of Jijel, 18000Jijel, Algeria

[b] Materials Science and Engineering Laboratory (LISM) - EA 4695,

University of Reims Champagne-Ardenne, France

Tel.: +213078828562; Fax: +21334502692

E-mail: nawboukmouche@yahoo.com

Abstract

Energy storage is a persistent problem in general and electrical energy storage in particular. Supercapacitor is emerging technology in the field of electrical energy storage and its use along with battery or fuel cell is viewed as a solution in many portable systems.

In this paper, we have developed characterization of activated carbon derived from Posidonia Oceanica for supercapacitor application. The scanning electron microscope investigation showed a graphene nanosheets structure with micropores. The activated carbon electrode has been studied in H_2SO_4 electrolyte. The impedance spectra exhibits showed that the surface capacitance increases with the insertion duration of H_2SO_4. Modeling is used to characterize the supercapacitive properties of activated carbon electrode by the equivalent electrical circuit models. These models are used to find most significant parameters.

A life cycle test was performed with a highly stable performance up to 50000 cycles. This material might have a potential application in electric energy storage.

Keywords: Activated carbon, graphene nanosheets, impedance spectroscopy, Supercapacitor, equivalent electrical, electric energy storage.

ID-74

Modeling Pseudocapacitance of Nanostructured Manganese Dioxide for Supercapacitor Application

N. Boukmouche[a], N. Azzouz[a], L. Bouchama[a], J. P. Chopart[b], A. L. Daltin[b]

[a] Laboratory of the Interactions Materials-Environment, University of Jijel, 18000Jijel, Algeria

[b] Materials Science and Engineering Laboratory (LISM) - EA 4695,

University of Reims Champagne-Ardenne, France

Tel.: +213078828562; Fax: +21334502692

E-mail: nawboukmouche@yahoo.com

Abstract

Supercapacitors are now being looked at for use in higher power applications such as mobile telecommunications and hybrid electric vehicles.

In order to better analyze and to explain the electrochemical and physical behavior of MnO_2 thin film, an original electrochemical model is developed in this paper. The MnO_2 thin films were electrochemically deposited from a solution of manganese acetate as a precursor solution. The supercapacitive properties of MnO_2 thin films electrodes have been studied in Na_2SO_4 electrolyte, by an experimental investigation of cyclic voltammograms. The cyclic voltammetry demonstrates that the electrodes have an excellent electrochemical reversibility and a good electrochemical stability. The maximum supercapacitance obtained is 954 F g^{-1} in a potential window of 0-1.2 V at a scan rate of 5 mV s^{-1} and the specific capacitance decreases with the increasing of scan rate. Moreover, the impedance spectroscopy of MnO_2 thin films has been investigated.

Keywords: Manganese dioxide, Voltammetry, Supercapacitor, Pseudo-capacitance

ID-75

Electrocatalytic Oxidation of Methanol at Pd Modified Electrode in Borate Solution

M. A. Ibrahim

Department of Chemistry, Faculty of Science, University of Tabuk, Tabuk, Saudi Arabia
Department of Chemistry, Faculty of Education in El-Arish, Suez Canal University, North Sinai, Egypt

Abstract
In this paper, we discussed the effect of Pb, Cd, Ni, Zn, and Mn ad-atoms on the rate of methanol oxidation at Pd electrode in the borate solution. In $Na_2B_4O_7$, the presence of Cd, Ni, Mn and Zn ad-atoms increased the electrocatalytic current density while the presence of Pb inhibits the methanol oxidation.

ID-77

Photodegradation of Orange II (OII) by CdS thin films

H. Moualkia [a], G. Rekhila [b], M. Izerrouken [c], A. Mahdjoub [a], M. Trari [b]

[a] Laboratory of materials and structure of electromechanical systems and their reliability,
Faculty of Sciences and Technology, University Larbi Ben M'Hidi, Oum El Bouaghi, Algeria
[b] Laboratory of Storage and Valorization of Renewable Energies, Faculty of Chemistry (USTHB), B P 32 El Alia 16111 Algiers, Algeria
[c] Nuclear Research Centre of Draria (CRND) BP 43 Draria, Algiers, Algeria

Abstract

Over recent years, extensive research has been carried out on the characterization of CdS thin films due to the widened industrial applications including electronic and optoelectronic devices. On the other hand, the uncontrolled discharge of hazardous organics (dyes, pesticides drugs etc...) in the aquatic medium is responsible of large scale pollution. For the photocatalytic processes, it would be advantageous for economic reasons to use thin films with polycrystalline nature for the water decontamination. More than half of the solar spectrum is useful in photocatalysis with CdS and as application, CdS film is successfully tested for the degradation of orange II (OII) under sunlight. OII is a model molecule with a weak biodegradability; it is actively employed in the textile industry because of its coloring properties and its photocatalytic degradation is of potential significance. Among various techniques for preparing CdS films, the chemical bath deposition (CBD) is low cost and convenient for large area deposition at low temperature. The physical and photoelectrochemical properties have been investigated as a function of deposition time.

The optical transmittance is measured with a Shimadzu 1650 PC UV-visible spectrophotometer over the wavelength range (300-1100 nm). The film thickness (d) is determined by fitting the experimental transmittance spectra. The surface morphology is examined by scanning electron microscopy (SEM) using an ESEM, XR 30 instrument and by atomic force microscopy (AFM, Pacific Nanotechnology). The AFM technique offers digital images which allow quantitative measurements of surface features such as root mean square (RMS). The point of zero charge (pzc) is measured from the equilibrium pH of an aqueous powder solution with a digital pH meter (Schott 825).

Electrochemical measurements are done in the working solution (OII 10^{-4} M, pH ~7) using a three electrode cell: CdS, a Pt counter electrode and a saturated calomel electrode (SCE). The potential of the working electrode is monitored by a potentiostat/galvanostat PGZ301 (Radiometer).

The optical measurements show that the films have high optical transmission (85%). The band gap presents a maximum of 2.44 eV for a deposition time of 30 min. The scanning electronic microscopy (SEM) and atomic force microscopy (AFM) show homogeneous and continuous thin layers with small rounded cristallite and surface roughness RMS of about 15 nm for the films deposited for 30 min. The Mott-Schottky characteristic indicates *n* type conductivity with a flat band potential of -0.95 V_{SCE} and an electron density of 1.43×10^{25} m^{-3}. As application, orange II is oxidized via radicals and the best photoactivity is obtained at pH ~7. 68% of orange II disappears in ~ 1 h under solar light (AM 1). The oxidation follows a zero order kinetic with a rate constant of 0.11 mol L^{-1} min^{-1}.

ID-78

Deep Oxidative Desulfurization of Sulfur Compounds in Model Diesel with Hydrogen Peroxide and Formic Acid

H. A. Khalfalla[a], S. Ghareba[a] , M. M. El-Garni[b], E. Dreedr[c]

[a] *Department of Chemical Engineering Al-Mergeb University, Al-Kums, Libya*

[b] *Canadian Oil and Gas Consulting and Training Services,Canada*

[c] *National Oil Corporation Tripoli, Libya*

E-mail: hkhalfalla@yahoo.com, melgarni@hotmail.com, *mahdred@hotmail.com*

Abstract

Deep desulfurization of liquid hydrocarbon fuels has received more attention due to the increasing stringent regulations and fuel sulfur specifications in many countries for environmental protection (e.g., for diesel fuel 15 ppm since 2006 in the US and 10 ppm since 2008 in the EU) [1,2].

The process most widely used in refineries to remove sulfur compounds from liquid hydrocarbon fuels is hydrodesulphurization (HDS), which catalytically carried out in the presence of hydrogen under severe operating conditions making HDS a very costly option for deep desulphurization [3]. Moreover, HDS is not effective for removing hetrocyclic sulphur compounds. Oxidative desulfurization (ODS) appears a very promising method for obtaining ultra low-sulfur fuels requested worldwide by the new regulation mandates, particularly if considered as an add on to existing hydrodesulfurization (HDS) technology, as experimental results in this work had shown that the reduction of sulfur content from 1353 to less than 50 ppm is technically possible.

In this work, in order to reduce the sulfur level in liquid hydrocarbon fuels for environmental protection and fuel cell applications, deep desulphurization of model sulfur compounds (di-n-butyl sulfide (DNBS), dimethyl sulfoxide (DMS) and dibenzothiophene (DBT)) conducted with hydrogen peroxide as oxidant and formic acid as catalyst. A series of batch experiments were carried out using a small reactor operating at various temperatures. The effects of reaction temperature, reaction time and amount of catalyst were investigated.

The effectiveness of sulfur removal is found to be proportional to the reaction temperature in the range of 40 to 60 ºC and maximum 15 ml of formic acid. The conversion of DBT was nearly 100%. As a result, the oxidation reactivity of the different sulfur compounds in model diesel followed the order DBT > DNBS >DMS.

Keywords: Desulfurization, Formic acid, Hydrogen Peroxide

ID-79

Turbulent Plane Wall Jet Impingindg a Hot Obstacle

M. Kabache[a], A. Mataoui[b]

[a] University M'hamed Bouguerra – Boumerdes, Algeria

[b] Theoretical and applied laboratory of fluid mechanics, University of science and Technology Houari Boumedienne-USTHB, Algiers, Algeria.

Abstract

The mean turbulent flow structure around an elongated hot obstacle is investigated numerically. Two types of incoming flow are checked in order to clarify the influence of the external zone of the flow on the reattachment process. It comes about a wall jet or a boundary layer incoming flows.

The results show that the increasing of Reynolds number and nozzle thickness enhances the heat transfer and modifies considerably the reattachment point's location. The recirculation volumes depend also on the thickness of the jet exit, at a given Re number. In comparison to the case of the boundary layer incoming flow, the first and the third reattachment lengths (X_{r1} and X_{r3}) are reduced for the case of the wall jet , however the second one (X_{r2}) it is augmented. Furthermore, when the momentum of the incoming flow augments the first reattachment length and averaged Nusselt number increases. Consequently, the boundary layer incoming flow gives the greatest Nusselt number values in comparison with wall jet cases. The turbulence kinetic energy and vorticity contours further highlight the effect of the external zone of each incoming flow on reattachment processes. The distribution of the average Nusselt number is correlated according to some problem parameters.

Keywords: Wall jet; Heat transfer, Turbulence, Obstacle, Boundary layer, Shear flow

ID-80

Can Beijing fight with haze? Lessons can be learned from London and Los Angeles

K. Wang

Center for Energy and Environmental Policy Research and School of Management and Economics, Beijing Institute of Technology, 5 South Zhongguancun Street, Haidian District, Beijing 100081, China

e-mail: wangke03@yeah.net, kewang2083@gmail.com

Abstract

In 2013, the problem of haze and fog in China was hitting the record-level, and China is currently suffering the worst air pollution problem since 1961. In Beijing, the capital city of China, the haze problem in winter can be traced back to over 600 years. Specific geographical conditions and particular climatic situation led to chronic hazy winters. However, the immediate causes of the haze problem in recent years is the rapid increase of fossil fuel consumption which is associated with the rapid development of industries in Beijing and surrounding provinces. In general, the grey sky in Beijing is mainly due to coal burning, vehicle exhaust, climate and geographical environment and other factors, such as crop stubble burning and fireworks. Haze problem has come up due to industrialization in many cities. Bothe London and Los Angeles have been struggling with the haze problem for over 50 years. They both controlled the haze in two ways: control the air pollution and clean the fuel. Beijing may find out particular strategies to deal with its current haze problem according to the experiences of London and Los Angeles.

Keywords: haze and fog, Beijing, coal burning, vehicle exhaust

ID-82

GA- PID Controller of Solar Power Plant

N. Djouamaa, M.L.Saidi, S.Kermiche, A. Kharouati, D. Boumelita

Laboratory of Automatic and Signals, Badji Mokhtar University Annaba, BP12, Annaba, 23000, Algeria
E-mail: dj.nora@yahoo.fr, saidi-m @univ-annaba.org, mskermiche@yahoo.fr, k.aicha23@yahoo.fr, bm.djamila@yahoo.fr

Abstract

This paper presents an intelligent approach for the improvement and the optimization of performances the solar system by the genetic algorithm has basis of PID regulator to find the parameters (K_p, K_i, K_d) by minimizing mean square error. It is very interesting to investigate its utility in a solar power plant in order to maintain temperature oil output more nearer to the reference temperature.

Keywords: renewable energy, Distributed solar collector field, Genetic Algorithm, PID.

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ID-83

Motorists' knowledge, perceptions and attitudes towards ethanol blended fuel in Zimbabwe.

D. Mabumbo[a], P. Mafongoya[b]

[a] Human Economy Programme, Centre for the Advancement of Scholarship,
University of Pretoria, Private Bag x20, Hatfield 0027, South Africa.
[b] Agronomy and Rural Development, School of Agriculture, Earth and Environmental Sciences (SAEES). University of KwaZulu-Natal, Pietermaritzburg, 3209, South Africa.
Email:dmabumbo@gmail.com, mafongoya@gmail.com

Abstract

Governments all over the world including those of Brazil, USA, China, EU, India and recently in Africa have enacted mandatory legislation for use of biofuels (ethanol) in the transport sector. This is meant for climate change mitigation and reduction of greenhouse gas emissions. This study seeks to investigate the level of awareness and prevailing attitudes of motorists in Zimbabwe where a mandatory ethanol blending policy was recently introduced. The study uses data derived from 200 respondents, to whom a questionnaire was administered. The major challenge faced by motorists is failure to distinguish between the various blended fuel types that has been hastily introduced on the market. About 63.1% were not clear about the technical attributes of ethanol blended fuel especially as it relates to engine efficiency. Secondly, some motorists experienced a number of problems ranging from poor idling (36%), lack of power (19.5%) and difficulties with engine starting (16.5). Despite all these complaints, 54% of the respondents generally exhibit a positive attitude towards ethanol blended fuel and 60.3% said that they were keen to recommend blended fuel to other motorists. An appropriate institutional, legal and policy framework that supports massive awareness campaigns for ethanol can go a long way to dispel negative perceptions associated with ethanol blends. Such initiatives are critical for transforming the current fossil fuel based economy in Zimbabwe into a low carbon energy economy.

ID-84

Selective Uptake and Stable Solidification of Radioactive Cesium by Porous Silica Gels loaded with Insoluble Nickel Ferrocyanides

X. B. Yin[a], H. Mimura[a], Y. Wu[b], Y.Z. Wei[b], Y. Niibori[a]

[a] Department of Quantum Science and Energy Engineering, Tohoku University, Aramaki-Aza-Aoba 6-6-01-2, Sendai, 980-8579, Japan

[b] School of Nuclear Science and Engineering, Shanghai Jiao Tong University, 800 Dongchuan Road, Shanghai, China

Tel and Fax: +81-22-795-7915,

E-mail: hitoshi.mimura@qse.tohoku.ac.jp

Abstract

The development of cesium selective adsorbent is urgent subject for the decontamination of highly contaminated radioactive water in Fukushima NPP-1. For the selective uptake and stable immobilization of radioactive Cs, porous silica gel (SG(PEI)) loaded with insoluble nickel ferrocyanides (NiFC-SG) was developed by using impregnation/precipitation method. The uptake equilibrium of Cs^+ for NiFC-SG was attained within 10 h and the uptake (%) was estimated to be above 90%. The Cs content in NiFC-SG was determined to be 6.3 wt% by EDS analysis. As for the column test, the flow rate had a significant effect on the breakthrough curve of Cs^+, and the 5% breakpoint and breakthrough capacity were estimated to be 65 cm^3, 14 mg/g and 25 cm^3, 5.3 mg/g at flow rate of 0.5 cm^3/min and 1.0 cm^3/min, respectively.

The immobilization of Cs^+ and stable solidification of spent NiFC-SG adsorbing Cs are very important from the viewpoint of safety treatment and disposal of secondary solid wastes. The Cs content in the calcined products of CsNiFC-SG was markedly lowered with calcining temperature and the Cs immobilization ratio (%) was less than 30% after calcination at 1,200℃; porous silica gel matrix had no immobilization ability for Cs. In order to enhance the Cs immobilization ratio, CsNiFC-SG adsorbents were mixed with different kinds of solidification matrices (additives: zeolite A, X, Y, modified chabazite, mordenite, clinoptilolite, clay, fly ash and allophane), and then the molded mixtures were calcined at high temperature up to 1,200℃. The Cs content in the calcined mixtures (CsNiFC-SG: additive= 1:1) was almost unchanged even by varying the calcining temperature up to 1,200℃. At higher mixing ratio of 9:1, the Cs content tended to decrease with calcining temperature, while only the mixture with allophane had constant Cs content; in this case, the Cs immobilization ratio was estimated to be nearly 100% up to 1,200℃. In this case, the crystal phase immobilizing Cs was identified as pollucite ($CsAlSi_2O_6$) by X-ray diffractometry. The Cs leachability from the sintered products was further evaluated under different leaching conditions; as for the sintered product of CsNiFC-SG and allophane (4:1) at 1,200℃, the leaching (%) of Cs after 15 d-leaching in water was estimated to be about 0.1%.

These results indicate the stable solidification of Cs selective adsorbent of NiFC-SG can be accomplished by high temperature sintering using an excellent solidification matrix of allophane.

ID-86

Reliability Importance Measures of Components for Stand-alone Hybrid Renewable Energy Microgrid

A. Abdulkarim, S. M. Abdelkader, D. J. Morrow

Energy, Power and Intelligent Control, School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, United Kingdom.

E-mail: aabdulkarim02@qub.ac.uk, s.abdelkader@qub.ac.uk, dj.morrow@ee.qub.ac.uk

Abstract

Recently, renewable energy sources are becoming more important because of being environmentally friendly. Especially, wind and solar energy conversion systems are utilized together in stand-alone applications for isolated loads and remote communities that are difficult to reach due to technical and economic reasons. This paper presents the results of a new approach on the reliability analysis of stand-alone hybrid microgrid based on components importance measures. The microgrid presented consists of wind, photovoltaic, diesel generator and energy storage systems for supplying an isolated load. Reliability models of the customers connected to the Microgrid with the mentioned components has been model using a new approach based on reliability block diagram algebra. Different microgrid design structures and component measures on the reliability of load points were examined on a standard IEEE low voltage benchmark microgrid. Finally, other novel approaches on how to rank components that make up standalone microgrid were investigated for reliability. The results show the possibility of modeling and reliability analyses of standalone microgrid using the proposed technique. Additionally, the results of the contribution of components to the system reliability based on the structure of microgrid have been presented. The work could be used in identifying direction, priority, upgrading and suggest the most efficient way to operate and maintain a microgrid.

Keywords: Reliability, importance measures, Wind, Solar, standalone microgrid and reliability block diagram.

ID-87

Tensile and Torsional Loads Stress Distribution along the Drill String for Deep Wells

L. Belkacem[b], N. Abdelbaki[a], M. Gaceb[b], E. Bouali[a], M. Bettayeb[b]

[a] University Akli Mohand Oulhadj , Bouira,10000, Algeria

[b] University Mohamed Bougara, Boumerdes, Faculty of Hydrocarbons and Chemistry Independence Street, Laboratory of Petroleum Equipments Reliability and Materials,. 35000, Algeria.

Fax: +21326934026

E-mail: lfep@umbb.dz

Abstract

Common knowledge and rule of thumb tell us that the tensile failures will mostly occurs in the pipe body, while torsional failures will occurs in the tool joints. The total stresses on the drill string should be considered which are induced by combined bending; torsion and tensile stresses. The later can usually be operating up until 80% of the pipe body yield stress which is considered as safe working limit. Moreover; torque and drag are caused by the lateral forces and the friction between the borehole wall and the drill pipe; the lateral forces depend on the weight of the drill string.

Torque and drag are sometimes overlooked when drilling simple wells. In deep well this is not acceptable. Proper decision made using correct torque and drag can make all the difference between TD drilling and suspended drilling. Therefore; the over pull load plus the torque are the most important points to be considered in deep well drilling, since the resistance of the drill string body to the combined efforts will limit probably its tensional limit. By this I mean; exerting both a tension and torsion load on the drill string the yield stress of this later will weaken consequently applying a high tension effort combined with a significant torque lead to plastifiad the drill pipe body. This problem is well observed in back-reaming operation.

Nine deepest wells 6300 m have been drilled in Berkine field in Algeria until now., taken as a whole drilling problems which has been encountered in this area ; we situate that over pull in conjunction with torque took the greatest part that have met in mostly drilling sections (16" ,12 ¼ " and 6") ,which lead to a lot of back reaming to work these intervals .So this paper will discuss the effect of these loads in generating stresses distribution along the drill string based on the strength of drill pipe against all the loads and suggest recommendations that will provide a considerable improvement in longevity.

ID-88

Reduction of the Polluting Load of Tannery Wastewater by Electrocoagulation

M. Ziati [a], Khemmari F. Adam Issoufou R.[b], S. Hazourli [a]

[a] Laboratory of water treatment and valorization of industrial wastes, Chemistry Department, Faculty of Sciences, Badji Mokhtar University, Box 12, Annaba 23000, Algeria.

[b] Chemistry Department, Faculty of Sciences, M'Hamed Bougara University, Boumerdes 35000, Algeria.

E-mail: ziatimoun@gmail.com

Abstract

The characterization of waste water of “Rouiba” Tannery, by analyzing a number of physicochemical parameters has shown a raised polluting load, therefore the treatment of these water is essential. In this study, we chose an electrochemical treatment recognized as easy and inexpensive process, called electrocoagulation.

The used electrochemical reactor consists of two plane parallels metal electrodes (Aluminum) with water to be treated between them. Potential differences from 2 to 15V were imposed to treat this water.

The influence of some parameters (such as the contact time, the surface of the electrodes, the inter electrode distance, pH of the medium, the presence of electrolyte and the effect of agitation) on the elimination of COD, turbidity, the chlorides, the sulfates and chromium has been studied.

The results show that COD (BOD and organic matter) abatement reached 76%, turbidity 99%, sulfates 88%, chlorides 46% and 93% for chromium, treated under a potential difference of 15V with the aluminum electrodes of surface: 90 cm^2, inter electrodes distance equal to 2 cm, in basic medium and during 90 minutes. However, the volume of generated mud is considerable (700 cm^3).

On the basis of the variation of the influence factors and effectiveness of the treatment, we could conduct a forecast of the choices and conditions of realization at a higher level.

Keywords: Tannery effluents, Electrocoagulation, Chromium, Organic pollution.

ID-89

Influence of the *Staphylococcus aureus* Bacteria Cells on the Zeta Potential of Graphene Oxide Modified with Alumina Nanoparticles in Electrolyte and Drinking Water Environment

A Jastrzebska[a], E. Karwowska[b], A. Olszyna[a]

[a] Woloska 141, 02-507 Warsaw, Poland, Faculty of Material Science and Engineering, Warsaw University of Technology

[b] Nowowiejska 20, 00-653 Warsaw, Poland, Faculty of Environmental Engineering, Warsaw University of Technology

E-mail : agnieszka.jastrzebska@inmat.pw.edu.pl, karwowska@is.pw.edu.pl, aolszyna@meil.pw.edu.pl

Abstract

Microbial adsorption to solid surfaces plays a fundamental role in bioengineering, food processing, environmental protection, medicine and medical biotechnology as well as water filtration. So far, graphene and graphene oxide also attracted great scientific attention as a potential effective sorbents.

The primary objective of this study was to describe the model bacteria cells (*Staphylococcus aureus*) influence on the zeta potential of reduced graphene oxide/Al_2O_3 nanocomposite (RGO/Al_2O_3), graphene oxide (GO) and Al_2O_3 with a special emphasis on the analysis of their zeta potential distributions as a function of pH. The additional objective of the work was also to investigate the influence of modificator (Al_2O_3 nanoparticles) on the morphology, physical and electrical properties of GO and its ability to adsorb bacteria cells.

The obtained results indicate that the RGO/Al_2O_3 nanocomposite developed and synthesized by us is characterized by different surface electrical properties in comparison with GO and Al_2O_3 alone and that the alumina nanoparticles can be successfully used as a modificator of the surface electrical properties of graphenes. Zeta potential investigations suggest that Al_2O_3 nanoparticles localized at the surface of reduced graphene oxide flakes make them more sensitive to the changes of chemical composition of water environment and the bacteria adsorption processes. Also, the bacteria cells adsorption on the surface of analyzed RGO/Al_2O_3 suspended in electrolyte solution and drinking water environment have an influence on its zeta potential value and a lowering of the zeta potential values was observed when *S. aureus* cells were present in the mixed solutions.

Keywords: graphene, alumina, nanoparticles, nanocomposite, zeta potential, adsorption, bacteria

ID-90

Computational Design of Dual Cation Ammine Metal Borohydrides: $LiTi(BH_4)_5(NH_3)_x$

Y. Kışlak, A. Tekin

Informatics Institute, Istanbul Technical University, 34469 Maslak Istanbul Turkey.
E-mail: yusufkislak@gmail.com, adem.tekin@be.itu.edu.tr

Abstract
Global energy need is mostly fulfilled via fossil fuels. Usage of these sources causes harmful consequences to both environment and human beings. Besides, they have limited reserves and therefore alternative fuels must be discovered. Hydrogen is one of these alternatives due to its high energy content and environmentally friendly nature. However, there are many challenging problems waiting to be addressed for its widespread use. One of them is hydrogen storage which is especially very important for on-board applications. Even hydrogen can be stored as in the form of gas or liquid. These mediums are not practical in everyday use. As an alternative, hydrogen can also be stored in the solid form. For this purpose, both metal borohydrides and ammines are proposed due to their high gravimetric and volumetric densities and other peculiar features. Metal borohydrides have some severe drawbacks e.g., requirement of a very high temperature for the hydrogen decomposition. Therefore, they can be mixed with ammines to produce new materials with a better thermodynamics. Dual-cation ammine metal borohydrides (AMBs) just suit well for this purpose. In this study, we computationally designed new AMBs in the form of $LiTi(BH_4)_5(NH_3)_x$ x=2, 3, 4 using a strategy which combines crystal structure prediction with density functional theory computations.

ID-92

Simulating Combustion of Methanol in SI Engines Using Different Heat Transfer Models

O. H. Ghazal

Applied Science Private University, Mechanical and Industrial Engineering Department, P.O. Box 166, 11931, Amman, Jordan

Tel: +962796939867, Email: o_ghazal@asu.edu.jo

Abstract

Various solutions have been proposed for improving combustion process of conventional gasoline engines and reducing the exhaust emissions without making serious modifications on the engine, one of which is the use of alternative fuel, such as methanol, ethanol and LG, either in combination with gasoline or directly ("neat"). However, for optimizing engine performance, fuel availability, and toxicity, a blend of methanol and petroleum is likely to be preferable to using any of these individual substances alone. The influences of various heat transfer models on the combustion process within IC engine fueled with methanol were investigated. The Annand, Woschni, and Eichelberg models have been used in this analysis. The engine's output power, mean effective pressure, fuel consumption, volumetric efficiency, and brake thermal efficiency were also examined for both fuels. It is shown that using methanol as a fuel in spark-ignition engines can offer an increased thermal efficiency and increased power output as compared to gasoline. However, the fuel consumption will be higher than hydrocarbon fuels. Moreover, the results obtained from the simulation show that Eichelberg model for methanol fuel increases the engine's brake power approximately 12% compared to Annand model especially for high engine speed. In addition, in case of high engine speed, the Eichelberg model presents very interesting fuel consumption characteristics. For low engine speed, the increase in fuel consumption is about 10% using Annand model compared to Woschni model.

Keywords: modeling SI engine, combustion, heat transfer models, methanol fuel, green car.

ID-93

Simultaneous Removal of Fluoride and Nitrate from Reverse Osmosis Concentrate Issued from Treatment of Brackish Water of Southern Algeria

Berkani, M. Larachiche, F. Djebloun, M. Belkacem, K. Bensadok

Laboratoire de Génie des Procédés et Environnement, Université des Sciences et de la Technologie Houari Boumediene, BP 32, El-Alia, 16111 Bab-Ezzouar, Alger, Algeria

Tel: +213-776-146-002; , E-mail: belkacemed@yahoo.fr

Abstract

In southern Algeria, removal of fluoride and nitrate contained in brackish water are necessary because of their terrible effects on human beings and environment. Nowadays, the most common technique used to treat brackish water is reverse osmosis (RO), although the RO concentrate is a major problem. The present study attempted to investigate the applicability of electrocoagulation (EC) method for the simultaneous removal of fluoride and nitrate contained in RO concentrate of treated brackish water of El-Oued (area of southern of Algeria). The influence of various variables such as electrode material, pH, reaction time and current density, on the treatment efficiency, was investigated. It was observed that the treatment efficiency is optimal with the use of both cathode and anode made of aluminum, pH 6.3, 0.3 A and 40 min of electrolysis. At these optimal conditions, fluoride and nitrate concentrations were respectively reduced from 10.0 to 0.52 mg/L and 20 to 9.8 mg/L, corresponding to 94.8 % and 51 % removal efficiency. To understand the mechanism involved, nitrite and ammonium ions were measured and obtained sludge was analyzed by SEM, XRD and FTIR.

ID-94

Hydrogen production by conversion of ethanol using atmospheric pressure microwave plasmas

D. Czylkowski[a], B. Hrycak[a], R. Miotk[a], M. Dors[a], M. Jasiński[a], J. Mizeraczyk[b]

[a] Centre for Plasma and Laser Engineering, The Szewalski Institute of Fluid-Flow Machinery, Polish Academy of Sciences, Fiszera 14, 80-231 Gdańsk, Poland

[b] Department of Marine Electronics, Gdynia Maritime University, Morska 81-87, 81-225 Gdynia, Poland

E-mail dczylkowski@imp.gda.pl

Abstract

Hydrogen meeting the requirements of being environment-friendly and renewable is one of the most promising alternative energy carriers [1, 2]. In our investigations an atmospheric pressure microwave (2.45 GHz and 915 MHz) plasmas has been used for hydrogen production via ethanol reforming. The waveguide-supplied metal-cylinder-based microwave plasma sources (MPSs) were used. It was shown that the MPS is a high potential tool for hydrogen production via methane conversion [3]. Several ethanol based methods of hydrogen production like: steam reforming, dry reforming, partial oxidation, thermal decomposition could be performed using our MPSs. Some of the preliminary results could be found in [4]. Recently argon, nitrogen and carbon dioxide were used as a working gas carrying ethanol vapours into the plasma. The working gas flow rates ranged from 1500 to 3900 NL/h. Absorbed microwave power was up to about 6 kW. The tested parameters were the hydrogen volume concentration in the outlet gas (%), ethanol conversion degree (%), hydrogen production rate NL(H_2)/h, and energy yield NL(H_2)/kWh. The proper choice of the process input parameters, i.e. the absorbed microwave power, operating gas composition and flow rate resulted in the ethanol conversion degree greater than 99%. The hydrogen production rate was up to about 730 NL(H_2)/h and the energy efficiency was 180 NL(H_2) per kWh of absorbed microwave power. Generally, presented microwave plasma method can be used for hydrogen production not only from ethanol, but also from different liquid hydrocarbons like gasoline, heavy oils and biofuels.

Acknowledgements: We are grateful to The National Science Centre (Programme No. 2012/05/B/ST8/02789) for the financial support of this work.

ID-95

Electrical Characterization of n-Si/Copper Phthalocyanine Based on Photodiode

A. A. Hendi, R.H. Al Orainy

Physics Department, Sciences Faculty for Girls, King Abdulaziz University, Jeddah, Saudi Arabia.

Abstract

The electrical and photovoltaic properties of n-Si/Copper phthalocyaninehybrid heterojunction device have been investigated by current-voltage and capacitance-voltage measurements. The ideality factor of the diode was found to be 2.08, suggesting that the heterojunction diode indicates a non-ideal diode behaviour. At higher voltages, the space charge limited-conduction mechanism is dominant in the diode. The series $R_s$and shunt resistance R_{sh} values for the diode were found to be $6.97x10^4$□ and $1x10^8$□, respectively. The photocurrent in the reverse direction of the diode increases with illumination intensity. n-Si/Copperphthalocyanineheterojunction diode gives an open-circuit voltage of 0.092 V and a short-circuit current of 0.08 □A at light intensity of 6 mW/cm^2.

ID-96

Doping Polypyrrole Particles by Removing of Cu^{2+}, Ni^{2+} from Aqueous Solutions

L.Seid[a], D. Chouder[a], N.Maouche[b]

[a] Laboratoire d'Energétique et d'Electrochimie du solide (LEES)

[b] Laboratoire d'Electrochimie et Matériaux (LEM)

Département de Génie des Procédés Faculté de Téchnologie,

Université de Sétif-1, 19000 Sétif, Algeria

E-mail: Lamriachimie@yahoo.fr

Abstract

The development of simple methods for removing heavy metals from aqueous samples is a relevant field of research. For this, various techniques are used such as chemical sedimentation [1], surface absorption [2, 3] ions-exchanger [4, 5] and reverse osmosis [6].

In the same aims, the objective of this study is to investigate the removal of Cu^{2+} and Ni^{2+} ions, from aerated aqueous solutions by complexing them with polypyrrole particles. A mass of polypyrrole powder was immersed in solutions of metallic salts ($CuSO_4$, $NiSO_4$), with concentration of 10^{-2} M for 48 h, at room temperature, then the mixture was filtered and dried. The obtained complexes were characterized by analytical methods**:** FTIR spectroscopy, cyclic voltammetry, X-ray diffraction, atomic force microscopy. Conductivity measurements of the polypyrrole and complexes were made using the four-points method .

The results show that the FTIR comfirmed the metal coordination with azomesthine nitrogen of polypyrrole [M-N] and the complexes present an amorphous structure which was determined by XRD. The voltammetric reponse of PPy modified with metallic microparticles showed higher current and a shift in the peaks potentials compared to unmodified polymer electrode. the conductivity of complexes are very important in presence of metallic cations, particullarly in the case of Cu.

From economic view, the new composites open us many application in different fields as catalysis, batteries, fuel cells or microelectronics.

Keywords: heavy metals, polypyrrole, complexes, doping, conductivity

ID-97

Fabrication and Electrical Characterization of CdO/p-Si Photosensors

R. H. Alorainy, A.A. Hendi

Abstract

CdO nanorods were grown by sol gel technique and the structural properties were analyzed by X-ray diffraction and AFM measurements. CdO films were grown onto p-type silicon substrates. Optical band gap was determined by optical absorption. The optical band gap of the CdO film was changed by Al dopant. Heterojunction diodes based on undoped and aluminum doped CdO/p-Si were fabricated using sol-gel spin-coating technique. The effect of light intensity on junction properties of the diodes was studied. The ideality factor of the diodes were obtained to be 2.30, 2.95, and 2.80, for undoped, 0.1%, and 1.0% for Al doped CdO diodes, respectively. The transient photocurrent results indicate that photocurrent under illumination is higher than the dark current. The on/off ratio values of the diodes were observed to be 5.84, 7.50, and 3.96 for undoped, 0.1%, and 1.0% Al doped CdO respectively. The observed decrease in the capacitance and increase in the conductance with increase in frequency was explained on the basis of interface states. The obtained results indicate that the photoresponse properties of the CdO/p-Si are controlled by Al doping.

ID-98

A Good Rectifiying Al /ZnO/pSi/Al Diode Investigation

M. Benhaliliba [a], Y.S .Ocak[b], H.Mokhtari[a]

[a]Department of Material Technology, Physics Faculty, USTOMB University, BP1505 Oran, Algeria

[b] Dicle University, Education Faculty, Science Department, 21280 Diyarbakir, Turkey

Tel: +213772211491, E-mail: mbenhaliliba@gmail.com

Abstract

The fabrication of Al/ZnO/pSi/Al Schottky diode has been achieved and its electronic properties have been measured. From the I-V and C-V characteristics several magnitudes such as ideality factor (n), rectification coefficient (R), serie resistance Rs, effective carrier density N_D have been extracted. Al, Sn–codoped ZnO films have been sprayed onto p type silicon substrate @ 350°C. Al front contacts have been thermally evaporated process in vacuum at 10^{-6} Torr. The metallic contacts have a radius of 1.5 mm and a thickness of 250 nm. The current-voltage (I-V) characteristics show a good rectifying profile R~3900. The extracted parameters, ideality factor (n), barrier height (Φ_b), series resistance R_s are found to be 3.54 (dark), 1.6 (150mW/cm²), and 0.74eV (dark), 0.89 eV (150 mW/cm²), 5400 Ω (dark), 1575 Ω (150 mW/cm²), a photocurrent of 0.89 mA. Effect of temperature, varied within the range of 295-380K, on the I-V characteristics was emphasized. Dark and illumination characteristics were also studied. Finally, we accomplish the study by the measurement of capacitance-voltage (C-V) characteristics at result of frequency. We fabricate the device in the aim to use it in solar cell, photodiode and photoconductor applications.

Keywords: Ultrasonic spray pyrolysis; Al, Sn-codoped ZnO film; I-V characteristics; dark and illumination exposure; C-V measurement.

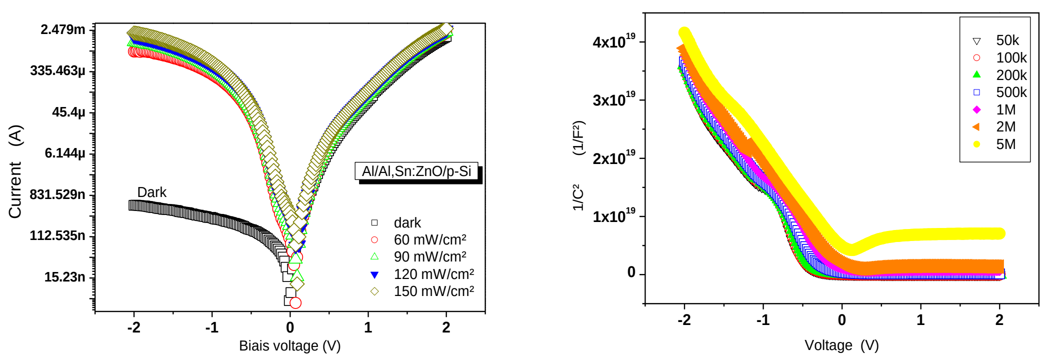

Figure: I-V characteristics under dark and illumination (left), C^{-2}-V plot at several frequencies 50k-5MHz (right) of Al/ZnO/pSi/Al Schottky diode.

ID-99

Numerical Simulation and Prediction of the Performance of a Direct Injection Turbocharged Diesel Engine

M. Bouchetara, B. Menacer, A. Bekouche

Department of Mechanical Engineering, University of Sciences and Technology of Oran, Oran, Algeria
BP 1505 El-MNAOUER, Oran 31000 Algeria.
Email: mbouchetara@hotmail.com, acer.msn@hotmail.fr, aek.bekouche@yahoo.fr

Abstract

In this work we carried out a comparative study of indicated mean effective pressure, mean effective pressure, power, torque and brake specific fuel consumption obtained by the analytical model for thermodynamic cycle simulation of a turbocharged diesel engine with the computer program developed in the language FORTRAN and those with the GT-Power software. The language FORTRAN program developed is currently used in the course of modeling and simulation of engine performance.

Keywords: One zone model; Ignition compression engine; Heat transfer; Friction; Turbocharged Diesel engine; GT-Power.

ID-100

Carbon/Phosphates Composite as Efficient Electrochemical Energy Storage Materials

I. Saadoune[a], S. Difi[a], K. Lasri[a], K. Edström[b], P.E. Lippens[c], R. Hakkou[a]

[a]Laboratoire de Chimie des Matériaux et de l'Environnement, Université Cadi Ayyad University, Morocco
[b]Depatment of Chemistry - Ångström Laboratory, Uppsala University, Uppsala, Sweden
[c]Institut Charles Gerhardt, UMR 5253 CNRS, Université Montpellier 2, France

Abstract

We report the enhanced energy storage performance of carbon-coated sodium super ion conductor (NASICON)-structures as a convenient host matrix for reversible insertion of both Li and Na ions. The targeted NASICON-type compounds were prepared by means of the sol/gel route using phosphoric acid as a Phosphorous source. The synthesized phosphates were subsequently carbon coated.
Several characterization techniques such as in-situ XRD, in-situ Môssbauer, thermogravimetric analysis (TGA), SEM, Raman analysis were used to study the physicochemical properties before using these carbon-coated phosphates as active materials in rechargeable batteries.
Very interesting energy storage features were evidenced by the studied samples in terms of coulombic efficiency, electrochemical cycling, and rate capability making them as suitable materials for the energy storage applications.
More detailed results will be presented during this meeting.

Acknowledgements: The authors would like to thank IRESEN, Volubilis-Toubkal, VR MENA and CNRST for the financial support.

ID-102

Optimization of the Electrodes of Micro-tubular Solid Oxide Fuel Cells Made by Sequential Aqueous Electrophoretic Deposition

F.A. Yu, B.C. Ho, J.S. Cherng

Department of Materials Engineering, Ming Chi University of Technology, 84 Gungjuan Rd., Taishan, Taipei 24301, Taiwan

Tel: +886-2-2908-9899, E-mail: cherng@mail.mcut.edu.tw

Abstract

A series of anode-supported micro-tubular solid oxide fuel cells (SOFCs) are manufactured by sequential aqueous electrophoretic deposition (EPD). The process of these micro-tubular SOFCs includes sequential aqueous EPDs of an anode layer (8YSZ-NiO), an electrolyte layer (8YSZ), and a cathode layer (LSM) onto a thin wire electrode, followed by stripping, drying, and a single-step co-sintering. The microstructure of the resultant micro-tubular SOFCs, including the thickness and porosity of each layer, is controlled by the processing parameters such as solid loading, current density, deposition time, and sintering temperature. In particular, the effects of the electrode microstructure on its ionic/electronic conductivity and in turn on the electrochemical performance of such micro-tubular SOFCs are investigated and discussed based on the microstructural, 4-probe DC, 4-probe ionic DC, AC-impedance and voltage–current–power analyses. It is found that a threshold ionic transport number is required for a decent electrochemical performance of the micro-tubular SOFCs.

Keywords: micro-tubular SOFC, sequential aqueous EPD, ionic/electronic conductivity, electrode microstructure.

ID-103

Production of CO and CO_2 Free Hydrogen and Carbon Nanotubes by Catalytic Dehydrogenation of Methane

J. Majewska, B. Michalkiewicz

The West Pomeranian University of Technology in Szczecin, ul. Pulaskiego 10, 70-322 Szczecin, Poland
Tel: +48 9144 94730 , E-mail: justyna.majewska@zut.edu.pl, beata.michalkiewicz@zut.edu.pl

Abstract
Methane decomposition to hydrogen and carbon nanotubes (CNT) was studied using 4, 8, 16 wt% Ni catalyst doped onto ZSM-5 support. Various ZSM-5 zeolites were used with SiO_2:Al_2O_3 ratios of: 50, 80, 200-400. The supported Ni catalysts were prepared using the impregnation method. The activity tests for the catalysts in the decomposition of methane were carried out at atmospheric pressure in a conventional gas-flow system at the temperature of 450 – 750 ^oC. The catalyst was activated by reduction of nickel oxide to metallic nickel. During the reaction the gases from the outlet of the reactor were sampled out and analyzed by GC. The hydrogen was the only product of the methane decomposition. The reaction, $CH_4 \rightarrow C+2H_2$, occurs selectively.

The quality of CNT was judged by intensity of D and G peaks from Raman spectroscopy. Regardless temperature, Ni concentration, SiO_2:Al_2O_3 ratio CNT quality was similar. The highest yield of the reaction was achieved around 650 – 700 ^oC. The hydrogen concentration in the effluent gas was 60 – 70 mol. %. In spite of the growth of the CNT during the reaction time the hydrogen concentration was constant and catalyst was still active during 5 hours.

Acknowledgements: The project was financed by the National Science Centre of Poland (NN507306240)

ID-104

Environmental Pollution & Management

F. Farzianpour[a], S. Hosseini[b]

[a] Dept. of Health Management and Economic, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran. Tel: +98 21 44648943 Email: farzianp@sina.tums.ac.ir

[b] Dept. of Electrical Power Engineering, Science & Research branch of Islamic Azad University, Tehran, Iran Tel: +98 21 44658703 Email:riercom@yahoo.com

Abstract

Environmental health is concerned with all the factors, circumstances, and conditions in the environment or surroundings of humans that can influence health and well being. A clearly defined aspect of the environment is the workplace, where many kind of exposures to hazards have been identified. Another is best described as the built environment, a term that encompasses domestic housing conditions and the environment in public spaces such as office buildings, hotels and other institutions, and enclosed sports arenas.

ID-106

Relaxation Times Constants in Amorphous and Crystallized Poly-L Lactic Acid PLLA Estimated by Simplex-CDTS Spectroscopy

H. B. Mehor[a], M. M. Soufi[b], M. Benzohra[b], J. M. Saiter[b]

[a] Laboratoire de Microphysique et de Nanophysique (LaMiN), ENP-Oran , B. P. 1523 EL M'Naouer, 31000 Oran, Algerie

[b] Laboratoire LECAP-AMME, EA 4528,. Université de Rouen, Faculté des Sciences, Avenue de l'Université BP 12, 76801 Saint Etienne du Rouvray, France

E-mail: benchhal@yahoo.fr

Abstract

The investigation on Poly-L Lactic Acid (PLLA) is attracting a great interest among the researchers because its bio-degradation and bio-compatibility. In this work, we propose to use the temporal technique analysis by a simplex optimization method of isothermal transient depolarization current measurements "Simplex-TSDC" to study the dielectric properties of PLLA, and more exactly, its characteristic relaxation times in the range of glass transition domain. The measurements have been performed at first on amorphous PLLA close to its glass transition temperature then on crystallized of 43% samples.

Keywords: Glass transition, Relaxation times, isothermal transient depolarization currents, Simplex-TSDC

ID-107

The potential of geothermal surface in region Noumerat (Ghardaia)

N. Chenini[a], S. Chabou[b]

Unit for Applied Renewable Energy URAER Centre for Renewable Energy Development, CDER, 47133, Ghardaia, Algeria

PO box: 88 Gart Taam Z.I Bounoura Ghardaïa, Algeria

E-mail: chenini_nadir@uraer.dz, salicha@yahoo.fr

Abstract

The existence of thermal waters in the town Ghardaïa, whose water temperature was held at 41.5 ° C to Zelfana and 40 ° C to Guerrara, has led us to make a geothermal study for determined the variation of the temperature in depth soil. In this study we are interested in the first few meters below the ground surface. We used data from soil temperature and data daily ambient temperatures measured during the year 2013 representative of the radiometric station which is installed in our research unit is located Noumerat (Ghardaia), whose latitude is 32.36 ° N, 3.80 E longitude and altitude of 450 m. An employee model is developed from the unsteady heat equation for a milieu homogeneous.

The objective of this work is the determination of variations along the year, the soil temperature at the shallow depths in the region Noumerat.

Keywords- Geothermal, temperature, Ghardaïa, radiometric station, shallow depths.

ID-108

Numerical Analysis of Turbulent flow of Nanofluids through a Cavity

C.Abdellahoum, A. Mataoui

University of Science and Technology Houari Boumediene, USTHB , Faculty of Physics,
Theoretical and Applied Fluid Mechanics Laboratory
E-mail: chahra-abd@hotmail.fr , mataoui_amina@yahoo.fr

Abstract

Separated and reattaching flow over a rectangular cavity of aspect ratio Ar between the width and height of 10 is investigated in this work. However, the elongated cavity believes as a backward forward facing step pair. Heat transfer in separated flows is frequently encountered in various engineering applications microelectronic circuit boards. Thus, it is very essential to understand the mechanisms of heat transfer in such regions in order to enhance heat transfer. Different volume fractions of nanoparticles of two types, such as: heat exchangers, axial and centrifugal compressor blades, gas turbines blades, and of nanoparticles are used. The governing equations were discretized by the finite volume method based one point closure of two equations turbulence model . Our objective is to understand the effect of nanofluid on heat transfer in such configuration. Numerical simulations are performed for pure water and two nanofluids (CuO and Al2O3). The results are analyzed through the thermal and dynamical fields with a special interest to the Nusselt number evolution . It was found an increase in average Nusselt number with the volume fraction of nanoparticles for the whole tested range of Reynolds number. A correlation of average Nusselt number versus Reynolds number and volume fraction of each type of nanoparticles over the cavity wall is proposed in this paper.

Key words

Nanofluids; Separated flows; Heat transfer; Cavity, Step , Nusselt number

ID-109

Optimization of Pilot Torrefaction Moving Bed Plant Operating Parameters

V.F. Kosov, I.S. Kuzmina, V.A. lavrenov, V.M. Zaychenko

Joint Institute for High Temperatures of the Russian Academy of Science, Izhorskaya st. 13 Bd.2, 125412 Moscow, Russia

E-mail: juli_kuzmina@mail.ru

Abstract

Torrefaction (low temperature pyrolysis) is a relatively new and promising way to upgrade thermotechnical characteristics of biomass solid fuel. This method is the thermal treatment of a pre-pelletizied material (heating up to the temperature near 300˚C) in oxygen-free environment. This process gives rise to formation of hydrophobic product, increment of density and combustion heat of produced fuel in comparison with initial raw materials. The main difficulties of torrefaction process are to create an oxygen-free environment in the reactor and emergency conditions with spontaneous self-heating of biomass (the temperature in the layer could rise up to 700-800 °C).

The report describes the process scheme of initial pellets torrefaction in oxygen-free environment. A pilot torrefaction moving bed plant with capacity of 50 kg/h of torrefied pellets was successfully tested. As heat transfer agent exhaust products of gas-piston engine was used. The calorific value of pellets increased 1.5 times as compared with the fe edstock, and the hygroscopy decreased by 20%, which greatly affects the cost of transportation and storage of the pellets. The proposed scheme is a cogeneration plant, to generate electricity and allows recycling the heat produced during this in order to enhance application properties of the solid fuel from biomass. Wood pellets torrefied at several temperatures and residence time. Data untreated granules were also prepared for comparison. The chief sample characteristics (ash content, elemental analysis, energy and mass yields, higher and lower heating values (HHV, LHV)) of torrefied pellets and untreated granules were investigated.

ID-110

Modelling and Analysis of the Power Supply System for the Generator of Hydrogen

K. Górecki[a], J. Zarębski[a], Paweł Górecki[a], Sławomir Halbryt[b]

[a] Gdynia Maritime University, Department of Marine Electronics, Morska 83, 81-225 Gdynia, Poland

[b] Sescom S.A., Grunwaldzka 82, 80-244 Gdańsk, Poland

E-mails: gorecki@am.gdynia.pl; zarebski@am.gdynia.pl; pawel.gorka@wp.pl; s.halbryt@sescom.pl

Abstract

Hydrogen belongs to more and more commonly used ecological sources of energy, and its great advantage is the fact that the only product of combustion is aqueous vapour. A popular method of producing hydrogen is hydrolysis, which demands the appropriate amount of electrical energy. In the classical case, one uses, accordingly, dc power supplies. However, a disadvantage of this solution is an increase, sometimes considerable, in the device temperatures as a result of exothermic character of the process of water electrolysis. The dissipation of this heat lowers the watt-hour efficiency of the process. This efficiency can be increased by optimizing parameters of the output signal of the power supply.

In the paper the manner of characterising properties of the generator of hydrogen and the form of the computer model of this generator are presented. The model was formulated in the form of an subcircuit for SPICE software. The structure of the model is worked out on the basis of the measured dc current-voltage and frequency characteristics of the considered generator of hydrogen. Diodes, resistors, inductors and capacitors appear in the worked out model and series resonance on the measured frequency characteristics is observed. The values of parameters of the model are estimated with the use of the original measuring-set and the author′s estimation procedure.

Using the worked out model, the computer simulations illustrating the influence of parameters of the control signal of this generator on the efficiency of hydrogen production at different values of volume and concentration of the electrolyte are performed. As a result of the carried out analyses, a proposal of the network solution of the power supply system is presented and the values of amplitude, frequency and the duty factor of the output current of the power supply are calculated. This ensures obtaining the desirable watt-hour efficiency in the production of hydrogen with the method of hydrolysis.

ID-111

Photo-electro-thermal Characteristics of Photovoltaic Panels

K. Górecki, E. Krac, J. Zarębski

Gdynia Maritime University, Department of Marine Electronics, Morska 83, 81-225 Gdynia, Poland
E-mails: gorecki@am.gdynia.pl; ewa.krac@gmail.com; zarebski@am.gdynia.pl

Abstract

Photovoltaic panels are important structural parts of solar power stations and autonomous photovoltaic systems. Characteristics of these devices depend both on power density and the spectrum of radiation on their surface, as well as on temperature and on resistance of the circuit being their load. For self-heating phenomena, appearing with the temperature rise of the panel as a result of the exchange of the dissipated electrical energy into heat, and the phenomena of absorption of infrared radiation causing also the temperature rise of this panel, one can speak about the interaction of electric, optical and thermal phenomena in the considered device, which decides about the course of characteristics of the considered panel in real terms of its operation. Therefore, the characteristics obtained under these conditions can be called photo-electro-thermal characteristics.

In order to obtain such characteristics the realization of measurement in the conditions which make possible the simultaneous control of optical, electric and thermal parameters of the examined panel or the realization of computer simulations with the use of the model taking into account all the mentioned phenomena, is indispensable. In the paper, the constructed by authors measuring set for measuring photo-electro-thermal characteristics of photovoltaic panels and the worked out by authors model of the photovoltaic panel for SPICE software are presented. The constructed measuring-set contains halogenous light sources of regulated illuminance and regulated on-time, a table of the regulated depression angle, a meter of illuminance to measure the distribution of power density of radiation on the surface of the examined panel, the set of thermoresistors to monitor temperature distribution on the surface of the panel and volt-meters and ammeters.

By means of the constructed set characteristics of the selected photovoltaic panels and single cells used to construct the considered panels are measured. The influence of mutual thermal coupling between the cells contained in the panel and protecting layers on the exploitive parameters of the considered panels are evaluated.

ID-112

Modelling PFC Circuits

K. Górecki, J. Zarębski

Gdynia Maritime University, Department of Marine Electronics, Morska 83, 81-225 Gdynia, Poland
E-mails: gorecki@am.gdynia.pl; zarebski@am.gdynia.pl

Abstract

An essential technical problem is the quality of electrical energy characterized by the coefficient of total harmonic distortions and the power factor. These parameters describe a degree of deformation of the signal in the electroenergy-net from the sinusoidal signal. The deformation of the network voltage can cause essential worsening of electrical properties of exploitive devices connected to this network, eg. electric machines. The problem of the quality of electrical energy becomes especially important in autonomous electric networks, in which a source of energy is photovoltaic installation or the wind turbine. Due to comparability of power dissipated by the power source and the greatest receivers of energy, it is important to increase the power factor of devices connected to this electric network.

Nowadays, many integrated circuits dedicated to the PFC (Power Factor Correction) circuit are accessible on the market. However, for the purpose of a computer analysis of the system belonging to the considered class of integrated circuits, the model of the PFC controller is indispensable. In the paper the form of the model of the selected monolithic PFC controller dedicated for SPICE software is proposed and the results of calculations and measurement illustrating the correctness of the worked out model are presented.

The structure of the worked out model has a form of the subcircuit for SPICE software, which contains the controlled voltage and current sources. The removals of the model are identical as the removals of the real integrated circuit. The description of the controlled sources contained in worked out model are presented in the full version of the paper. Tests of the correctness of the model were carried out in the typical application circuit of the considered PFC circuit, performing its transient analysis until the steady state is obtained. Simulations and experimental investigations were performed at the load of different character. In all the considered cases the good agreement between the results of calculations and measurements were obtained.

ID-113

Novel Designed Complementary Splitting Resonators CSRRs in the Microstrip line of Bande-Passe Filter Based on Substrate Integrated Waveguide

D. Mehdi[a, b]

[a]Laboratoire de Technologies de Communications TC, Faculté technologie, -Université Dr Moulay Tahar, – BP 138– Ennasr, Saida, Algérie

[b]Laboratoire de recherche Systèmes et Technologies de l'Information et de la communication STIC, Faculté de Technologie - Université de Tlemcen – BP 119 – Tlemcen, Algérie

E-mail: bouazzamehdi@yahoo.fr

Abstract

In this paper, A novel band-pass Substrate Integrated Waveguide (SIW) filter based on complementary Split ring Resonators (CSRRs) is presented in this work. In the cell, the (CSRRs) is etched on the top plane of the SIW with high accuracy, so that the performance of the filter can be kept as good as possible. Finally, the filter, consisting of three cascaded cells, is designed meet compact size, Three different CSRRs cells are etched in the top plane of the SIW for transmission zero control. A demonstration band-pass filter is designed, This structure is designed with Numerical Method (MoM) using CST on a single substrate of RT/Duroid 5880. Simulated results are presented and discussed..

Keywords: SIW, Filter, CSRRs

ID-114

Prediction of Turbulent Separated Flow in a Wind Tunel

K. Boukhadia, N. Benziane

Faculty and Department of Mechanical Engineering, University of Sciences and Technology Mohamed Boudiaf
U.S.T.Oran Algeria
Email : boukhadiakarima@yahoo.fr, management2009@hotmail.fr

Abstract

At the outing of heat engines, recuperation of lost kinetic energy on form of heat is done by a type of divergent conduit called diffuser. Diffusers are integral parts in fuel injection engines. Simulation of flow in diffusers is a task particularly of defies for CFD due to unfavourable pressure gradient created by the deceleration of flow, which frequently results the separations.

Identification of flow separation in diffusers is significant since separation increases the trail and causes the deformation of ventilators and compressors of engines. In this study, subsonic flow in an asymmetrical diffuser was simulated numerically using code CFX 11.0, Two models of turbulence were tested: K- ε and K- ω SST.

The key challenge in designing diffuser is to make it as short as possible while avoiding any possibility of massive flow separation. Energy losses due to the separated flow reduce engine performance while unsteadiness and recirculating flow associated with separation can cause catastrophic engine failure. An optimal design probably operates very near separation for some part of the engine's operating envelope.

The results obtained showed that the K- ε model singularly over-estimates the speed value close to the wall and that the K- ω SST model is qualitatively in good agreement with the experimental results. Separation, reattachment of fluid on the tilted wall and the length of separation zone strongly depend on the angle of inclination of the lower wall of diffuser.

These separations depend strongly on the level of turbulence, the viscous effects, and on the pressure ratio, which are functions of the speed gradient and physical geometry.

Keywords: Asymmetric diffuser, Separation, Reattachment, Tilt angle, Separation zone.

ID-115

Numerical Study of the Interaction of an Inclined Plane Turbulent Jet with a Moving Horizontal Isothermal Hot Wall

D. Benmouhoub, A. Mataoui

Theoretical and applied laboratory of fluid mechanics, University of science and Technology Houari Boumedienne-USTHB B. P. 32, Bab Ezzouar, 16111 Al Alia, Algiers, Algeria.

E-mail: benmouhoub_d@yahoo.com ; mataoui_amina@yahoo.fr

Abstract

The present work is devoted to the numerical study of the interaction of an inclined plane turbulent jet with a moving horizontal isothermal hot wall. The inclination of the jet allows the control of the stagnation point location. The numerical predictions based on statistical modeling are achieved using second order Reynolds stress turbulence model coupled to the enhanced wall treatment. For a given impinging distance H (H =8e), the problem parameters are: (a) jet exit Reynolds number (Re, based on the thickness of the nozzle: e) ranged from 10000 to 25000, (b) surface-to-jet velocity ratio Rsj from left to right; range of 0 to 1.75 and (c) optimal inclination angle of the jet between 0° to 25°. The calculations are in good agreement with the available data. The numerical results show that the heat transfer is greatly influenced by the velocities of the jet and the moving wall. The local Nusselt number decreases with increasing surface-to-jet velocity ratios (until Rsj=1). However, the optimal inclination of the jet enhances heat transfer and modifies the stagnation point location. The distribution of average Nusselt number is correlated according with some problem parameters.

Keywords: Impinging jet, inclined slot jet, fluid phenomena, heat transfer, Nusselt number, correlation.

ID-116

Study of Ni-M/MgO and Ni-M-Mg/Al (M=Fe or Cu) Catalysts in the CH_4-CO_2 and CH_4-H_2O Reforming

A. Djaidja[a,b], H. Messaoudi[a] , D. Kaddeche[a] , A. Barama[a]

[a]*Laboratoire des Matériaux Catalytiques et Catalyse en Chimie Organique, Faculté de Chimie, USTHB BP.32.El Alia Alger 16111 Bab-Ezzouar, Alger, Algérie.*

[b]*Laboratoire des Procédés pour Matériaux, Energie, Eau et Environnement, Faculté des Sciences et des Sciences Appliquées, Université de Bouira, Algérie.*

Tel: +213774790083, E-mail: a_djaidja@yahoo.fr

Abstract

The catalysts Ni-M/MgO prepared by impregnation of the MgO support and Ni-M-Mg/Al by co-precipitation method using NH_4OH as precipitating agent (M=Cu or Fe), were characterized by BET surface area, XRD, TEM-EDX, temperature programmed reduction (TPR), temperature programmed oxidation (TPO) and tested in CH_4/CO_2 and CH_4/H_2O reactions. XRD analysis showed the presence of $Ni_xMg_{1-x}O$ (x=0,05 or 0,1), $NiAl_2O_4$ and/or $MgAl_2O_4$ solid solutions. NiO was not observed on all catalysts what could confirm the formation of solid solutions. The reducibility of the catalysts increased in the presence of Cu or Fe due to the reduction assistance of these elements. The reactivity results showed very high performances (with CH_4 conversion and yields of H_2 and CO up to 90%) and a good resistance for coke formation. For the CO_2 reforming of methane, the TPO profiles and TEM-EDX analysis showed mainly four types of coke: CH_x species, surfaces carbon, nickel carbide and carbon nanotubes. However, for the H_2O reforming, the nanotubes carbon was not detected. The coke deposit decreased in the presence of Fe or Cu species due probably to the formation of Ni-Fe or Ni-Cu alloys where in the active phase is highly dispersed. In this work, we concluded also that the presence of Mg, basic element, decreased coke formation when it included in solid solution.

Keywords Ni catalysts, spinal, CO_2 reforming, H_2O reforming

ID-117

Crude Palm Oil: A Renewable Energy Base for Bio-Fuel Production in Ghanaian Rural Communities

Y. Asiedu[a], L. Morales[b]

[a] CPPG LIMITED, P. O. BOX, 9073. KIA, ACCRA, Ghana

[b] Dublin Institute of Technology. College of Bunissess. Department of Accounting and Finance. Room 3023. Aungier Street. Dublin 2. Republic of Ireland.

E-mail: yvonne.asiedu@yahoo.com, lucia.morales@dit.ie

Abstract

Ghana's energy needs and ways of meeting its net demand to support industrialization, and commerce related activities that foster growth are studied in this paper. This research looks into the prospects of waste from CPO (Crude Palm Oil), as the alternative energy (bio-fuel) source that can power rural development in the country in a sustainable manner, and how the agricultural sector and in particular rural communities can play a central role in the development of sustainable energies. It was found that Ghana's current energy needs are not met, as supply of electricity falls short on an increasing demand. In addition, the distribution system does not reach all dwellings in Ghana, especially in the remote rural areas, where economic development is needed the most. The research highlights that a renewable energy source generated from the processing of CPO would be of prime importance to the nation with a minimal impact on the environment. It was also observed that improvements in the rural infrastructure and other social amenities geared towards oil palm plantation result in migration trends, as peasant farmers are confronted with the trouble of enduring with their traditional crops and upholding their self-sufficiency.

Keywords: Palm Oil, Ghana, Economic Development.

ID-118

Policy constraints to implementing greenhouse gas mitigation scenarios in the Republic of Korea cement sector

Y. S. Hwang[a], N. Y. Kim[b], Y. H. Ahn[c]

[a] Kyung Hee University, #613 Faculties of Politics and Economics, Kyung Hee University, 26 Kyunghee-Daero Dongdaemoon-Gu, Seoul, Korea, 130-701 Phone: +82-2-961-0455, E-mail: rusiahys@khu.ac.kr

[b] Greenhouse Gas Inventory & Research Center of Korea, Gwanghwamun officia, Sinmunno1-ga, Jongno-gu, Seoul, South Korea, 110-999, Phone: +82-2-6943-1315, E -mail: nyeahkim@korea.kr

[c] International Institute for Applied Systems (IIASA), Schlossplatz 1, A-2361 Laxenburg, Austria Phonr: +43-2236 -807-381, E -mail: ahn@iiasa.ac.at

Abstract

To reduce greenhouse gas emissions, in 2008, Korea proclaimed a national plan of ‘low carbon green growth’ and established a medium- to long-term greenhouse gas reduction plan to reduce emissions by 30% compared to business-as-usual until 2020. In 2011, a detailed sector-specific greenhouse gas reduction goal was established to support the national and governmental plan. Using a sectorial approach, we analyze the Korean cement industry. The cement industry, together with the steel and petro-chemical industries, is one of the most fundamental industries forming the basis of the country’s development, but these are also very energy intensive sectors. In this paper, we adopt a Long-range Energy Alternative Planning (LEAP) model for the analysis of long-term scenarios for Greenhouse Gas (GHG) emissions reduction in the cement sector. The results of the analysis of the cement industry’s GHG emissions based on the year 2050 shows that the scenario that increases the use of slag cement achieves the greatest GHG reduction, but also incurs the highest cost of reduction. In contrast, the fuel substitution scenario was shown to achieve the least reduction as of 2050, yet was the most cost effective method.

ID-119

The Effect of FDI on CO2 Emissions

Y. S. Hwang, X. Dong

Kyung Hee University, #613 Faculties of Politics and Economics, Kyung Hee University, 26 Kyunghee-Daero Dongdaemoon-Gu, Seoul, Korea, 130-701 Phone: +82-2-961-0455,
E-mail: rusiahys@khu.ac.kr , E-mail: superxu88@163.com

Abstract

The increasing threat of a warming climate has been a major global concern over the last two decades. The predominant cause for the increase of average global temperatures since the mid-20th century is an increase in anthropogenic greenhouse gas concentrations emitted by human economic activity. In 2012, carbon dioxide (CO2) from developing countries represented nearly 60 percent, double the amount recorded in 1990. Researchers have identified that population, economic growth, income level and trade are important influence factors of CO2 emissions. In recent years, there has been growing interest in analyzing the relationship between FDI and CO2 emissions. However, research focusing on the different effects of FDI inflows/outflows on CO2 emissions between high-income countries and low-income countries using last panel data is scarce. This paper explored how economic growth, trade, population, especially FDI flows affect the CO2 emissions between different development levels countries. The empirical analysis used data from 56 high income countries and 129 low income countries during the period from 2005 to 2010 collected by World Development Indicators. The empirical results proved the basic EKC hypothesis and PHH hypothesis which means that there exists an inverted U-shaped relationship between economic growth and CO2 emissions and furthermore that developing countries have a comparative advantage in “dirty” good production. Inflows FDI only in developing counties significantly increase CO2 emissions, not in developed countries. The reduction of the level of CO2 cannot be done by one nation; developed countries should transfer lower CO2 emission technologies to developing countries.

ID-120

Effect of Geometric and Thermo-Physical Properties of the Main Elements of Solar Collector on the Performance of a Solar Water Heater System

Mustapha Koussa, Djohra Saheb – Koussa

Centre de Développement des Energies Renouvelables
Algeria. E-mail: manisyaya@gmail.com

Abstract

This work consist first to highlight the domestic water heating transient behavior . The second is to bring out the effect of geometric and thermo-physical characteristics of the main components on the performances of the solar system. Thus, modeling the system chosen is based on the overall energy balance method for each component of the solar water heater while having taken the initial conditions related to the collector. The resolution of the equation system was done under MATLAB environment and the effect of the geometry and thermo-physical characteristics of some material on the solar water heating system performances has been brought to light.

ID-121

Removal of Chromium from Tannery Wastewater by Electrosorption on Coal Prepared From Peach Stones

Khemmari F.[b], Ziati M.[a,b], Hazourli S.[a]

[a] Laboratory of Water Treatment and Valorization of Industrial Waste,Faculty of Sciences, Chemistry Department, Badji-Mokhtar Annaba University, Algeria

[b] Laboratory of Chemistry and Environment, Faculty of Sciences, Chemistry Department, M'hamed Bougar, Boumerdes University, Algeria

Abstract

The objective of this study is the removal of chromium from tannery wastewater by electrosorption on carbon prepared from a lignocellulosic residue natural "peach stones" thermically treated. The steps for obtaining the coal were: cleaning, drying, crushing and carbonization at 800 ° C. The characterization of the obtained carbon showed properties comparable to those industrially prepared carbon. The dynamic study by adsorption of chromium on the obtained material, gave a low removal rate (33.7%) in the absence of applied potential. The application of negative potential (-0.7 V and -1.4), increases the adsorption of chromium to 96 to 90% respectively. On the other hand, a positive voltage (+1.4 V) allows the desorption of the contaminant at a level of 138%.

Keywords: Peach stones, Coal, Thermal treatment, electrosorption, Chrome, Tannery.

ID-122

Efficiency Improvement of Steam Power Plants in Kuwait

H. Hussain, M. Sebzali, B. Ameer

Energy and Building Research Center, Kuwait Institute for Scientific Research, P.O.Box: 24885 Safat, 13109 Kuwait, Email: hhusain@kisr.edu.kw, Tel. +965 24989235, Email: msebzali@kisr.edu.kw, Tel. +965 24989983, Email: bameer@kisr.edu.kw, Tel. +965 24989101

Abstract

The main objective of this paper is to study and analyze the steam Rankine cycle for Kuwaiti power plants operate to come up with ways and means to enhance its efficiency, hence, it would result in savings in fuel consumption as well as reducing harmful emissions. To achieve this objective, the Rankine cycle was modeled and simulated. Estimation of water and steam properties were also carried out. The equation-oriented approach is utilized for the process modeling with subroutines for each unit operation solved sequentially. Results showed that the steam inlet temperature had more significant effect on the turbine work production and the thermal efficiency than the inlet pressure, where increasing the steam inlet temperature would increase both thermal efficiency and work production. The peak efficiency also occurred at reheat to inlet pressure ratios between 10% and 20%, and thermal efficiency increased from 42.7% to about 44% when optimal feed-water heater pressures were used.

Keywords: Regenerative Rankine cycle; Thermal efficiency; Pressure ratio; feed-water heater; Kuwait

ID-123

Effect of CdSe (QDs) in the Photocatalytic Activity of TiO_2 Nanotube Arrays

J. B. Naceur, S. B. Taieb, F. Eljoudi, Y. Liteyem, I. B. Assaker, R. Chtourou

Laboratoire Photovoltaïque, Centre de Recherches et des Technologies de l'Energie Technopole borj cedria, Bp 95, hammamm lif 2050, Tunisie

E-mail address: jamila_bennaceur@yahoo.fr

Abstract

Titanium dioxide (TiO_2) is one of the most important wide gap semiconductors and is widely investigated for use in photocatalysis, heterojunction solar cells, environmental purification and gas sensing [1-3],due to its potential advantage of bountifulness and low coast, non toxicity, excellent functionality and long-term stability [4]. The performance of material is significantly determined by geometry, shape, and morphology of nanostructures [5]. Recently, many studies indicate that highly-ordered, TiO_2 nanotube arrays fabricated by potentiostatic anodization produce a significant improve in sensing, compared with TiO_2 nanoparticle films. The disadvantages of titanium oxide that its wide band gap (3.2 eV). This limits its photocatalytic property in the UV region. Therefore, extending the activity of the metal oxide into the visible range has been one of the major challenges of research in this field. Various methods of extending the absorption ability of TiO_2 have been developed via doping it with impurities, such as C, N, and S and preparing composite materials with organic dyes or quantum dots (QDs) [6].

In this work, highly ordered TiO_2 nanotube arrays were fabricated on titanium substrate via electrochemical anodization method. CdSe nanoparticles were deposited on the TiO_2 nanotube arrays through the electrodeposition process. The detailed synthesis process and the surface morphology, phase structure and the photocatalytic activity under visible light irradiation of the resulting films with the CdSe /TiO_2 nanotube-array structure are discussed.

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ID-124

Index Decomposition Analyses – Artificial Neural Network – Data Envelopment Analyses Energy model: Approaches and Application

O. A. Olanrewaju[a], A. A. Jimoh[b]

[a] Centre for Energy and Electric Power (CEEP), Tshwane University of Technology, Pretoria, South Africa
Telephone Number: +27 79 089 4923, Email:dlp4all@yahoo.co.uk
[b] Electrical Engineering Department, Tshwane University of Technology, Pretoria, South Africa
Telephone Number+27 82 787 0251, Email: JimohAA@tut.ac.za

Abstract
Energy models are significant. On one hand, they force quantification of the variables at play in the energy phenomenon and dynamics. On the other, they allow for the use of mathematical methods to better understand the inter-play between the state variables and the behavior of the phenomenon. It is a commonplace that integrated models work better in various analyses to force the quantification of intended variables in energy phenomenon and dynamics. Where energy saving and greenhouse gas mitigations are concerned, proven models give avenue for such opportunities. Among the proven models is the integrated IDA-ANN-DEA energy model. This study focuses on a recently developed integrated energy model combining the functions of index decomposition analyses (IDA), artificial neural network (ANN) and data envelopment analyses (DEA) to assist in the quantification of possible energy potentials in the industrial sector.
This study reviews the functions of each of the models that formed the integrated model, their gaps and the significance of the integration. The developed integrated model was successfully designed to offset the disadvantages of other models to easily identify energy potentials. The integrated model serves as a tool to the alertness on how to monitor, control and manage energy consumption and mitigate greenhouse gases. Numerical examples and application studies using energy consumption data of Canada and South Africa are presented.

Keywords: Integrated Model; Energy Saving; Greenhouse Mitigation

ID- 125

Solid State Synthesis of Nano-Sized AlH_3 and Its de-Hydriding Behaviour

H. Lianxi, D. Congwen, X. Dan

Campus Box 435#, School of Materials Science and Engineering, Harbin Institute of Technology, Harbin 150001, China, Phone: +86-451-86418613. E-mail: hulx@hit.edu.cn

Abstract

Aluminum hydride (AlH_3) has a high gravimetric and volumetric hydrogen capacity (10.1wt.% and 149kg/m^3, respectively) and has attracted considerable attention due to its great potential for hydrogen storage application. The conventional synthesis route of AlH_3 proposed by Brower et al [1] is through the chemical reaction of $LiAlH_4$ with $AlCl_3$ in diethyl ether. This yields dissolved AlH_3 etherate, and AlH_3 can be then separated from the ether. However, for a cyclic process, lithium metal must be recovered from LiCl by the energy-consuming electrolysis of a LiCl-KCl melt at 600℃, and the cost for the regeneration of the reactant $LiAlH_4$ is very high, which makes such a synthesis route economically impractical for the production of AlH_3.

In the present paper, solid state reactive ball milling was proposed to synthesize $AlH_3/MgCl_2$ composite, from which AlH_3 can be expected to be separated by the use of etherate. This new process is supposed to be much more efficient and cost-effective than the conventional route proposed by Brower et al. Using commercial $AlCl_3$ and nanocrystalline MgH_2 prepared by reactive milling of Mg in hydrogen, $AlH_3/MgCl_2$ nonocomposite was successfully synthesized by the solid state reactive milling at room temperature. The effect of milling parameters on the reaction progress was investigated. The as-milled samples were characterized by XRD, SEM and TEM, respectively. It was found that the reaction progress was mainly dependant on the milling intensity, with the reaction rate being promoted by increasing the ball to powder ratio. The average crystallite size of the as-synthesized AlH_3 phase in the nanocomposite was estimated to be about 5nm and the threshold temperature for de-hydriding was found to be around 150℃, respectively. At 220℃, the AlH_3 phase in the as-synthesized nanocomposite presented reasonable de-hydriding kinetics, with the hydrogen desorption achieving about 86% of the theoretical hydrogen capacity of AlH_3 within 16800s.

Keywords: aluminium hydride, solid state synthesis, nanocomposite, hydrogen storage

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ID-126

Oxy-Combustion Modeling Of A Mixture Of Carbon Monoxide And Water Vapor In The Stagnation Region Of A Laminar Axisymmetric Jet

Abderrahim Hammoud, Amina Mataoui, Hakan F. Oztop
University of Science and Technology Houari Boumediene, Algeria

Abstract
In this study a mathematical modeling of laminar premixed flame jet in a stagnation region has been developed by numerical solution of the boundary layer equations. The general mathematical description consists of a coupled set of differential equations based on conservation principles. In order to arrive at a mathematically solvable problem, similarity transformations are introduced to convert the original partial differential equations (PDE) set into simplified ordinary differential equations (ODE) set. The chemical kinetic mechanism of the fuel combustion, which is the mixture of carbon monoxide, oxygen and water vapor, is modeled by 30 elementary independent reactions which incorporate (09) nine chemical species. The governing system of equations is solved by the finite difference method. This study lets us conclude that, the preheat inlet temperature affects the ignition point; the mixture ignites earlier at high inlet temperature. The strain rate has a crucial importance in the ignition of the flame; also it was observed that the presence of OH radicals plays an important role in carbon monoxide combustion.

ID-127

Statistical Analyses of Wind and Solar Energy Resources for the Development of hybrid Microgrid

S. M. Abdelkader , A. Abdulkarim, D. J. Morrow

Energy, Power and Intelligent Control, School of Electronics, Electrical Engineering and Computer Science, Queen's University Belfast, United kingdom.

s.abdelkader@qub.ac.uk, aabdulkarim02@qub.ac.uk, dj.morrow@ee.qub.ac.uk

Abstract

In this paper, a procedure for the statistical analyses of wind and solar energy resources were investigated in order to determine the accurate frequency distribution for the development of hybrid microgrid. The frequency distributions of wind speed data are investigated using Weibull, Rayleigh and Gamma distribution functions. On the other hand the frequency distributions used for the analysis of solar radiation data include Weibull, Logistics, lognormal, Beta and Gamma functions. The performance of the probability distributions used in the wind speed analyses are based on the error evaluations between the predicted and the theoretical wind power densities of the site. Similarly, the performance of the probability distribution functions used in the solar radiation data were judged based on Kolmogorov-Smirnov, Anderson-Darling and Chi-Square tests. The GOF results of the wind speed analysis show that Weibull distribution performed better compared to Rayleigh and Gamma distributions. On the other hand Beta distribution fitted the solar radiation data better than all other distributions models. The results of the analysis have confirmed that all the sites are suitable for the development of hybrid renewable energy system consisting of wind and solar energy sources. The results of these analyses could be used as an input of an algorithm for the reliability analyses and optimum design of both grid connected and standalone hybrid renewable energy systems in the study area.

Keywords: Wind speed, solar radiation, probability density function, hybrid renewable energy system, statistical analyses.

ID-128

How To Refurbish '80s *Brutalist Architecture*, Turning It Into Nzeb: The Case Study Of The High School "Enrico Fermi" In Muro Lucano (Potenza, Italy)

F.P.R. Marino, F. Lembo

School of Engineering, University of Basilicata, Viale dell'Ateneo Lucano n.10, 85100 Potenza (Italy). Tel. +39971205176 - email: francesco.marino@unibas.it , Tel. +39971205177 - email: filiberto.lembo@unibas.it

Abstract

The *brutalist architecture* of the '70s and '80s has the responsibility to have promoted the creation of buildings that, to better adhere to the poetics of exposed concrete, have often overlooked any principle of environment-Friendly quality.

Many buildings, as this case study, a school built after the 1980's earthquake in Basilicata, as USAID gift, in Paul Rudolph's style, have the exterior walls made in exposed concrete, without any type of insulation and lacking of flashings, but of downpipe too, so as to resemble, now, a picturesque ruin; have roofing systems wrongly designed; windows partly insufficiently sized to ensure natural lighting, but partly without any protection against dazzling; internal walls not performing acoustic performances fixed by Standards, and all grater spaces (atrium and corridors, auditorium, sports hall) with reverberation time many times the standard value.

The building envelope disperses 50 kWh/m^3 year, so to be placed in the worst performance classes of actual Italian thermal rules. Becoming the conditions of use and management increasingly heavy and almost unbearable, this study detected the strategies and solutions by means of which to resolve the design faults, transforming the building in a NZEB eco-Friend, which produces from renewable sources the energy required for its necessities, recovering its original appearance and formal configuration.

Keywords: sustainability in refurbishment, NZEB & *brutalist architecture*

ID-129

The Environment-Friendly Architecture Come Trough Wooden Architecture

F. Lembo, F.P.R. Marino

School of Engineering, University of Basilicata, Viale dell'Ateneo Lucano n.10, 85100 Potenza (Italy). Tel. +39971205177 - email: filiberto.lembo@unibas.it, Tel. +39971205176 - email: francesco.marino@unibas.it

Abstract

If you have a building well designed, with bioclimatic approach, NZEB, and you want to change step-by-step building design in way to achieve higher scores in an environmental appraisal system, qualitative type as BREEM or Italian ITACA, or quantitative type, as those based on LCA Method and with use of software Ga.Bi. or SimaPro, you invent that you can't go further 4,3 on 5 or so on, also if the building is comfortable, good enlighten by the sun and built with reused and recyclable materials; and primary energy balance is ever negative. And that, also if the functional phase is about 87% of GWP, 94% of ODP and 71% of EP. The only way to achieve a full score, 5 on 5, that is a positive primary energy balance and at least of some of other analysis factors, is to build with materials from renovable sources, which is in wood. In Basilicata, local woods are hardwoods: there are some 4 million cubic meters of *Quercus* Cerris timber tree, and they grow at the rate of 240.000 cubic meters per year. With appropriate hygro-thermal conditioning, according to a protocol drawn by Authors in the La.Te.C. Laboratory of Potenza University, this hardwood allows to realize glued laminated timber beams which can work with bending tension of 40,9 N/mm^2, much more than normal elements in resinous glued laminated timber. This new material can be combined with new structural earthquake-resistant moment resistant timber frame with post tensioning and energy dissipating system, developed by Prof. F.C. Ponzo and other Researchers in SisLab Laboratory of Engineering School of Basilicata University and by Department of Civil and Natural Resources Engineering of University of Cambridge, Christchurch, New Zealand, and in this way is possible to realize high rise framed buildings, which can resist to more violent earthquakes, with a positive ecologic balance.

Keywords: sustainability, wooden structures, Quercus Cerris, hardwood glued laminated timber.

ID-130

MLP/Levenberg-Marquardt for prediction solar radiation Case study Bejaia city.

Z.Asradj, R.Alkama

Genie Electrique laboratory, University of Bejaia
zahirasradj@yahoo.fr, rezak_alkama@yahoo.fr

Abstract:
In order to model the global solar radiation based on meteorological parameters for the Bejaia site, we established a database of more than 26,000 points obtained by recording every eight minutes of illumination and meteorological parameters (sunshine hours, ambient temperature, air pressure, relative humidity and rainfall). empirical models have been developed using several parameters and, recently, prognostic and prediction models based on artificial intelligence techniques such as neural networks.
The daily averages were used to test NN models with 5 parameters and the relationship with the coefficient of the highest correlation was chosen. Two thirds were used to establish the model and one third for validation. We compared its performance with four models in the literature (Angstrom-Prescott, Bahel, Newland and Abdalla).
After confronting the measured values and those estimated by the models in the literature and the proposed, we noted that this last, driven to better results (R= 0. 8952, RMSE =0.0150 MJ/m²/j). This is explained by the fact, that this model considers five meteorological parameters (sunshine hours, ambient temperature, air pressure, relative humidity and rainfall).
Solar radiation can be adequately estimated by linear models and neural networks, from values of meteorological variables of routine use; even NN produced better estimates.
Neural networks are an efficient methodology to estimate daily solar radiation, using a reduced number of meteorological parameters; they allowed, principally, reproduce the solar radiation evolution patterns for BEJAI city (Algeria).

ID-131

Structural Study and Electrochemical Evaluation of Thin-Film Cathodes for Modeling Li-Ion Batteries

Z. P. Li [a], H. Tan[a], K. Bharathi[a], S. Takeuchi[a], I. Takeuchi[b], L. A. Bendersky[a]

[a] Material Measurement Laboratory, National Institute of Standard & Technologies, 100 Bureau Drive, Gaithersburg-20899, MD, USA (301-975-6167, leoben@nist.gov)

[b] Department of Materials Science & Engineering, University of Maryland, College Park-20742, MD, USA (301-405-6809, takeuchi@umd.edu)

Abstract

Thin film based solid state Li^+-ion batteries hold technological promises for applications such as microelectromechanical systems (MEMS), smart cards, microsensors, and biochips. Thin film electrodes, especially those grown as oriented single crystals, can be utilized as model systems to study in details electrochemical processes on an atomic scale. In this work we investigated structures of different insertion cathode films deposited by pulse laser deposition (PLD) on different orientation Nb:$SrTiO_3$ substrates from $LiMO_2$ (M=Co, Ni, Mn) targets. Structural similarities of Li-M-O phases and textured growth of the films make analytical TEM/STEM the techniques of choice, thus the films were characterized by electron diffraction, electron energy loss spectroscopy, and high-resolution imaging. The studied films include single composition films and films with varying composition of transition metals. HRTEM and HAADF imaging demonstrated the presence of structural variations within the films related to the different distribution of Li and M atoms in the framework of a oxygen sublattice. The films grow as epitaxially oriented facetted islands, coalescence of which results in the formation of vertically aligned domain interfaces and faceted surfaces. Electrochemical properties of the films and its relation to the structure and orientation were successfully measured. Effect of a film/substrate interface on electrical transport and performance of the battery will be discussed.

ID-132

New Insights From *In Situ* Electron Microscopy into Capacity Loss Mechanisms in Li-Ion Batteries with Al Anodes

M. S. Leite[b], D. Ruzmetov[a], Z. Li[b], L. Bendersky[b], A. A. Talin[b]

[a] Center for Nanoscale Science and Technology, NIST, Gaithersburg, USA (301-975-5265, rdmitry@nist.gov)

[b] Department of Materials Science and Engineering, Institute for Research in Electronics & Applied Physics, University of Maryland, College Park, MD, USA (301-405-023, mleite@umd.edu)

[c] Material Measurement Laboratory, NIST, Gaithersburg, USA (301-975-6176, leoben@nist.gov)

Abstract

Thin-film Li-ion battery (TFLIB) anodes that alloy with Li, including Si, Ge, Sn, and Al have high specific capacities. However, the large volume expansion/contraction that accompanies charging/discharging processes lead to prominent mechanical stresses and failure of the anodes. Here, we combine real-time scanning electron microscopy with electrochemical cycling to quantify the dynamic degradation of the Al anode upon charging/discharging of a TFLIB with a LiPON electrolyte and a $LiCoO_2$ cathode. The approach allows to control the lithiation rate, record the voltage, and to correlate these parameters with changes in the electrode morphology. Surprisingly, we find that significant changes in the Al film morphology occur at very low lithiation level, at $\approx$ 1.0 % Li in Al. A capacity of 20 μAh/cm^2 is reached on the first charge cycle, which is equivalent to 94% of theoretical cathode capacity and 20% of anode capacity. With increasing number of cycles the smooth surface of the Al anode film is significantly roughened and covered with AlLi phase mounds. The origin of the discharge capacity fade is directly related to the Li being trapped in the mounds, which is due to the blockage of Li and Al diffusion pathways necessary for the decomposition of LiAl at room temperature. This process is a direct consequence of the extremely low diffusivity of Li within Al, which will be discussed in details.

ID-133

Assessment Auto Emissions for Sustainable Traffic

A. Leila, B. Noureddine,

University of Batna-Institute of health and industrial safety, email: bourmadan@yahoo.fr, email: laouragh@yahoo.fr

Abstract

In order to improve the environmental aspects of a city, whose acceleration of the urbanizzation followed by a very rapid increase in the number of vehicles in the urban areas, many environmental concerns order and growing iquietudes about the effects at local and regional scale, created a social economic impacts recorded. These different dimensions make all partners consider reducing these problems permently. This work will present the state of art dimension related to vehicle rejection at the city of Batna, using one of the software (Fluent) known in the field of dispersion on the monitoring of various pollutants.

Keywords: Pollutants, environmental aspects sustainable development, transport, environmental impacts, fluent model.

ID-134

Water Pollution Treatment in the Dianchi Lake of Kunming

Z. Li, Y. Han

Kunming University of Science and Technology, Kunming 650093, China,
Tel: 086-13577178717, zhekunlikust@sina.com, Tel: 086-65916860, hyuehong@163.com

Abstract
The Dianchi Lake is the largest lake of Yunnan Province. It is the sixth largest freshwater lake in China. The small amount of water exchange, historically repeated drainage or land reclamation, agricultural and domestic sewage, caused the Lake seriously polluted. Monitoring data shows that the water quality began to deteriorate continuously and was over Class V. Past 10 years, the Lake Treatment became a government landmark project. In the end of 2010 the deterioration was basically limited and the National specialists assessed that the treatment had initial success and a new water pollution control had been explored.
The basic experience are: improving the quality is the main objective, around the three major tasks, “completely interception, water displacement, ecological construction”, unswervingly implement “the six projects”: the lake interception, control agriculture and rural pollution sources, ecological restoration and construction, repair the rivers, ecologically dredge, water diversion from outside the basin and water conservation.
The specific experiences are: (1) Integrated management: developed a comprehensive management from the source and around the lake area. (2) Set up a law: promulgated and implemented the “Regulations on the Kunming River Management”, “Regulations on the Protection of Groundwater in Kunming”, etc. (3) Scientific treatment: combined the treatment and the ecological management with the government efforts and the market mechanisms together, implement that all industrial, sewage and agricultural pollution sources will be entirely collected and dealt. (4) Democratic supervision: the “people river leader” will monitor the “executive government river leader”, the people will monitor governance.

Keywords: Water Pollution, Dianchi Lake, Treatment

ID-135

Investigation of Two-Component Hydrocarbon Mixture Filtration in Porous Media

I.L. Maikov, D.A. Molchanov, V.M. Torchinsky

Joint Institute for High Temperatures of Russian Academy of Sciences (JIHT RAS), Izhorskay street 13-2, Moscow Russia, +7 (495) 485-79-81, dmitriy.molchanov13@gmail.com

Abstract

Natural-gas condensate is valuable raw for chemical and oil industries. In the process of gas-condensate reservoir exploitation one has to deal with product which changes its composition all the time. This is due to retrograde condensation phenomenon of reservoir hydrocarbon mixture during reservoir pressure decrease. With appearance of such condensate within reservoir porous space fluid flowrate decrease and even ultimate extinction of filtration process takes place.

A mathematical model is developed, which describes one-dimension filtration of two-component hydrocarbon mixture in porous media. Methane – n-butane mixture appears as model mixture for being close approximation of real gas-condensate reservoir hydrocarbon mixture. Structurally, the model consists of two parts, namely, the hydrodynamic part, which describes the process of two-phase filtration in a porous medium in the Darcy law approximation, and the thermodynamic part, within which the equations of state for mixture are used to calculate the compressibility coefficients of the mixture and the parameters of phase equilibrium of the system in the vapor and liquid phases.

The results of mathematical modeling are in good agreement with experimental research of filtration processes of methane –n-butane binary hydrocarbon mixture. Possibility of gas-condensate plug (each of dynamic and static) formation is shown. Wave impact on an active reservoir could be one way to production rate increase.

ID-136

Electrospinning and its application to Energy Device

Jun Seo Park[a] and Ok Hee Chung[b]

[a]Department of Chemical Engineering, Hankyong National University, Anseong, Korea
[b]Department of Physics, Sunchon National University, Sunchon, Korea

Abstract
Electrospinning is a unique and useful approach using electrostatic forces to produce fine fibers from polymer solutions or melts and the fibers thus produced have a thinner diameter (from nanometer to micrometer) and a larger surface area than those obtained from conventional spinning processes.
We introduce an anode material in LIBs, silicon nanoparticle and carbon nanotube loaded carbon nanofibers (SCNFs), fabricated by electrospinning. The one dimension structure of electrospun nanofibers provides porosity for the material. Carbon nanotubes (CNTs) in the electrospun fibers reduce volume expansion of silicon nanoparticles (SiNPs) and improve mechanical stability of the electrode. Both CNTs and carbon nanofibers enhance electrochemical performances of SCNF anode-based LIBs resulting in the enhancement of capacity and cycling ability. Coaxially electrospun silicon nanoparticle-carbon nanotube core/carbon shell nanofibers (SCNFs) were fabricated for using as an anode material in LIBs. The precursor of the SCNFs was electrospun using a blend of SiNPs, CNTs, and polyvinylpyrrolidone (PVP) in the core and polyacrylonitrile (PAN) in the shell. After carbonization at 1000 °C for 1 h in nitrogen, the SCNFs were formed with SiNP-CNT composite core wrapped by carbon shell. The electrochemical performances of the SCNF anode-based LIBs were evaluated. The results indicated that the SCNF electrode with 1 wt% of CNTs had an initial delithiation capacity as high as 1500 mAh/g at C/10 rate and a retained capability of 50% at high rate (10C). The cycling performance resulted a capacity of 1000 mAh/g with a coulombic efficiency of 99% in the 100th cycle at 1C, remaining 74.1% comparing to the original capacity (1350 mAh/g
We also applied eletrospun fibers in dye-sensitized solar cells (DSSCs) as a photo-electrode. TiO_2/carbon coaxial-structured nanofibers (TCNFs) were fabricated by coaxial electrospinning. The precursor of TCNFs was electrospun using polyacrylonitrile in the core and a blend of titanium isopropoxide and polyvinylpyrrolidone in the shell. After calcination at 500 °C for 2 h in air and followed carbonization at 1000 °C for 2 h in nitrogen, the TCNFs were formed with nanocrystalline TiO_2 in the shell layer and carbon in the core. The photovoltaic properties of TCNF photoelectrode-based DSSC were investigated using measurements as current density-voltage (*J–V*) curves, incident photon to converted electron (IPCE), and electrochemical impedance spectroscopy (EIS). The power conversion efficiency (PCE) of TCNF photoelectrode-based DSSC was 7.5 %, higher than that of the DSSCs with TiO_2 nanofiber (TNF) and TiO_2 nanoparticle (TNP)-based photoelectrodes, respectively.

Keywords: DSSCs; Titanium dioxide; Electrospinning; Coaxial; LIBs; Carbon nanotube

ID-137

Effect of the addition of a mineral additive on the improvement of the electrochemical reactivity of alpha chemical PbO_2

M. Foudia, L. Zerroual

Laboratoire d'Energétique et Electrochimie du Solide (LEES), Département de Génie des Procédés, Faculté de Technologie, Université Sétif -1, Sétif 19000, Algeria
É.Mail : foudiamalika@yahoo.fr

Abstract

The lead dioxide is frequently used in the industry because of their excellent properties such as his cycle life, high electronic conductivity, low cost of material and its high strong stability. The chemical αPbO_2 is electrochemically less active than the β electrochemical PbO_2, to make it more active, porous additives is dispersed uniformly in the material in order to increase its porosity and may act as acid reservoirs and favor the ionic diffusion. The results show the addition of the mineral additive to the chemical variety does not influence its structure but affects significantly the average crystallite size, phase composition and material capacity.

Keywords: chemical αPbO_2, porous additives, electrochemical reactivity, discharge capacity

ID-138

Semi-empirical method to extract minority carrier bulk lifetime and Surface Recombination Velocity in P-type multicristallines silicon wafers from QSSPC measurements

D. Bouhafs, N. Khelifati, A. Boucheham, B. Palahouane

CRTSE, Division de Développement de Dispositifs de Conversion à Semiconducteurs, 2, Bd Frantz Fanon, BP 140 Alger 7-Merveilles 16038, Algeria

Email: bouhafsd@CRTSE.DZ

Abstract

We have investigated the effect of extended phosphorus diffusion gettering (EPDG) on effective minority carrier lifetime (τ_{eff}) in P-type multicristalline silicon (mc-Si) for photovoltaic solar cells. Quasi-steady state photoconductance (QSSPC) technique are used to measure τ_{eff} before and after each EPDG run. The silicon surface is pasivated with Iodine Ethanol (IE) solution before each measurement. τ_{eff} values have been increased from 7 µsec to 35 µsec after EPDG gettering. We have used the theoretical model which lie the apparent lifetime using Hornbeck-Haynes model and the fit of measured effective lifetime τ_{eff} to determine the bulk lifetime τ_b, surface recombination velocity (SRV), the recombination center (N_r) and traps density (N_t). Surface recombination velocity value around 300 cm.s^{-1} relative to the IE passivation is deduced and the obtained bulk lifetime (τ_b) values vary from 11 to 99.6 µsec depending on gettering efficiency. Bulk lifetime τ_b =99.6 µsec are obtained at the second temperature stage T_L=600 °C. Using the apparent lifetime τ_{app} fitting curves the recombination center density N_r and traps density N_t are 5.3x10^{11} cm^{-3} and 1.0x10^{14} cm^{-3} respectively, proving a neutralization of the recombination electrical activity centers and the reduction of traps density.

Keywords: Multicristalline Silicon, Gettering, Carrier Lifetime, Recombination, traps.

ID-139

Optimal deposition parameters of silicon nitride for solar cells

A. E. Amrani, A. Bekhtari, A. E. Kechai, H. Menari, L. Mahiou, M. Maoudj

CRTSE, 02 Blvd Frantz Fanon. BP 140 Alger-7 Merveilles, 16200 Algiers, Algeria.
Tel/Fax: 213 21 433 511

Abstract

In photovoltaic silicon solar cells fabrication, the passivation quality of Plasma Enhanced Chemical Vapor Deposition (PECVD) silicon nitride film (SiN) has obvious effect on efficiency of solar cells. Efficient passivation consists of optimizing all of the film deposition parameters.

In this paper, we investigated the optimization of the main deposition parameters of the SiN film deposited on multicrystaline silicon solar cells. The parameters investigated were deposition temperature, electrical power of deposition and refractive index of the film which is determined by varying the process gas flow ratio SiH_4/NH_3.

Using a symmetrical structure of SiN/Si/SiN and QSSPC characterization we have found that 380°C and 4600 W are the optimal temperature and power, respectively.

The optimal refractive index was determined using a method which encompasses optical and electrical properties of SiN films deposited on multicrystalline silicon solar cells. This method is based on the calculation of the short circuit current densities. The optimal film corresponds to the maximum short circuit current density. Films with the following refractive indices were studied: 1.9, 2.0, 2.1 and 2.4. The optical characterization of these films gave a minimal weighted reflection for refractive index of 2.0 and a maximum transmission for refractive index of 1.9, respectively.

The QSSPC characterization revealed that the annealed film refractive index of 2.4 performed the best passivation quality. Internal quantum efficiencies of simulated multicrystalline silicon solar cells coated with these SiN films were determined by PC1d program simulation.

Short-circuit current densities calculated using these experimental and simulated data revealed that the optimal refractive index is 1.9.

Keywords: multicrystalline silicon, solar cells, Silicon nitride.

ID-142

Synthesis of Silver Paste for Solar Cells Metallization

Y. Boukennous, N. Moudir, I. Bozetine, R. Sikaddour, F. Tiour, M. Maoudj, A. Hazmoune

CRTSE, Division Développement des Dispositifs de Conversion à Semiconducteurs (DDCS), 2 Blvd Frantz Fanon. BP 140 Alger 7 Merveilles, Alger, Tel/fax: +213(0)21 43 35 11,
E-Mail: boukennous_y@yahoo.fr

Abstract
The study focuses on the synthesis of silver powders for the preparation of conductive pastes used for solar cells metallization. Carbitol and carbitol acetate have been used as solvents and reducing agents of silver nitrate ($AgNO_3$) as precursor.
XRD characterization revealed silver powders with a cubic Crystal system. MEB showed spherical morphology of the particles. Similar particles distribution was obtained by the two agents.
Using same glass frit and organic vehicle for comparative purposes, two conductive pastes were prepared with the synthesized silver powders for the front-side metallization of multi-crystalline cells. The pastes were fired on a fast-firing IR belt furnace at a peak set point temperature around 720ºC with roughly 3 seconds in the hot zone to achieve a thickness of 12 µm. The pastes provided good print resolution, strong adhesion, and acceptable low contact resistance of 7.3 $x10^{-6}$ and $9.1x10^{-6}$ Ωcm^{-2} respectively.

Keywords : silver nitrate, chemical reduction, conductive paste, solar cell

ID-143

Modeling of Solar Cell Efficiency Improvement using pyramid grating in single junction silicon solar cell

H. Heidarzadeh[a], M. Dolatyari[b], G. Rostami[b], A. Rostami[a,b]

[a]Photonic and Nanocrystal Research Lab. (PNRL), Faculty of Electrical and Computer Engineering, University of Tabriz, Tabriz 5166614761, Iran

[b]OIC Research Group, School of Engineering-Emerging Technologies, University of Tabriz, Tabriz 5166614761, Iran

m.dolatyari@tabrizu.ac.ir, rostami@tabrizu.ac.ir

Abstract

In the recent years scientists are working on in both sides of solar cells to manipulate light in more effective ways than conventional optical materials to convert extra and cheap electrical energy from the sunlight. At first this work concentrate on solar cell performance enhancement by introducing pyramids at the top of the wafer based crystalline silicon solar cells. The optimization of used pyramids as well as their height and width were performed in this paper. This specific geometry requires 2D simulation. Simulation results show improvement of performance when pyramids are used. Simulations are made without and with pyramids with an appropriate length and height of pyramids. The efficiency near 24% has been obtained for cell with thickness of 50μm. Also reducing the overall cost per watt is one of the major goals of this paper. The main factor of price in a solar cell is material cost and materials represent a large fraction of the expense. For instance, in bulk crystalline silicon solar cells, material costs account for 40% of the final module price. As the thickness of the absorbing region reduces, the absorption significantly decreases at energies close to the electronic bandgap of the semiconductor. This is particularly a problem for thin-film Si devices. The devices based on crystalline Si have poor absorption near the bandgap. Light trapping schemes are thus needed to enhance light absorption. In this paper light trapping is achieved using a micron-sized pyramidal surface texture and backside filters that causes scattering of light into the solar cell over a large angular range, thereby enhancing the effective path length in the cell. So in this paper we study the use of antireflection coating and back reflectors to improve solar cell performances with the aim of approaching to efficiency of 24% with thickness of lower than 10μm in the crystalline single junction solar cell.

Keywords: Solar cell, Simulation, grating, Efficiency improvement

ID-144

A proposal for Intermediate Band Solar Cells with optimized transition energy in Cr doped 3C-SiC

M. Esgandari [a], H. Heidarzadeh[b], A. Rostami[a, b], G. Rostami[a], M. Dolatyari[a]

[a] OIC Research Group, School of Engineering Emerging Technology, University of Tabriz, Tabriz 5166614761, Iran

[b] Photonic and Nanocrystal Research Lab. (PNRL), Faculty of Electrical and Computer Engineering, University of Tabriz, Tabriz 5166614761, Iran

rostami@tabrizu.ac.ir

Abstract

The Intermediate Band Solar Cell (IBSC) is a new concept proposed to better match the solar spectrum by absorbing sub-bandgap energy photons. One approach to implement this idea is to form an intermediate band (IB) with creating metallic intermediate band inside the host semiconductor. With this configuration, not only the well-known transition between the valence band (VB) and the conduction band (CB) but also the transition between VB and the IB and between the IB and the CB can take place. Theoretical calculations using the detailed balance model show that the conversion efficiency of this photovoltaic device can overcome 60% and 70% for one and two forbidden band, respectively. Excellent electronic properties of 3C-SiC such as high electron mobility and saturated electron drift velocity and its suitable band gap makes it an important alternative material for light harvesting technologies instead of conventional semiconductors like silicon. In this paper, the electronic band structure along with density of states calculated by the density functional theory (DFT). Main goal of this paper is proposing a new materials in the field of photovoltaic with intermediate band in the appropriate position. However our theoretical analysis show Cr is appropriate doping for 3C-SiC. In the other hand by energy level calculations we demonstrate that our material choice is more advantageous in order to approach the ideal combination of transition energies compared host 3C-SiC.

Keywords: Solar Cell, Intermediate Band, optimization, transition energy

ID-145

Comparison the effect of size and inter-dot spaces in different matrix embedded silicon quantum dots for photovoltaic applications

H. Heidarzadeh[a], G. Rostami[b], M. Dolatyari[b], A. Rostami[a,b]

[a] Photonic and Nanocrystal Research Lab. (PNRL), Faculty of Electrical and Computer Engineering, University of Tabriz, Tabriz 5166614761, Iran

[b] OIC Research Group, School of Engineering-Emerging Technologies, University of Tabriz, Tabriz 5166614761, Iran

rostami@tabrizu.ac.ir

Abstract

Quantum dot solar cells are a new and very recent generation of solar cell properly developed to optimize the efficiency of standard solar cells. The two most significant power loss mechanisms in single band gap solar cells are the inability to absorb photons with energy less than the band gap (transparency loss), and thermalization of photon energy exceeding the band gap (thermalization loss). There are several approaches for tackling these losses for instance tandem cell with increasing the number of band gaps or intermediate band solar cell by creating energy level inside the forbidden band of host materials. Quantum confined nanostructures of silicon with barriers of SiO_2, Si_3N_4 or SiC can potentially fill these criteria and allow designing of tandem cell or intermediate band solar cell with increased absorption given by direct band gap of such quantum confined systems. In this work, tunneling probability between QDs (which depends on dot size, type of matrices (SiO_2, Si_3N_4 or SiC) and thickness of barrier) is studied. The simulation results indicate that SiC as dielectric matrix for silicon quantum dots could improve the tunneling rates, which provides an efficiency improvement in silicon based solar cells.

Keywords: silicon, quantum dots, photovoltaic, Simulation, Tunneling

ID-146

Criticality of Energy Related Material: A Systematic Overview of Major Methodologies

S. M. Mohaghegh, I. Keppo, C. McGlade

UCL Institute for Sustainable Resources
Central House | 14 Upper Woburn Place | London | UK WC1H 0NN
Seyed.ahmadabadi.12@ucl.ac.uk

Abstract

In the recent years several studies have considered the issue of critical metals which are required for the energy sector, particularly by focusing on low carbon energy technologies. Most of these low carbon technologies have been introduced as a possible response to climate change. The main target in these studies is to investigate whether there is enough amount of material to implement low carbon technologies and how the supply of these metals will be affected by the increasing demand.

In this paper, initially through an inventory analysis, most of the previous studies which focused on the identification of critical metals are investigated. Then by a systematic method their main approaches and methodologies will be analysed and their final result will be compared.

All critical assessment studies which aim to investigate the material criticality are going through three main steps. Initially they seek to capture the parameters related to the supply side by using pre-defined metrics and indicators. Then they will investigate the vulnerability of their system (e.g. national economy or energy sector) to a potential disruption in supply side and observe the possible response in the system. The last step involves considering the future demand projection which will enable them to analyse the balance of future supply and demand.

Under each of these three steps, it is required to use the appropriate indicators and metrics. To apply these indicators to a list of metals and identify the critical metals, different studies use various aggregation methods. They choose the suitable aggregation method based on the scope of the study and the time frame which they have set for the critical assessment.

In this paper, the major indicators used by different studies will be identified. Then the frequency of each indicator and the relevant metric will be calculated. It could be observed that most of the studies use similar indicators (e.g. R:P, country concentration, depletion time) to analyse the supply risk. However, to estimate the future demand, a common robust methodology does not exist. Some of the approaches to analyse the future demand include qualitative methods such as experts' citation.

Regarding the criticality of the energy related materials, through the systematic literature review, it could be concluded that there is a lack of comprehensive future demand projections. It is suggested that one of the options to improve the future demand projections is using energy system modelling. By considering the material intensity of energy technologies, they could be add as an extra module to the bottom-up energy system model. The energy system model could capture the pathway of required material for different processes within the energy sector. Considering material intensity in the energy system models will be an option for future demand projections of energy related material. It could advance the previous studies by identifying the material constraints related to the future low carbon energy scenarios in a dynamic bottom-up approach.

Keyword: Critical materials, Energy material, Criticality matrix, Rare Earth Element, Energy system, Modelling, Demand Projections,

ID-147

Study of the kinetic of the reduction of alpha and beta PbO_2 in H_2SO_4 on the microcavity electrode

N. Chahmana, L. Zerroual

Laboratory of energetic and electrochemistry of the solid of University of Sétif1, Algeria.
nchahmana@yahoo.fr, N° tel: 0772683246, zerroual@yahoo.fr , N° tel:0669465831

Abstract
The aim of our work is the contribution to the improvement of the performances of the positive plate of the lead acid battery.
For that, we synthesized two varieties of PbO_2 used in industry, alpha and beta PbO_2 by electrochemical way starting from the not formed industrial plates. We studied the kinetics of reduction of the alpha varieties and PbO_2 beta on electrode with microcavity in sulphuric medium. The electrochemical study of the powders of α and β-PbO_2 was made by cyclic voltamperometry with sweeping of potential by using a traditional assembly with three electrodes.
Values of the coefficient of diffusion of the proton in α and β-PbO_2 are respectively equal to $0.498*10^{-8}cm^2$ /s and $0.793*10^{-8}$ cm^2 /s. During the cycling of the two varieties of PbO_2, we obtain a clear increase in the capacity.

Keywords: Lead acid battery, α and β - PbO_2, synthesis, kinetics, cyclic voltametry, coefficient of diffusion.

ID-148

The World Market For Biofuels: What Future Place For Bioethanol Produced From Sugar?

B. Benyoucef

Faculy of economics, Khemis-Miliana University, Road Theniet-El-Had, Khemis-Miliana, 44225, Algeria
Tel. 0776434046, E-mail. benzohrab@yahoo.fr

Abstract

The main constraints to the development of green energy production are rather economic, since they have a relationship with profitability and competition, especially in the less competitive regions. The objectif of this article is to explain the perspectives of market of bioethanol which is produced from sugar; knowing that sugar is a raw material whose prices are very unstable. Our approach is to start by analyzing the world sugar market, then policies of states and finally the strategies of firms. The volatility of sugar prices on the international market, has been the source of protectionist policies, but under pressure from the World trade organisation (WTO) several states tend to reform these policies which induced an orientation towards the production of bioethanol from sugar. This conversion does not threaten the international food security, due the existence of productive potential in several regions of the world; However it has two problems: the high cost of production in some countries and an unsatisfactory carbon balance sheet. These constraints do not provide an advantage for the production of sugar, because there is a trend toward expanding of the substitution products, including natural sweeteners which are not considered threatening to human health. However, they provide an opportunity for the development of biofuels of the second generation considered more clean, to the detriment of the first generation notably those obtained from the processing of sugar beet. This change does not ad the oncoming end of the beet bioethanol, but a new geography of his production.

ID-149

Wind Turbine Modeling via Different Numerical Techniques

E. Mahmoodi [a], M. Jamil [b]

[a] University of Shahrood, Semnan, Iran

[b] Material & Energy Research Center, Karaj, Iran

Abstract

Different numerical models are computed and compared to measurement load and wake of a 4.5 m of diameter wind turbine rotor. The collaborative European wind turbine MEXICO project is carried out for three commonly experimental defined test cases at wind speeds of 10, 15 and 24 m s^{-1}. A Laminar Navier-Stokes approach and a Reynolds Averaged Navier-Stokes turbulent model both coupled with an Actuator Disc technique are computed and a direct model from the literature as a full rotor technique are discussed. The actuator disc momentums are calculated using User Defined Functions in FLUENT. The results are discussed in detail and reliable agreement with measurements is obtained.

Keywords: Wake Modeling, Laminar Navier-Stokes, Turbulent Navier-Stokes, Actuator Disc, PIV Experiment.

ID-150

Materials for Hydrogen Production by the Thermo-Chemical Method

J. W. Park, J.U. Kim, M. H. Kim, S. D. Hong, Y. Kim

Korea Atomic Energy Research Institute, 1045 Daedeok-Daero, Yuseong-Gu, Daejeon-City, Republic of Korea, phone: +82-42-8682970, pjw@kaeri.re.kr

Abstract

The materials for hydrogen production by the thermo-chemical method (I-S cycle) are subjected to an extremely severe corrosion environment. For the corrosion protection, a system of SiC coating on Alloy HX has been studied. In this system, the bonding between the film and the substrate is often problematic. A strong bonding between SiC/Alloy HX was achieved by mixing the atoms at the interface by ion-beam. The ion mixed about 1 μm thick film was not peeled-off at ≥ 900 ℃ in spite of a big difference in CTE. Instead, the film was cracked along the grain boundaries of the substrate after annealing at ≥ 700℃, confirming excellent adhesion. Furthermore, the film island was formed at ≥ 900℃ so that a considerable part of the substrate could be exposed to the corrosive environment. In order to cover the coating imperfections, multiple ion beam processed ~ 1 μm thick coating followed by annealing at 950℃ was thus carried out. When the process was repeated 4 times (total film thickness ~ 4 μm), almost no weight loss caused by the substrate corrosion through the exposed area in 80% sulfuric acid at 250 ℃ for 100 hrs was achieved. The strategy of ion beam engineering employed in this work for the production of a SiC protective coating on metallic materials is suggested to be useful for the components subjected to an extremely corrosive environment at a temperature exceeding 900℃, as in the nuclear hydrogen production system.

ID-152

Renewable hydrogen production from bio-ethanol by oxidative steam reforming over Ni/CeO_2-ZrO_2 catalyst: Effect of noble metal on catalytic activity

T. Mondal [a], K. K. Pant[a], A. K. Dalai [b]

[a] Department of Chemical Engineering, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110016 (India)

[b] Department of Chemical and Biochemical Engineering, University of Saskatchewan, Saskatoon, SK S7N5C5 (Canada)

Abstract

Hydrogen production from renewable sources such as biomass, has gained attention due stricter environmental norms. Hydrogen production from steam reforming of ethanol has attracted great attention owing to several advantages, such as negligible CO_2 emission, low toxicity, and high hydrogen content in ethanol. The catalytic oxidative steam reforming of ethanol (OSRE) for hydrogen production was studied over Ni/CeO_2-ZrO_2 and Ni-Rh/CeO_2-ZrO_2 catalysts. The catalysts were prepared by impregnation-co-precipitation method and characterized by BET, XRD, TPR, TPD, Chemisorption, TGA, Raman spectroscopic and SEM-EDX techniques. Characterization results revealed that addition of ZrO_2 improves the oxygen storage capacity of CeO_2 which improves catalytic activity. The effect of process variables i.e. temperature and space time on conversion and product selectivities were investigated in a tubular fixed bed reactor at atmospheric pressure at an ethanol to water molar ratio of 1:9 and oxygen to ethanol ratio of 0.35 over a temperature range of 400 to 700°C. H_2 and CO_2 were obtained as the main products with small amount of CO and CH_4 during steam reforming. It was found that conversion increased with temperature and complete conversion achieved at 600°C with maximum hydrogen yield of 4.6mol/mol ethanol reacted on 30%Ni-1%Rh/CeO_2-ZrO_2 catalyst. Ethanol conversion and H_2 selectivity increased with increasing contact time while CO and CH_4 selectivity decreased. Investigation revealed that 30%Ni/CeO_2-ZrO_2 catalyst promoted with 1% Rh has better catalytic activity than that of 30%Ni/CeO_2-ZrO_2 catalyst indicating that addition of noble metal Rh improves the catalytic activity significantly for OSRE.

Keywords: Oxidative steam reforming, hydrogen production, ethanol, Ni-Rh/CeO_2-ZrO_2 catalyst

ID-154

Effects of Zn and Zr addition on $AlH_3/MgCl_2$ nano-composite and its dehydriding properties

D. Congwen, H. Lianxi*, S. Yu

Campus Box 435#, School of Materials Science and Engineering, Harbin Institute of Technology, Harbin 150001, China
Phone: +86-451-86418613. E-mail: hulx@hit.edu.cn

Abstract

Aluminum hydride, or AlH_3 (alane) is a metastable metal hydride with a high gravimetric and volumetric hydrogen capacity (10.1wt.% and a 149kg·m^3, respectively). And both of capacity has exceed the 2015 US department of energy (DOE) system targets which are 5.5wt.% and a 130kg·m^3. The high hydrogen content and low decomposition temperature make it regarded as an attractive material for hydrogen storage. Traditionally, many wet chemical methods for synthesizing alane (AlH_3) involve reacting $LiAlH_4$ and $AlCl_3$ in solvents. However, the organo-metallic methods for synthesizing AlH_3 is sensitive to both time and temperature and the alane is unstable at room temperature, so it is fairly difficult to make large-scale production based on this wet chemical method. Thus, mechanochemical method is regarded as a valid and well recognized method for preparing AlH_3.

In this work, the $AlH_3/MgCl_2$ composite was prepared by mechanochemical sythesis method, and the nano-sized AlH_3 can be separated from the composite similar to that used in the conventional synthesis route. $AlH_3/MgCl_2$ nano-composite was synthesized by the mechanochemical reaction between commercial $AlCl_3$ and nanocrystalline MgH_2 which was prepared by milling ZK60 magnesium alloy in hydrogen for 25h in the vial under hydrogen atmosphere. The effect of Zn and Zr elements on the reaction progress and the dehydrogenation behaviour of the $AlH_3/MgCl_2$ nano-composite were investigated, as well as the specimens containing nano-sized AlH_3 were confirmed by XRD, SEM and TEM, respectively.

It was clarified that the crystallite size of the nano-sized AlH_3 phase was mainly influenced by the Zn and Zr element. Comparing with the $AlH_3/MgCl_2$ nano-composite prepared by MgH_2 (Mg), the average crystallite size of the final AlH_3 phase in the composite was approximately to be 4.5nm. Because of the addition of the Zn and Zr in nano-composite, the content of the hydrogen for de-hydriding can reach 7.62wt.% at 423K. When the dehydriding temperature increased to 493K for 8h, the dehydriding curves of the AlH_3 phase in the nanocomposite presented more remarkable kinetics, with the hydrogen desorption achieving about 9.54wt.% which is correspond to the theoretical content 10.1wt.%.

Keywords: mechanochemical synthesis, $AlH_3/MgCl_2$ nanocomposite, dehydriding properties

ID-157

Intermolecular Dynamic and NMR Thermometric Properties of Aminopolycarboxylate Complexes with Lanthanides as Reagents for Nuclear Energy

S. P. Babailov

A.V. Nikolayev's Institute of Inorganic Chemistry SB of the Russian Academy of Sciences, Novosibirsk, 630090, Russia

Abstract

The paramagnetic aminopolycarboxylate compounds of lanthanides (Ln) attracted the interest of researchers due to numerous practical applications (relaxation contrast agents for MRI, agents for photodynamic therapy, fluorescent and NMR probes, etc.) [1-2]. EDTA complexes with Ln are one of the varieties of this type of coordination compounds. Ln-EDTA complexes also have many applications (in particular lanthanide and actinide separation of spent fuel nuclear power plants). They are studied in detail by various methods [1-2]. However, the energy characteristics of the kinetics of intermolecular dynamics studies are not complete. In this regard, the objectives of the work were to analyze the kinetics of chemical exchange processes between EDTA in two states (free and associated with lanthanide cations) in aqueous media. We studied the NMR spectra of lanthanide complexes with EDTA and DOTA depending on temperature and pD. ^{1}H NMR measurements are reported for the aqueous solutions of EDTA complexes of Ln (La, Pr, Eu, Tb, Ho, Tm, Yb, and Lu). Comparison $\Delta G^{\ddagger}_{298}$ values (of the intermolecular EDTA ions exchange at $[Ln^{3+}(EDTA)]^{-}$) showed a significant change of properties between Eu and Tb within the lanthanide series. Studied paramagnetic coordination compounds are lanthanide paramagnetic probes for in situ NMR temperature control in solution. The found results are in particular useful for helping to understanding solution chemistry of lanthanides with EDTA in aqueous environments, which is applicable to lanthanide-lanthanide separations and actinide/lanthanide behaviour in storage pond conditions within the area of nuclear waste management.

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ID-158

Evaluation of Electrocatalytic Activity of Pt-Co/Ti towards Methanol Oxidation

E. Norkus, Ž. Činčienė, A. Balčiūnaitė, A. Zabielaitė, I. Stankevičienė, J. Vaičiūnienė, A. Selskis, L. Tamašauskaitė, Tamašiūnaitė

Center for Physical Sciences and Technology, A. Gostauto 9, LT-01108, Vilnius, Lithuania, tel.: +370 52648892, e-mail: norkus@ktl.mii.lt

Abstract

One type of alkaline fuel cells - direct methanol fuel cells (DMFCs) is being developed for portable power supply. Since methanol is used as fuel a great deal of effort has been put into the exploration of cost-effective, active, and stable catalysts able to substitute Pt or allow reducing the amount of it in low temperature fuel cell anodes. Search of alternative catalyst compositions with high activity towards the oxidation of methanol is still in progress.

The Pt-Co catalysts were deposited onto the titanium surface using simple and cost-effective chemical methods: electroless Co deposition followed by a spontaneous Pt displacement from the platinum-containing solution. The morphology, structure and composition of the prepared catalysts were examined by means of Field Emission Scanning Electron Microscopy and Inductively Coupled Plasma Optical Emission Spectroscopy. Electrocatalytic activity of Pt-Co/Ti towards the oxidation of methanol was investigated by means of cyclic voltammetry and chronoamperometry.

It was found that immersion of Co/Ti in the platinum-containing solution for 5 min results in the formation on the Co surface of nonspherical platinum crystallites ca. 15-50 nm in size. The Pt crystallites appear as light oblong nanorods and are quite uniform in size and well separated. After immersion of the Co/Ti electrodes into the platinum-containing solution for a longer time periods of 15 and 30 min, the size of Pt crystallites increase and flowerlike character of the structures is evident. The Pt nanoflowers are not spherical and consist of a large number of spearlike nanorods of size ca. 450-850 nm which are bonded to each other to form bigger secondary 3D flowerlike architectures.

It has been determined that the Pt-Co/Ti catalysts with low Pt loadings in the range from 19 up to 98 μg_{Pt} cm^{-2} exhibited an enhanced electrocatalytic activity towards methanol oxidation as compared to that of bare Pt and Co/Ti and seem to be promising anode material for DMFCs.

Acknowledgement This research was funded by a Grant (No. ATE-08/2012) from the Research Council of Lithuania.

ID-159

Properties of CdS deposited by the SILAR method using Cd(II) organic salt as precursor

L. Tamašauskaitė-Tamašiūnaitė, B. Šimkūnaitė-Stanynienė, G. Grincienė, A. Žielienė, L. Naruškevičius, A. Selskis, V. Jasulaitienė, E. Norkus

Center for Physical Sciences and Technology, A. Gostauto 9, LT-01108, Vilnius, Lithuania, tel.: +370 52661291, e-mail: lortam@ktl.mii.lt

Abstract

N-type cadmium sulfide (CdS) is used as the window material for hetero-junction in solar cells due to a high absorption coefficient causing the reduction of the useful current delivered from the cell to the load. A variety of methods have been developed to prepare CdS such as vacuum evaporation, electrochemical synthesis, spray deposition, chemical vapor deposition, electrodeposition, chemical bath deposition (CBD) and etc. Nowadays the successive ionic layer adsorption and reaction (SILAR) method has advantageous due to it allows to control the film thickness at atomic level, which is difficult by the conventional CBD and electrodeposition methods.

In the present study thin CdS films with thickness from 18 up to 80 nm were prepared by means of the SILAR method using cadmium 2,4-pentanedionate and disodium sulfide precursors. The morphology and composition of the as-prepared CdS thin films were characterized using Field-Emission Scanning Electron Microscopy, Energy Dispersive X-ray Spectroscopy and X-ray Photoelectron Spectroscopy. The optical properties of the CdS thin films deposited onto glass sheets were investigated by measuring optical absorbance in the wavelength range from 300 to 800 nm.

The data of optical properties of the CdS films deposited with different thickness are compared and presented.

Acknowledgement The work was carried out within the project VP1-3.1-ŠMM-08-K-01-009 that is partly supported by the National Programme “An improvement of the skills of researchers” launched by the Lithuanian Ministry of Education and Science.

ID-160

Study of Indoor Thermal Comfort Based On Building Design Options: A Review

A. S. Maheshwari

School Of Architecture & Design, Manipal University Jaipur, India

Abstract

The Progression of Human Civilization has been sensitive to human comfort. Studies are suggestive that individuals spend approximately 90% of their time inside building(s) and consequently Indoor Environmental Quality has an impact on the inhabitants' comfort. Research states that extreme hot or cold environments affect human body movements and cognitive behavior of individuals. Therefore, it is necessary to investigate the impact of building design on Indoor Environment with a focus on thermal comfort.

The paper intends to review the studies on indoor thermal comfort perceptions and building design options affecting the inhabitants' comfort and performance. For the purpose of this research, "performance" is defined as the effortlessness with which the individuals may carry out their mundane activities such as classroom studies or office works or household activities.

The paper endeavors to comprehend the gaps in the body of present knowledge of building design options based on building forms, astute building materials and contemporary energy efficient building design guidelines in accordance with indoor thermal comfort perceptions.

Keywords: Thermal Comfort, Indoor Environment, Building Design Options, Energy Efficient Building Design

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ID-161

Adsorption equilibrium of carbon dioxide and hydrogen on chemically modified commercial activated carbon

J. S. Nazzal, U. Narkiewicz, A. W. Morawski, R. Wróbel, B. Michalkiewicz

The West Pomeranian University of Technology in Szczecin, ul. Pulaskiego 10, 70-322 Szczecin, Poland,
Fax: +48 9144 94686, Tel: +48 9144 94730, jsrenscek@zut.edu.pl, urszula.narkiewicz@zut.edu.pl, amor@zut.edu.pl, rafal.wrobel@zut.edu.pl, beata.michalkiewicz@zut.edu.pl

Abstract

The adsorption of carbon dioxide and hydrogen up to 40 atm on chemically modified commercial activated carbon at different temperatures from 40 to 100 ^oC have been investigated. WG-12 activated carbon kindly supplied by Gryfskand Sp. z o. o. Poland was treated by KOH, $ZnCl_2$, K_2CO_3, then heated at 800 ^oC. The activating agent was removed by washing with water to pH =7.

The specific surface area S_{BET} was estimated by BET method on the basis of adsorption-desorption nitrogen isotherms at - 196 ^oC. The micropore volume V_{mic} was obtained by DFT method. The S_{BET} of WG-12 was equal to 1187 m^2/g and V_{mic} 0.42 cm^3/g. After treatment with KOH the S_{BET} and V_{mic} increased by 50%. The CO_2 adsorption at temperature 40 ^oC and pressure 40 atm was equal to 9 mmol/g WG-12. After KOH treatment the CO_2 uptake increased by 72%. Henry's law constant and adsorption equilibrium selectivity of CO_2 and H_2 were calculated via Virial equation. The results showed 18 times higher equilibrium selectivity for CO_2 over H_2.

Acknowledgements The research leading to these results has received funding from the Polish-Norwegian Research Programme operated by the National Centre for Research and Development under the Norwegian Financial Mechanism 2009-2014 in the frame of Project Contract No Pol-Nor/237761/98/2014

ID-162

Determination of Assessment Scale of Selected Indicators in Slovak Building Environmental Assessment System BEAS

S. Vilčeková, E. K. Burdová*, M. Čuláková

Institute of Environmental Engineering, Faculty of Civil Engineering, Technical University of Košice, Vysokoškolská 4, 042 00 Košice, Slovakia

Corresponding e-mail: eva.kridlova.burdova@tuke.sk

Abstract

The building environmental assessment systems and tools used over the world were the base of new system development for Slovak conditions. The proposed fields are site selection and project planning; building construction; indoor environment; energy performance; water management and waste management. The fields and indicators were proposed on the bases of available information analysis from particular fields of building environmental assessment and also on the base of our experimental experiences. By assessed different material compositions of building envelope which comply U-value of energy standard and near zero energy residential buildings is possible to compare impact of increasing insulation materials in structure compositions on embodied energy. The selection of building materials for structures which has significant share of total environmental performance of building and the potential of improvement is analyzed in this paper. By evaluating of large quantity of different material compositions of conventional and alternative environmental suitable structures of building envelope were determined criteria for environmental indicators such as embodied energy, $CO_{2eq.}$ emissions and $SO_{2eq.}$ emissions. The criteria for the evaluation of mentioned environmental indicators are determined on the base of alternative material compositions of structures which are assessed in order to identifying the most optimal solutions in terms of environmental sustainability by LCA within system boundary “cradle to gate”. The aim of this paper is presentation of Slovak building environmental assessment system and determination of assessment criteria of environmental indicators such as embodied energy, embodied $CO_{2eq.}$ emissions and embodied $SO_{2eq.}$ emissions for the purpose of their implementation to BEAS.

Keywords: sustainability, building materials, environmental assessment, indicators evaluation, environmental impact, embodied energy, LCA.

ID-163

The study of the addition of nano-sized noble metals to CuTl-based superconductors for different energy applications

A. Jabbar, M. Mumtaz, K. Nadeem, A. Shah

Materials Research Laboratory, Department of Physics, International Islamic University, Islamabad, Pakistan

Email: aj_qau@yahoo.com Cell# +92 333 6014106

Email: mmutaz75@yahoo.com Cell# +92 333 5101074

Email: kashif.nadeem@iiu.edu.pk Cell# +92 334 5322545

Email: anam_ayeds1990@yahoo.com Cell# +92 333 6004751

Abstract

High T_c superconductors gained numerous attention of scientific community due to their promising potential applications in energy efficiency, magnetic resonance imaging, electrical machines, wind turbine and superconducting magnets. Active research in high T_c superconductors is the creation of artificial pinning centres, which act to stop the flow of magnetic flux lines. The inclusion of nanoparticles is one of the methods to create magnetic flux pinning centres and way to improve superconducting properties. The efficient pinning centres improve the superconducting properties such as critical current density (J_c), critical magnetic field (H_c), high irreversible field (H_{irr}), etc. In the present research work, effect of noble metals nanoparticles addition on physical properties of low anisotropic CuTl-based high T_c superconductor has been studied in detail. Structural characterization includes X-ray diffraction, Fourier transform infrared spectroscopy (FTIR), and scanning electron microscopy. Superconducting properties such as zero resistivity critical temperature {T_c(R=0)}, critical current density (J_c) are studied by temperature dependent dc-resistivity and ac-susceptibility measurements. Dielectric properties have been also studied in detail. The CuTl-based superconductors have been doped with noble metals nanoparticles of different concentrations. We got some interesting results after inclusion of nanoparticles in CuTl-based superconductor, such as enhancement as well as depression of T_c which depends upon nanoparticle type and concentration, negative dielectric constant, etc.

ID-164

Discovery of new Dual Cation Metal Ammine Borohydrides: A computational study

S. Demir, A. Tekin

Informatics Institute, Istanbul Technical University, 34469 Maslak Istanbul Turkey.
E-mail: sametdemir@gmail.com, E-mail: adem.tekin@be.itu.edu.tr

Abstract

World’s growing energy need is mostly reliant upon fossil fuels. Fossil fuels are cosidered to be non-renewable energy sources because it needs million years to form and reserves are being depleted much faster than new reserves are being made. Usage of fossil fuels comes with harmful consequences. It is responsible for 20 percent of global warming pollution. To avoid these harmful effects, new energy sources must be discovered. As an alternative to fossil fuels, hydrogen can be used for energy needs and it has a lot of benefits over fossil fuels such as being environmentally friendly, carrying high energy content and being renewable. To use hydrogen as a energy source instead of fossil fuels, some problems must be ironed out. One of them is hydrogen storage. Hydrogen can be stored as gas or liquid but these type of storages are not so efficient for widespread use. Storing hydrogen in the form of solid can be a more convenient way for storage. To store hydrogen in solid form metal borohydrides and ammines can be used by reason of their high gravimetric and volumetric densities and other peculiar features. To decompose hydrogen, metal borohydrides requires very high temperature but they can be mixed with ammines to form a new materials with better thermodynamic characteristics. To achive this goal, in our study we design dual-cation ammine metal borohydrides (AMBs) in the form of LiSc(BH4)4(NH3)x=2,3 using an approach which combines crystal structure prediction with density functional theory computations.

ID-165

Highly transparent and conductive single-walled carbon nanotube films for energy applications

A. G. Nasibulin[1,2], A. M. Funde[1,3], I. V. Anoshkin[1,2], I. A. Levitsky [4,5*], K. Mustonen[1], A. Kaskela[1], P. Laiho[1], E. I. Kauppinen[1]

[1] Department of Applied Physics, Aalto University School of Science,
Puumiehenkuja 2, 00076, Espoo, Finland
[2] Skolkovo Institute of Science and Technology, 100 Novaya str., Skolkovo,
Moscow Region, 143025, Russia
[3] School of Energy Studies, University of Pune, Ganeshkhind, Pune-411007, India
[4] Emitech, Inc. Fall River, MA 02720, USA
[5] Department of Chemistry, University of Rhode Island, Kingston, RI 02881, USA
E-mail: a.nasibulin@skoltech.ru

Abstract

The unique properties of single-walled carbon nanotube (SWCNT) films, such as high porosity and specific surface area, low density, high ratio of optical transmittance to sheet resistance, high thermal conductivity and chemical sensitivity, and tuneable metallic and semiconducting properties, open up a new avenue for a wide range of applications. SWCNT networks have been demonstrated to show potential advantages in performance and fabrication cost reduction in comparison with ITO as well as most of organic materials that have been extensively studied as low-cost alternatives. Furthermore, high flexibility of the SWCNTs opens avenues beyond the ITO, i.e. creation of completely new components, urgently needed in the flexible and transparent electronics.

The optoelectronic performance of the produced SWCNT films depends on many parameters: quality, length, diameter, metallicity and chirality of SWCNTs comprising the film, the length, morphology and diameter of bundles, orientation of the SWCNTs and their doping. In this paper, we report the improvement of the film conductivity by tuning the parameters of SWCNTs.

We demonstrated an aerosol CVD process to dry-deposit large area SWCNT-networks with tuneable and the state-of-the-art conductivity and optical transmittance on wide range of substrates including flexible polymers. Wide application potential of our SWCNT films is demonstrated by successful applications in photovoltaic devices, supercapacitors, and the field effect transistors.

ID-166

Radiation Induced Modifications in the Dielectric Properties of Nylon 6 and Polystyrene Blends

Fathia Shokr, Sammera Al Gahtani

King Abdulaziz University, Saudi Arabia. dr.fshukr@hotmail.com

Abstract

Blend of nylon 6 (poltamide 6) and polystyrene PA6 /PS (75: 25, wt/wt) was prepared by means of melt-mixing using a twin- screw extruder, and the effects of γ-radiation in the air on their dielectric properties were investigated at different frequency range. In this blend, PS was the dispersed phase in the nylon6 matrix. Pure PA 6 was processed in the same way and used for comparison. It was noted that the blended samples have a higher ε` value compared with the unblended ones. There is a decreased broadening of the loss spectra on blending as determined by Havriliak-Negami (HN) fits to the dielectric data. The changes observed in the dielectric relaxation spectra were related to the modifications in the structural and morphological parameters attributed to the exposure of the samples to radiation.

ID-167

Social Aspects of Renewal Energy Potential Identification and Modelling

T. Soylu, S. Buessler, C. Weber

Laboratoire Image, Ville, Environnement – UMR 7362, CNRS Université de Strasbourg, Faculté de géographie et d'aménagement, 3 Rue de l'Argonne 67000 Strasbourg, +33 3 68850957,
tamer.soylu@live-cnrs.unistra.fr; sophie.buessler@live-cnrs.unistra.fr; christiane.weber@live-cnrs.unistra.fr

Abstract

The main aim of this study is to develop an analysis framework and a planning tool usable by cities for prospective issues. We apply this approach to the "Communauté Urbaine de Strasbourg (CUS)" to exploit the maximum amount of potential renewable energy. Regarding the emergence of decentralized energy production and networks, and diffused spatial characteristics of renewable energies sources, the analysis and evaluation of the local potential is a complex task. Identification and examination of the theoretical potential requires a comprehensive modelling approach. This analysis approach should take into account not only the energetic techno-structures and the spatial characteristics but also the socio-economic and political attributes of the research area. Especially the socio-economic settings of a region play a vital role in putting into practice the available potential. Within this context in this study we would like to present our modelling approach which takes into account the socio-economic settings of the observed region. Our approach follows a top-down modelling method in which after calculating the available theoretical potential, the implementable potential is calculated regarding the pre-defined constraints. These constraints include factors that could potentially limit the implementation of renewable energies such as social acceptance, political regulations etc. Later on we execute a social area analysis to examine the social settings in each neighbourhood using official demographic statistical datasets for the Alsace region (INSEE) which include variables like education, employment, age and gender structure, migration background and already installed renewable energy applications etc. This allows us to stress on the available potential, already installed potential and social settings of neighbourhoods. We use this valuable information on the following analysis step, scenario building, to define the areas where a big potential for renewable energies could exist.

Acknowledgements The results presented here are part of a joint research project called "Plan-EE: A GIS-based planning tool for renewable energies" funded by INTERREG IV Offensive Sciences programme. Project leader is Dr. Stefan Jergentz from University of Landau.

ID-168

Biogasoline production from glycerol over single step sol-gel made mixed oxides: effect of acid strength and acid type on product distribution

E. Demirkaya[1],E. Seker[2]

Chemical Engineering Department, Izmir Institute of Technology, Urla IZMIR 35430, TURKEY
Phone[1]: 0-232-750-6646, Phone[2]: 0-232-750-6646
email[1]: emredemirkaya@iyte.edu.tr, email[2]: erolseker@iyte.edu.tr

Abstract

It is vital to develop viable solutions, such as the usage of domestic renewable energy sources, to offset the increasing energy demand of Turkey and also to prevent or reduce the emission of carbon oxides (e.g. CO_2 also a greenhouse gas) and related inorganic oxides. It seems that carbon dioxide neutral fuel production could be the key. Among many carbon dioxide neutral fuels, biodiesel could industrially be produced from a variety of edible and inedible vegetable oils. Unfortunately, glycerol, the by-product of the biodiesel industry, is the main concern because of the market for glycerol is limited and also the amount of biodiesel is projected to increase over the years; hence, increasing amount of glycerol, too. Therefore, new catalytic processes and the catalytic materials need to be developed to convert the extra amount of glycerol to alkyl aromatics.

Acidic materials, such as zeolites, are known to produce gasoline like alkyl aromatics but they lose their activity and selectivity due to coke formation. This has been related to the operating space time, the pore structures and acid type. In this manuscript, the effect of acid strength and the acid type on the product distribution was presented by preparing alumina-silicates with varying amount of Al/Si ratios using single step sol-gel method. The pore size and structure of the sol-gel made alumina-silicates is in the range of 2-20 nm and ink-bottle type. We will present glycerol conversion and selectivity to alkyl aromatics as a function of Al/Si ratios and the sol-gel preparation parameters.

ID-170

Analysis and evaluation of reinforcement state for unsafe clay core dam

M. Yang[1], D. Wang[2], B. Ou[3], X. Fu[4]

[1] Ph.D. Candidate, State Key Laboratory of Hydrology-Water Resources and Hydraulic Engineering, Hohai Univ., Nanjing 210098, China(Corresponding author). E-mail: ymym_059@126.com; Telephone number: +8613776636291.
[2] Post Graduate, East-west Water Transfer Bureau of Liaoning Province, Shenyang 110006, China.
[3] Ph.D. Candidate, National Engineering Research Center of Water Resources Efficient Utilization and Engineering Safety, Nanjing 210098, China.
[4] Undergraduate, Dayu College, Hohai Univ., Nanjing 210098, China.

Abstract

Earth-rock dams are of the largest number and the dam-break rate is also the highest in all dam types. This article aims at conducting reinforcement analysis of unsafe clay core dams from stability state and material characteristic. A series of reinforcement studies are carried out in the paper on seepage and slope stability of unsafe clay core dam by geotechnical tunnel analysis system (GTS). The three-dimensional nonlinear finite element model is successfully used in the study with the constructive model of Duncan-Chang. The seepage and stability of the project meet the reinforcement requirements based on the analysis. Therefore, this indicates that Midas/GTS is feasible for consolidating the seepage calculation in dam reinforcement projects. The results also show the osmotic pressure has greater impact on the calculation of sliding stable safety factor. The elastic modulus of the concrete anti-seepage wall is high under conventional concrete condition, however, larger deformation and stress concentration will appear under the large water loading, which will undermine the effect of concrete anti-seepage wall. The low elastic modulus wall materials influence on the concrete anti-seepage wall is investigated. From the analysis of the practical project, less than 3,000 Mpa of elastic modulus should be suggested in future dam reinforcement projects because of the significant stress variation for the concrete anti-seepage wall. The conclusions are useful for similar projects as references.

Keywords: Earth-rock dam; Reinforcement; geotechnical tunnel analysis system; finite element model; seepage and slope stability; low elastic modulus;

ID-171

energy for telecommunications: monitoring and energy efficiency of base transceiver stations

Antonio Spagnuolo[1], Antonio Petraglia[1], Carmela Vetromile[2], Carmine Lubritto[2]

[1]Department of Mathematics and Physics (DMF), Second University of Naples
Viale A. Lincoln, 54, I - 81100 Caserta – ITALY
[2]Department of Environmental Science and Technology (DiSTABiF), Second University of Naples
Via Vivaldi, 43, I - 81100 Caserta – ITALY

Abstract

Telecommunications is one of the sectors where the continuous growth in demand for mobile services and the parallel technological development go hand in hand with regards to energy consumption. The development of new mobile telephony technology and the continuous evolution of mobile services have led to an increase, in the last few years, of Base Transceiver Stations.

In order to reduce energy consumption of the cellular networks, it is necessary to obtain accurate data on both the energy consumed by a Base Station and the influence that the traffic load has on such consumption. In the paper results coming from a measurements campaigns performed in different sites in Italy will be discussed.

In this context, power saving is one of the most important approaches to reduce energy consumption, in particular for transmission devices; it entails switching off unused channels during low traffic periods, such as nights or weekends. A Monte Carlo simulation algorithm that implements power saving features on transmission systems has been developed and tested by using Base Transceiver Stations with different characteristics and typologies (GSM, DCS) and with different traffic load conditions.

ID-172

Land cover change evaluation in Algeria using Landsat TM data

S. A. Azzouzi[1], A. V. Pantaleoni[2], H. A. Bentounes[3]

[1] Institute of Telecommunications and Multimedia Applications (iTEAM),
[2]Universidad Politécnica de Valencia, C de Vera, Valencia, 46022, Spain
[3] Signals and Systems Laboratory (LSS), Faculty of Sciences and Technology,
BP227, Abdelhamid Ibn Badis University, Mostaganem 27000, Algeria

Abstract

Satellite images bring a huge source of data that contains very valuable information in the spatio-temporal domains. However, exploiting this information remains one of the major challenges in the remote sensing field. Detection of the Earth surface change, especially in remote areas, is essential to monitor the use of land and the human impact on the environment. Possible land cover change causes include human activity like the growth of urban areas and natural changes related to natural disaster. Several studies have proved the importance of remote sensing techniques in the management and conservation of the environment.

This work describes a methodology to extract automatically spatio-temporal information between two images based on Change Vector Analysis (CVA). The objective is to get a precise map of changes including burnt areas and water reservoirs that will be also evaluated by visual observation for validation. For that purpose, Supervised Change Vector Analysis Posterior-probability Space SCVAPS is selected. Different supervised classifiers giving posterior probability data are employed and the Double Flexible Pace Search (DFPS) method is chosen for the threshold operation. This study takes into account uncertainties related to the spatiotemporal mining process and final evaluation is given with the overall accuracy and the kappa coefficient.

Some promising results in Algeria using SCVAPS technique have been obtained and they should provide an effective guidance to algorithm designers for the development of CVA based change detection techniques that effectively use the diverse and complex remotely sensed data for change detection even in mountain areas.

Keywords:

Remote Sensing, Classification, Land cover change, Change Detection, Change Vector Analysis.

ID-173

Advance Technologies of Biomass Energetic Use

V. Zaichenko

Department of distributed energy, head Joint Institute for High Temperature Russian Academy of Sciences (JIHT RAS), Moscow

Abstract

The paper presents investigation results in the field of new power technologies developing based on local fuels: wood and agricultural waste, peat and vital waste of different origin received in JIHT RAS.

To create distributed power based on local fuels it is necessary to develop technologies of power gas production from various source of biomass. This gas could be used as fuel for electric power production installations. Existing gasification and pyrolysis technologies cannot be used for these purposes because power gas received due to given technologies contains a liquid phase. The paper presents basic technical characteristics of new wasteless biomass conversion technology with production of dry energetic gas with advanced calorific characteristics.

The paper describes the main aspects connected with new technology of increasing calorific value of biomass fuel which also gives biomass fuel waterproof properties. The use of the said technology will lead to essential cost reduction for storage and transportation of fuels from biomass.

The article describes technology of joint processing of biomass and natural gas with production of pure carbon materials and hydrogen. Received pure carbon materials consist from biomass carbon and carbon of processed hydrocarbon gases. High value of carbon materials pays back all expenses connected with hydrogen production for power use. The developed technology is an example of a complex approach to the problem of a biomass processing with production high-calorific non-polluting fuel and carbon materials for wide industrial use.

ID-174

Framework for the mapping of the monthly average daily solar radiation using the finite element method and the kriging method

Taehoon Hong [1], Kwangbok Jeong [2*], Choongwan Koo [1], and Jimin Kim [2]

[1] Associate Professor, Department of Architectural Engineering, Yonsei University, Seoul, 120-749, Republic of Korea.

[2] Research Assistant and Ph.D. Student, Department of Architectural Engineering, Yonsei University, Seoul, 120-749, Republic of Korea

Abstract

South Korean government has effort to expand new renewable energy to achieve the stable energy supply and to reduce greenhouse gas emissions. In particular, the photovoltaic (PV) system has increased in comparison with the other new renewable energy system. In order to ensure the effectiveness of the PV system, it is important to accurately estimate the monthly average daily solar radiation (MADSR) in the location where the PV system will be installed. However, the MADSR data have been only measured in 24 regions in South Korea. Accordingly, it is difficult to accurately estimate the electricity generation of the PV system. Therefore, this study aimed to develop a framework for the mapping of the MADSR using the finite element method and the kriging method. To achieve this objective, this study was conducted in three steps: (i) collection of the MADSR data from Korea Meteorological Administration; (ii) estimation of the MADSR at unmeasured locations using the finite element method; and (iii) development of the MADSR map using the kriging method. To verify the feasibility of the developed MADSR map, this study conducted a case study. The developed MADSR map could be used to determine the optimal installation location with the highest potential of the PV system.

Keywords: Monthly Average Daily Solar Radiation, Photovoltaic System, Finite Element Method, Kriging Method.

ID-175

TGA Kinetic Parameters in Gasification of Sewage Sludge From Cantabria (Spain)

J. Fernández[a,b], J. Fernández[a], M.J. Renedo[a]

[a] Departamento de Química e Ingeniería de Procesos Recursos. ETSIIyT Universidad de Cantabria. Avda de Los Castros s/n, Tel: 34-42-202026.

39005 Santander SPAIN

E-mail: josefa.fernandez@unican.es

Abstract

There is considerable interest in new ways to dispose of waste using thermal conversion technologies, particularly gasification and pyrolysis, as a Waste to Energy technologies, being the kinetic studies a preliminary stage before the industrial application. In this work, kinetics parameters of sewage sludge from the thermal drying plant of Reocín (Cantabria, Spain) have been determined in an atmosphere simulating gasification (80-20 N2/air). This plant treats the sludge from the main WWTP of Cantabria.TG data were obtained at a flow rate of 50 ml/min and heating rates from 10 to 100ºC/min, to know the influence of this variable. The model selected considers independent parallel reactions and the overall reaction as the sum of them all. The order can be estimated by Coats and Redfern approximation method, widely used and accepted for the calculation of kinetics parameters. An overall fit was carried out, selecting the order that achieved the best values of the coefficient of correlation (R2) and calculating for this the apparent activation energy. Because DTG values distinguish different steps in the thermal processes, the model was applied to each interval of temperature. The order of reaction and the activation energy obtained with the loss of weight in the interval of 200 to 600ºC achieved a better adjust than in the overall fit. Results showed that the activation energy increases slightly with the heating rate, and the pre-exponential factor decreased slightly, due to the influence of transport phenomena. These kinetic data are of practical interest for the design of these processes and for decision-making in the proper sludge management.

ID-176

Conductimetric Titration to Analyze Nafion® 117 Conductivity

Héctor José Fasoli[a,b], María José Lavorante[a], Juan Isidro Franco[a]

[a] Departamento de Investigación y Desarrollo de Energías Renovables (CITEDEF-EST), San Juan Bautista de La Salle 4397, B1603ALO, Provincia de Buenos Aires, Argentina. (54-11)4709-8100, ext. 1472,

[b] Escuela Superior Técnica del Ejército General Manuel Nicolás Savio (EST), Cabildo 15, C1426AAA, Buenos Aires, Argentina.

E-mail: mlavorante@citedef.gob.ar, mjlavorante@gmail.com

Abstract

Nafion® membrane presents good chemical, thermal and mechanical stability and excellent prothonic conductivity when the material is previously well-hydrated. This type of perfluorsulphonic acid membrane is widely used in a great variety of devices, being mainly applied in the field of renewable energy, for fuel cells and electrolyzers of polymeric electrolyte. Focusing on electrolyzers, it is well known that nowadays, they represent the most promising method for the production of hydrogen, being a well established, robust and easy to use technology. Having the purpose of using Nafion® membrane as a separator in alkaline water electrolyzers, the aim of this study is to analyze its behaviour under alkaline and salt conditions. Samples of Nafion® 117 membrane in their original state and samples submitted to a previous cleaning treatment and specific hydration treatment were used. This hydration treatment assured an amount of molecules of water per sulphonic acid group (λ=17-20). The ionic exchange rate between the hydrogen ion of the sulphonic group of Nafion® membrane and the sodium and potassium cations present in the acqueous solution were studied. The chemical kinetics of the reaction was determined with the purpose of establishing the times to carry out conductimetric titration of the membrane using sodium and potassium hydroxide and the same cations in their chloride form as titrates. Preliminary results show that alkaline hydroxides in the solution present a first order reaction kinetics and similar exchange rate. Chloride salts also present a similar exchange rate .

Key words: Nafion® 117, Conductivity of Acqueos Solution, Conductimetric Titration

ID-177

Numerical Study of Latent Thermal Energy Storage in Shell-and-Tube Configuration

Bechiri Mohammed[a,b], Mansouri Kacem[a],

[a] Energy and Mechanical Engineering Laboratory, University M. Bougara, Boumerdès, 35000, Algeria
E-mail: bechiri_med@yahoo.fr

Abstract

A thermal energy storage system in a tube of Phase Change Material (PCM), with laminar fluid flow inside a duct, was numerically studied. The melting and solidification of the PCM was solved numerically by using the enthalpy method with adopting the finite difference scheme for both PCM and heat transfer fluid (HTF). The axial heat conduction in the PCM wall and the HTF is considered. The effects of various parameters on the storage system was studied and treated; The charging/discharging process is investigated in terms of liquid–solid interface position liquid fraction, total heat transmitted to PCM and thermal storage efficiency for various HTF working conditions.

Keywords: Latent Heat Storage, Enthalpy Method, Shell-and-Tube Configuration.

ID-178

Analytical Solution of Solidification and Melting Characteristics of PCM inside Cylindrical Enclosure

Bechiri Mohammed[a,b], and Mansouri Kacem[a]

[a] Energy and Mechanical Engineering Laboratory, University M. Bougara, Boumerdès, 35000, Algeria
E-mail: bechiri_med@yahoo.fr

Abstract

Phase change material encapsulated inside cylindrical enclosure is analyzed for solidification and melting process with considering transient term in the governing heat equation. The melting and solidification of the paraffin as PCM was solved analytically by using the **E**xponential **I**ntegral **F**unction and variable separation technique. Transient interface positions is predicted and compared with literature to validate the analytical results, the comparison show a good agreement. The charging/discharging process is investigated in terms of liquid–solid interface position liquid fraction, total heat transmitted to PCM and thermal storage efficiency for various working conditions. The effects of various parameters on the storage system was studied and treated.

Keywords: Energy Storage, Latent Heat, Cylindrical Enclosure, Melting and Solidification

ID-179

Lattice Boltzmann Simulation of Density Driven Natural Convection in CO_2 Sequestration Phenomena

Abdelmalek Atia[a,b], Kamal Mohammedi[b]

[a] Univ. El-Oued , LEVRES Lab, Algeria
[b] Univ. Boumerdes, LEMI Lab, Algeria
E-mail: abdelmalek-atia@univ-eloued.dz

Abstract

Global warming is concluded to the excessive emission of carbon dioxide (CO_2). A good long-term solution for this problem is geological CO_2 sequestration, which is the capture and storage of enormous amounts of CO_2 in underground reservoirs of brine or oil/gaz in order to reduce CO_2 build up in the atmosphere. In this paper, we use lattice Boltzmann method for simulate natural density-driven convection in a cavity saturated by saline aquifers in order to predect some results related to geological CO_2 sequestration phenomana like mass transfert between brine-CO_2, effect of Rayleigh on different physical parameter like velocity and concentration profile.

Also we try to compare these results by other existed in previous researches in order to show the applicability of lattice Boltzmann method for this genre of problems.

Keywords: Lattice Boltzmann Method, Natural Convection, CO_2 Sequestration, Brine, Mass Transfer.

ID-180

A Detailed Modelling, Optimisation and Evaluation Process for a 3 kWp, 50 Hz, 3x 380V Regulated Voltage, Stand Alone Photovoltaic Power Supply

Khelif Messaoud[a,b], M'raoui Abdelhamida[a], Hassaine Linda[a]

[a] Centre de Développement des Energies Renouvelables
CDER, 16340, Algiers, Algeria
E-Mail: m.khelif@cder.dz

Abstract

As a synthetic work, this paper deals with the complete design process, in a Matlab/Simulink environment, of the entire photovoltaic energy conversion system, consisting of a standard stand alone, (50Hz, 3x380 Veff phase to phase) electrical power supply (3 kWp). Starting from the basic schematic of an off-grid PV system, the first step was to identify the main external electrical characteristics of each stage, in order to build up a homogenous conversion chain, responding to the fixed objective. This is done without ignoring many of the practical sizing constraints to make the final design as near as possible to its detailed and planned realizable configuration. A progressive modelling process is then inaugurated with the chosen structure of the PV array. As a result, the external established characteristics of the latter are presented in presence of the main field perturbations such as solar irradiance intensity, temperature and shading variations. A maximum power point tracking stage (MPPT), based on the "perturb & observe" (P&O) as a control strategy of a boost DC-DC converter is then introduced, implemented and optimised. Its behaviour is investigated under a multitude of the various working conditions quoted above, along with the load constraints which consist, at this level, of a battery pack mainly sized to fulfil DC bus voltage considerations. Significant results in this scope are presented, before introducing a three phase inverter, which direct control circuits are based on the analog PWM technique. An output voltage regulation loop is then designed to assure optimum static and dynamic performances in presence of the main user ac load perturbation profiles. At the end, significant and realistic operating conditions were introduced to evaluate the overall performances of the installation as a whole, and some of the most representative results are presented and discussed.

Keywords: Modelling, Photovoltaic Power Supply, PV

ID-181

Effect of Polyacrylic Acid-Co-Polybutyl Acrylate Gel Electrolyte on the Efficiency of Natural Indigo Sensitized Solar Cell with ZnS Quantum Dots

Rathanawan Magaraphan[a,b], Pensiri Silakul[a], Warunya Junhom[a]

[a] Petroleum and Petrochemical College, Chulalongkorn University, Bangkok 10330, Thailand
Email: rathanawan.k@chula.ac.th

Abstract

Organic dye sensitized solar cell (DSSC) has been recently studied with aim to use the natural dyes instead of synthesized dye due to the expensive cost. Although it is suffered that natural dyes provide much lower efficiency and stability than the synthesized ones, it is more convenience to find and produce natural dyes, especially “indigo” which is commercially available for textile industries.

In this work, zinc sulfide (ZnS) quantum dot (QD) was used as a co-sensitizer with indigo dye and with the synthesized polymer gel electrolyte to enhance natural dye solar cell performance. The ZnS QD was prepared by dipping process. The content of ZnS QD was dependent on dipping time. From spectroscopy study, it was found that ZnS QD showed absorption and emission bands at 260 and 385 nm suitable to use with ZnO wurtzite semiconductor nanoparticles and indigo dye. X-ray diffraction showed ZnS QD having also wurtzite structure. After fabrication of indigo-ZnO sensitized solar cell with polyacrylic acid-co-polybutyl acrylate (PAA-co-PBuAc) gel electrolytes of various content of PAA-co-PBuAc, the conductivity increased initially with content of the copolymer gel and became steady at 80%monomer content with the value of 0.45 mS/cm. The solar cell characteristics and efficiency were measured. It was found that the maximum efficiency of this DSSC was 0.00237% at copolymer content of 90:10 mole ratio of acrylic acid to butyl acrylate. The PAA-co-PBuAc gel electrolyte DSSC could be used longer than liquid electrolyte DSSC.

ID-182

Composite Materials Based Electrospun Porous Carbon Nanofiber for Capacitive Desalination

Jianyun Liu[a,b], Shiping Wang[a], Le An[a], Haojie Pan[a]

[a] College of Environmental Science and Engineering, Donghua University, Shanghai 201620, China Tel: +86-21-67792381

Email: jianyun.liu@dhu.edu.cn

Abstract

The lack of fresh water is one of the most serious problems for human beings in the 21st century. In order to generate fresh water from sea water and brackish water, various desalination methods have been researched and widely applied for water desalination such as distillation, electrodialysis, reverse osmosis, activated carbon adsorption, ion exchange method, etc. Capacitive deionization (CDI) technology is becoming increasly attractive as an alternative desalination method due to low energy consumption, high water recovery rate, easy operation with no secondary pollution and the renewable characteristic of the electrode.

The high capacitive and high conductive electrode materials in CDI setup are needed in order to enhance the accumulation of ions and decrease energy consumption. Electrospun technique is very suitable for carbon nanofiber material fabrication with high specific surface area and conductivity. By adjusting the composition of the polymer solution, the fibers with different structure and morphology can be obtained. In this paper, the self-sustainable meso/micro-porous carbon fibers were fabricated by mixing different additives such as inorganic salts ($ZnCl_2$, ZnAc) or amorphous polymers PMMA in the polyacrylonitrile solution as pore-forming components, followed by carbonization. The pore size and density can be tuned by adjusting the ratio of the additives. Cyclic voltammetry experiment confirmed that the specific capacitiance of the carbon fiber has a significant increase compared with the pure PAN drived carbon fiber. The capacitive desalination performance has a great improvement with the salt removal amount 5 times higher than pure PAN based fiber. It demonstrates that the mesoporous carbon fiber electrode based supercapacitor is potential for water softing and brackish water desalination application.

Keyword: Carbon Nanofiber, CDI, Electrosun, Desalination

ID-183

High-Efficiency CIGS Thin-Film Solar Cells

Abderrahmane Belghachi[a,b], Naima Limam[a]

[a] The Laboratory of Semiconductor Devices Physics, Physics Department, University of Béchar, Béchar, Algeria
E-mail: abelghachi@yahoo.fr

Abstract

The efficiency of Copper Indium Gallium Diselenide (CIGS, $Cu(In_{1-x}Ga_x)Se_2$) solar cell has been steadily increasing over this last decade to reach a record value of 20.04% by the year 2013 complemented with a noticeable cost reduction. The observed improvement in performance could be attributed to the advance in growth and production techniques. The most attractive property of the SIGS compound is the ability to tune its energy band gap from 1.04 eV ($CuInSe_2$) up to 1.68 eV ($CuGaSe_2$) by variation of Ga fraction leading to a best match to the solar spectrum. In the present work we demonstrate the improvement to be gained if the SIGS band gap is optimized. First, the energy band gap of CIGS absorber layer was varied uniformly to find the optimal Ga content giving the maximum energy conversion efficiency, taking into account the metal contact work function. The maximum efficiency is about 20.92 % for a band gap of 1.43 eV (x = 0.7), which is close to the Shockley Queisser limit. In the second set of investigations, a graded band gap absorber is examined. In this simulation several configuration are examined the maximum efficiency obtained is 20.37 % corresponding to a graded absorber with Ga decreasing composition from 0.8 to 0.5.

ID-184

Reactivity of Mg-Ni Mixed Hydroxide Synthesized by Mechano-chemical Method for Chemical Heat Storage

Junichi Ryu[a,b], Yuki Hara[a], Yukitaka Kato[a]

[a] Research Laboratory for Nuclear Reactors 2-12-1-N1-22, O-okayama, Meguro, Tokyo,
Tokyo Institute of Technology 152-8550 JAPANTel: +81-3-5734-2964
E-mail: cyliu@nr.titech.ac.jp (J. Ryu)

Abstract

The application of heat storage technologies to harnessing waste from industrial processes is a potentially beneficial method for reducing energy consumption. Chemical heat storage technologies are particularly desirable in view of their heat storage density. Our group previously proposed a chemical heat pump system based on the reaction between magnesium oxide and water vapor. In this system, the dehydration of magnesium hydroxide, which functions as the heat storage operation, proceeds thermodynamically at around 270°C under 1 atm of water vapor; however, for practical applications, a temperature above 350°C is required. Consequently, this system must be modified to achieve heat utilization below 300°C, corresponding to the temperature region at which a large amount of waste heat is emitted from some industrial processes such as garbage-disposal facilities. In this work, the reactivity for dehydration and hydration of Mg-Ni mixed hydroxides synthesized by mechano-chemical method were investigated to develop a new material for chemical heat storage. Magnesium hydroxide and nickel hydroxide were used as precursor of the mixed hydroxides. The reactivity between the sample and water vapor was measured by thermo gravimetric (TG) method, using a thermo balance. These samples were characterized by FT-IR. Hydration conversion of Mg-Ni (9:1) prepared by mechano-chemical method was 39.5% at the hydration temperature of 110°C and vapor pressure of 57.8 kPa, after dehydration at 300°C. This value was higher than $Mg_{0.9}Ni_{0.1}(OH)_2$ prepared by co-precipitaion method. It is suggested that the difference of hydration reactivity between both samples was due to the difference of particle size of samples.

ID-185

Various Design of Windings for Optimizing Winding Capacitance in High Frequency Micro-Fabricated Transformer

M.Zhafran.Za[a,b], M.Isab[a], U.Hashimc[b], A.Rahim A.R.d[b]

[a]School of Electrical System Engineering (PPKSE, 02600 Arau, Perlis, Malaysia), University Malaysia Perlis (UniMAP)
[b]Institute of Nanoelectronic Engineering (INEE), University Malaysia Perlis (UniMAP), 01000 Kangar, Perlis, Malaysia
Tels: +6012-4989801, +6019-4780435, +6019-4008844, +6010-5253155
Emails: zhafranzakariya@gmail.com, muzamir@unimap.edu.my, uda@unimap.edu.my, abdulrahim@unimap.edu.my

Abstract

Micro-fabricated transformer is a light weight device obtained from silicon oxide growth method with coils of copper traces on the winding section which provides high switching frequency operation in most of power electronic applications such as inverter and power converter. Generally, it has similar parasitic component compared to wire wound transformer which consists of mutual and leakage inductance, ac and dc resistance, and winding capacitance. There are two types of winding capacitance in the transformer which are inter-winding and intra-winding capacitance which are being discussed in this paper. Variety technique of designing winding transformer is implemented and simulated using COMSOL multiphysics software in order to analyze the results of winding capacitance produced between the coil and between the winding layers.

Keywords: Winding Capacitance, Micro-fabricated, Transformer, COMSOL, Software, Coils

ID-186

Analysis of Leakage Inductance in High Frequency Micro-Fabricated Transformer

M.Zhafran.Za[a,b], M.Isab[a], U.Hashimc[b], A.Rahim A.R.d[b]

[a] School of Electrical System Engineering (PPKSE), University Malaysia Perlis (UniMAP), 02600 Arau, Perlis, Malaysia
[b] Institute of Nanoelectronic Engineering (INEE), University Malaysia Perlis (UniMAP), 01000 Kangar, Perlis, Malaysia
Tels: +6012-4989801, +6019-4780435, +6019-4008844, +6010-5253155
Emails: zhafranzakariya@gmail.com, muzamir@unimap.edu.my, uda@unimap.edu.my, abdulrahim@unimap.edu.my

Abstract
This paper discusses about the impact of frequency increment over leakage inductance produced by the coils of windings. Micro scaled 1:1 transformer is designed using silicon oxide growth method and being simulated using COMSOL multiphysics software. In high operating range of frequency, up to MegaHertz, magnetic behavior presented in between of the coils of copper trace and core is unpredictable due to decreasing size of copper trace and increasing hysteresis loss by the core. In order to obtain the impacts, various ranges of frequencies is applied during the simulation and the results are compared for the ideal range of frequencies.

Keywords: Leakage Inductance, High Frequency, Micro-transformer, Copper Trace, Software, COMSOL

ID-187

A Review on the Development of Wind Energy in Maharashtra, India

Ravindra B Sholapurkar[a,b], Yogesh S Mahajan[b]

[a] Department of Chemical Engineering, Dr. Babasaheb Ambedkar Technological University, Lonere, Tal Mangaon, Dist. Raigad, Maharashtra, India, Tel: +91 97 02 083888

[b] Professor, Dr. Babasaheb Ambedkar Technological University, Lonere, Tal Mangaon, Dist. Raigad, Maharashtra, Maharashtra, India, Tel.: + 91 9421939941,

E-Mail: rbsat68@gmail.com ysmahajan@dbatu.ac.in

Abstract

Now-a-days, due to growing population; socio-economic development and economic growth, energy is the most essential issue. In the world, about 86.4% of energy produced is only by fossil fuels. Worldwide, India is in the 5th position to generate maximum amount of energy by the wind sources. Last five years growth in the wind energy in India is about 16%. This growing Indian wind energy market is compared to the world's scenario and also with the State of Maharashtra in India which is in the 2nd position in India to produce maximum amount of energy by wind sources. The main objective of the work is to compare the Maharashtra state wind generation and development with the India and world's wind energy scenario in detail backed up by data base. The study also includes the detail of Maharashtra state wind energy and other sustainable energy progress in the last two years with prediction of future or three years, considering wind project installations, their make, capacity of turbine, total capacity, declared wind sites, wind power density at different altitude. This also covers the potential wind sites with wind monitoring stations with wind velocity. The significance of this work is to explore the wind potential and to facilitate the reader to judge the upcoming market in this area also for possible investment in wind power generation.

Keywords: Wind Energy; Wind Potential Areas; Wind Power Projects and Operators

ID-188

Computational Screening of Dual Cation Metal Ammine Borohydrides

Arash Emdadi[a,b], Yusuf Kışlak[a], Samet Demir[b], Adem Tekin[b]

[a] Energy Institute, Istanbul Technical University, 34469 Maslak Istanbul Turkey.

[b] Informatics Institute, Istanbul Technical University, 34469 Maslak Istanbul Turkey.

E mail: emdadi.arash@gmail.com

Abstract

Hydrogen is one of the promising alternatives for the replacement of fossil-fuels. One of the major bottlenecks preventing its widespread commercialization for on-board applications is to find the most suitable storage medium. Metal borohydrides are one of the classes of solid materials studied intensively to store hydrogen due to their high theoretical hydrogen capacities. However, their high thermodynamic stability is one of the major problems limiting their usage. The requirement of high decomposition temperature can be lowered by the inclusion of ammonia. The resulting new complex containing both borohydrides and ammines is called as Ammine Metal Borohydrides (AMBs). However, some of the AMBs have insuppressible release of ammonia during the dehydrogenation. This can be solved by the inclusion of a second metal atom into AMBs leading to dual-cation AMBs with a general formula of $M_1M_2(BH_4)_y(NH_3)_x$. Sun et al. [1] have synthesized one dual-cation AMBs ($LiMg(BH_4)_3(NH_3)_2$) with desired properties e.g., decomposition occurs below 200℃ and no release of ammonia.

In this study, a computational screening using periodic density functional theory was performed to find promising dual-cation AMBs ($M_1M_2(BH_4)_y(NH_3)_x$ with M_1=Li, Na, K, M_2=Mg, Ca, Sr, Zn, Mn, Ni, y=3, x=2, 3, 4, 5, 6). The screening has been accomplished using template crystal structures generated by CrystAl Structure Prediction via Simulated Annealing (CASPESA) method [2-7]. Formation, alloying and simple decomposition reactions were employed for the evaluation of the complexes.

Keywords: Hydrogen, Borohydrides, AMBs,

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ID-189

H_2 and CO Production by Methane Dry Reforming over Layered Double Hydroxides Derived Catalysts

Radosław Dębek[a,b], Anna Gramatyka[a], Monika Motak[a], Teresa Grzybek[a], Patrick Da Costa[b]

[a]AGH University of Science and Technology, Faculty of Energy and Fuels, Al. A. Mickiewicza 30, 30-059 Kraków, Poland, tel. +48 12 617 21 18;

[b]Sorbonne Universites, UPMC Paris 6, Institut Jean le Rond D'Alembert, UMR CNRS 71900, Saint-Cyr l'Ecole, 78210, France

E-mail: debek@agh.edu.pl

Abstract

The reaction of dry reforming of methane (DRM) might become of a great importance in the near future since it is one of the methods of chemical CO_2 utilization and to highly valorize natural gas and biogas. The reaction consumes two greenhouse gases, producing mixture of hydrogen and CO. The process has not yet been developed on the industrial scale mainly because of the lack of active and stable catalyst.

The aim of this work was to synthesize hydrotalcite based catalysts with different molar ratios of Ni^{2+}/Mg^{2+}, subsequently characterize them by XRD, FTIR, H_2-TPR, TEM, CO_2-TPD, S_{BET} and finally compare their catalytic activity in the DRM reaction at three temperatures (550, 650 and 750°C). From the series of catalysts, firstly tested at 550°C, the three best samples were tested at higher temperatures (samples with the nickel content ca. 20 and 50 wt.%). The average conversions of CH_4 and CO_2 at 550, 650 and 750°C were equal to 50 and 40%, 75 and 70%, 90 and 91%, respectively. The catalysts did not show decrease in activity during 5h tests, although the coke deposits were observed in XRD diffractograms of spent catalysts. The obtained values of H_2/CO molar ratios were strongly depended on the reaction temperature. The excess of hydrogen in the products of the reaction was observed with the decrease in temperature, indicating that the side reactions, such as CH_4 decomposition, are well developed at lower temperatures. The obtained results clearly indicate that hydrotalcite-derived materials are promising catalysts for DRM process.

ID-190

Synthesis of High Performance Electron Receptor MCB as PCBM's Alternative

Yuliang Li[a,b]

[a] Beijing National Laboratory for Molecular Science (BNLMS), CAS Key Laboratory of Organic Solids, Institute of Chemistry, Chinese Academy of Sciences, Beijing, 100190, P. R. China
E-mail: ylli@iccas.ac.cn

Abstract

Methyl 4-C_{61}-benzoate (MCB) series fullerene materials with low cost and high yield, including monoadduct (MCBM) and bisadduct (MCBB) compounds, were synthesized and their photophysical and electrochemical properties were investigated. Fabricated photovoltaic devices based on both two materials showed power conversion efficiency of 3.48% and 0.16%, respectively. The MCBM exhibited higher PCE relative to PCBM's 3.40%. The LUMO energy level of MCBM was 0.03 eV lower than that of PCBM, and it was facile to be synthesized by two steps with high yield of 55% from low-cost industrial commercials, whose molecular weight was 868.0 g/mol. This work supplied new route to design fullerene materials as PCBM's alternative.

Keywords: MCB, MCBB, PCMM, Photovoltaic, Electrochemical

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ID-191

Production and Use of Bioethanol in Turkey: Current Situation and Perspectives

Gülden Bölük[a], Figen Ara[b]

[a]; Akdeniz University Department of Economics, DumlupinarBulvari, Kampus, 07058, Antalya
[b]: 3AR Energy&Chemical, KizilirmakMah. 1446.Cad. 11/37 Cukurambar/Ankara
E-mail: arfigen@gmail.com, guldenboluk@akdeniz.edu.tr

Abstract

Turkey like many countries, tries to foster the renewable energy sources and ensures some incentives such as tax exemption, feed-in tariff, investment incentives etc. Moreover legislation activities in renewable energy market have intensified over the past decade. Turkish Energy Market Regulatory Agency (EMRA) issued a new regulation for biofuel blending which will be mandatory starting from 2014 and 2015, respectively for bioethanol (2%) and biodiesel (1 %) in 2011. EMRA, removed this mandatory blending for biodiesel in June, 2013. For bioethanol, however, mandatory blending is still in operation.
The aim of this article is to examine the current situation and potential of bioethanol and evaluate the impacts of the bioethanol blending mandate in the economy.
The established production capacity of bioethanol reached 184 million m^3 as of 2010, of which around 56 percent is run by a sugar beet producer cooperative union (Pankobirlik). Taking into account the blending ratios and fuel consumption data, bioethanol requirement is calculated to in 2014. When the EU criteria are implemented, 254 thousand tons bioethanol will be required. Based on the mandatory blending ratio 2%, 50.8 million liters of blending will result roughly 307.4 thousand cubic meters of oil replacement and this means a US$ 255.2 million reduction in oil import. Moreover, biofuels production will create 3,235 job possibilities and 119.500 tones CO2 saving. Compared to the biodiesel ethanol production from sugar beet seems more feasible and might be sustainable in Turkey.

Key-words: Biofuels, Bioethanol, Bioenergy Policy.

ID-192

Synthesis of Novel Acceptor Molecules of Mono- and Multiadduct Fullerene Derivatives for Improving Photovoltaic Performance

Huibiao Liu[a,]

[a] Beijing National Laboratory for Molecular Science (BNLMS), CAS Key Laboratory of Organic Solids, Institute of Chemistry, Chinese Academy of Sciences, Beijing, 100190, P. R. China

E-mail: liuhb@iccas.ac.cn

Abstract

We have successfully synthesized and separated a series of tert-butyl 4-C61-benzoate (t-BCB) organofullerenes, including monoadduct, diadduct, and triadduct compounds, and investigated their photophysics, electrochemistry, thermal properties, and high-performance liquid chromatography analysis. The photovoltaic devices were fabricated based on monoadduct, diadduct, and triadduct products, and the devices based on them exhibited power conversion efficiencies of 2.43%, 0.48%, and 1.68%, respectively. This was the first time to study the dependent relationship on the device performance and the different isomer numbers.

Keywords: Photovoltaic Performance,

ID-193

Synthesis and Photovoltaic Properties of Novel Monoadducts and Bisadducts Based on Amide Methanofullerene

Yongjun Li[a,b]

[a]Beijing National Laboratory for Molecular Sciences (BNLMS), CAS Key Laboratory of Organic Solids, Institute of Chemistry, Chinese Academy of Sciences, Beijing 100190, P. R. China

E-mail: liyj@iccas.ac.cn

Abstract

Four new [6,6]-phenyl-C61 and C71 butylsaure n-dibutyl amides (PCBDBA) with mono- and bis-adduction on C60 and C70 cages, respectively, have been synthesized as models to study the effect of the mono- and bisadduction on fullerene cages on device performance when used as electron acceptors with the donor of regioregular P3HT in bulk heterojunction organic photovoltaics (BHJ-OPV). The optoelectronic, electrochemistry, and photovoltaic properties of these mono- and bis-products were fully investigated. The best device performance of these fullerene derivatives were obtained from the two monoadducts with power conversion efficiency (PCE) of 1.77% for C60 derivative and 1.90% for C70 derivative, respectively, which are close to PCBM's 2.43%. It is demonstrated that the products were good models to study the structure performance of the monoadduct and bisadduct fullerene materials for revealing the relationship between C60 and C70 monoadduct and bisadduct derivatives and providing the logos on how to design fullerene materials for this purpose. It may have great potential for further applications on optoelectronic devices based on π-conjugated conducting polymers in various fields.

Keywords: PCBDBA, BHJ-OPV, Photovoltaic, Electrochemical, PCBM, C20, C60

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ID-194

Safe Management of Nuclear Reactors–towards Sustainability

Andrejs Dreimanis
Radiation Safety Centre of the State Environmental Service,
Rupniecibas Str.23, Riga LV-1045, Latvia
Phone: +371 670884288, e-mail: andrejs.dreimanis@rdc.vvd.gov.lv

Abstract

An interdisciplinary approach to socio-technical optimization of nuclear energy management is proposed, by recognizing a) the rising requirements to nuclear safety being realized using fast nuclear reactors, b) the actuality to maintain and educate qualified workforce for fast reactors, c) the reactor safety and public awareness as the keystones for improving attitude to implement novel reactors.

Knowledge management and informational support firstly is needed in:

1) technical issues**:** a) nuclear energy safety and reliability,
b) to develop safe and economic technologies;
2) societal issues: a) general nuclear awareness,
b) personnel education and training,
c) reliable staff renascence, public education, stakeholder involvement,
e).risk management.

The **key methodology -** the principles being capable to manage knowledge and information issues:

1) a self-organization concept,
2) the principle of the requisite variety.

As a primary source of growth of internal variety is considered information and knowledge.

Following problems are analyzed indicating the ways of their further solution:

a) threats in peaceful use of nuclear energy,
b) basic features of nuclear risks, including terrorism,
c) human resource development: basic tasks and instruments,
d) safety improvements in technologies,
e) advanced research and nuclear awareness improvement

There is shown: public education, social learning and the use of mass media are efficient mechanisms forming a knowledge-creating community thereby reasoning to facilitate solution of key socio-technical nuclear issues: a) public acceptance of novel nuclear objects, b) promotion of adequate risk perception, and c) elevation of nuclear safety level and adequate risk management resulting in energetic and ecological sustainability.

ID-195

Numerical Analysis of the Influence of Ventilation on the Indoor Air Quality within a Room

L. Koufi [a, b], Z. Younsi [a, b], Y. Cherif [a], H. Naji [a]

[a] Laboratoire Génie Civil et géo Environnement, Lille Université Nord de France & Université d'Artois, Technoparc Futura, F-62400 Béthune, France
[b] Ecole des Hautes Etudes d'Ingénieur-HEI,13 Rue de Toul, 59800, Lille, France
E-mail adress: hassane.naji@univ-artois.fr

Abstract

A healthy indoor environment is of paramount importance for the quality of life and economy. In fact, nowadays, the occupants spend most of their time indoors (home, school, office, transport, shops, etc.). In France, the presence of a person in a room is estimated at 22 hours per day. Therefore, the quality of the indoor environment is an essential element of life, including health. In this context, indoor air renewal must be sufficient to ensure good air quality. However, focus on building energy consumption has led experts to adopt various ventilation systems to reduce the losses that can result from the breakdown. Her, we intend to assess the performance of ventilation systems in terms of these two criteria both experimentally and numerically. This study aims to provide guidelines to master the inlet and outlet air flows in order to ensure a better air quality.
Measures of indoor air quality have been performed in habitable houses with different ventilation systems, namely single flow and double flow Controlled Mechanical Ventilation (CMV). These have been conducted to evaluate in situ the actual operating conditions of residential ventilation. However, infiltration of air inside buildings and the behavior of pollutants are difficult to master because of the presence of individuals, defects sealing and opening windows.
In terms of computations, the analysis of ventilation, heat and mass transfer inside buildings is based on solving the averaged Navier-Stokes equations. A ventilated cavity is usually the way to model a ventilated room as a first approximation in order to study the thermal behavior and the quality of the air inside. The experimental results show that the housing low energy buildings equipped with the double flow CMV evacuates quickly the carbon dioxide contaminant (CO_2). As for numerical results, they show that one obtains better thermal performance of a comfort point of view and air quality view.

Keywords: Air Quality, Ventilation, Energy Buildings, Contaminant, Simulation

ID-196

Improved Long Term Stability of Organic Solar Cell by UV Protectable Metal-Oxide Thin Film

Byoung-Ho Kang[a], Sang-Won Lee[b], Jae-Sung Lee[b], Hyun-Min Jeong[b], Sai-Anand Gopalan[b], Kwang-Don Lee[b], Sae-Wan Kim[b], Ju-Seong Kim[b], and Shin-Won Kang[a,b]

[a]Center for Functional Devices Fusion Platform, Kyungpook National University, 1370 Sankyuk-dong, Bukgu, Daegu 702-701, Republic of Korea

[b]School of Electronics Engineering, College of IT Engineering, 1370 Sankyuk-dong, Bukgu, Daegu 702-701, Republic of KoreaTel: +82-53-950-6829

E-mail: swkang@knu.ac.kr

Abstract

Recently, various types of solar cells that can be used as substitutes for Si-based solar cells have been researched; these include compound semiconductor solar cells (CIS, CIGS), dye-sensitized solar cells (DSSCs), and organic solar cells (OSCs) [1-3]. Among them, OSCs based on conjugated polymer and fullerene compositions may offer simple and low-cost fabrication and could be applied to a variety of devices with good flexibility. It has also been reported that the efficiency was increased up to approximately 6% when the conjugated polymer and fullerene composition were formed to the bulk heterojunction. However, OSCs have limitations, including weakness against oxygen, humidity, and UV. These limitations lead to a short OSC lifetime and solar cell performance degradation. In order to apply OSCs to commercial products, these limitations must be overcome [4].

In order to reduce the efficiency drop rate and enhance the long term stability for OSC, we induced IGZO thin film on OSC which is UV protectable transparent metal oxide layer. The proposed device was fabricated after depositing IGZO on back side of OSC substrate and evaluation of the performance degradation during UV illumination was carried out. When UV was illuminated on OSC without IGZO thin film and with IGZO thin film, efficiency of OSC without IGZO thin film was decreased comparing the pristine sample. This result shows that IGZO thin film could be applied in the UV blocking film. If IGZO thin film was optimized, OSC has more stable from the sunlight including the UV radiation.

Keywords: Organic Solar Cell OSC, DSSC, CIS, CIGS, Thin Film

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ID-197

Hydriding of Zircaloy-4 Fuel Cladding

Besma Alouache[a], Omar Menchi[b], Fateh Mernache[b]

[a] Faculty of Physics' Physics Laboratory Materials, 66 Boulevard Said Touati, B.E.O Algiers, Tel: 0774459723

[b]Center for Nuclear Research Draria BP 43.Sebala. Draria Algiers 16050 Algeria, Tel: 0557288853

E-mail: balouache@hotmail.fr, menchiomar@yahoo.fr, fmernache@yahoo.fr

Abstract

The Zircaloy-4 is used as a structural element of the fuel assembly in nuclear reactors. Its interaction with hydrogen is very important. Indeed, during the oxidation process of zirconium, a part of the hydrogen generated diffuse into the material. The micrographic observation of a clad showed a significant amount of hydrogen that penetrated and lead into the saturation of the clad material and forming new phases called hydrides. These hydrides caused the fuel properties degradation and can even lead to clad breaking causing considerable damage.

The aim of this work is, in a first step, the artificial production of hydrides under the same operating reactor conditions (temperature and cooling rate) via the thermo-gravimetric analysis (TGA). Thereafter, the study of the temperature effects on the formation and growth of this phase. The results obtained in this study were promising, allowed us to define the maximum temperature before rupture of hydrided material. The micro-hardness tests showed the influence of hydrides on the mechanical properties of the material studied.

ID-198

Power Quality Comparison between Incandescent, Fluorescent and Compact Fluorescent Lamps

Mohd. Shafiul Islam [a], Noor Alam Chowdhury [a], Abdul Kader Sakil [a], Amith Khandakar [a], Atif Iqbal [a]

[a] Department of Electrical Engineering, College of EngineeringQatar UniversityDoha, Qatar
E-mail: mm092622@qu.edu.qa, nc095342@qu.edu.qa, as090099@qu.edu.qa, amitk@qu.edu.qa, atif.iqbal@qu.edu.qa

Abstract

One of the major electrical load on a utility grid is industrial, street and residential lightings. To enhance the energy efficiency and as a measure of energy conservation, incandescent lamps (IL) are replaced with the modern lights. Replacing incandescent lamps with compact fluorescent lamp (CFL) and fluorescent lamp (FL) is one of the measures taken by the authorities to reduce the energy consumption and enhance energy efficiency. Both the CFL and FL are the sources of harmonics as electronic circuits are used in for their ignition. These harmonic sources adversely affect other loads connected to the same bus. It also affects the grid in terms of high reactive power demand (due to poor power factor), distortion in currents and hence overall degrading the power quality. Power quality measurements such as power factor, voltage and current total harmonic distortion (THD), transient are done and reported in this paper. Different scenarios are considered with full and partial replacement of lamps and with different brands of lamps. A comprehensive comparison between incandescent, FL and CFL are made in terms of these power quality measurements. From the result analysis, it is noted that, the CFL consumes less active power than incandescent and FL. But, the THD is considerably higher in CFL than incandescent and FL. The simulation and experimental approaches are used in this work. Some significantly new results are obtained and the presented findings will help the users in choosing the right lamps and will help authorities making right decisions in energy regulations.

ID-199

Experimental Characterization of a Hydrogen-Metal Reactor Plate

Mohamed Houcine. DHAOU[a], Abdelamajid. Jemni[a], SASSI. Ben Nasrallah[a]

[a] Laboratoire d'Etudes des systèmes Thermiques et Energétiques (LESTE), ENIM, Avenue Ibn El Jazzar, Route de Kairouan, 5019 Monastir, Université de Monastir, Tunisia.

E-mail : dhaou_2000tn@yahoo.fr

Abstract

Metal hydrides offer the potential to store hydrogen at low temperatures and pressures with high volumetric efficiencies. The process of charging hydrogen into a metal powder to form the hydride is exothermic, where reaction-released heat must be quickly in order to maintain a rapid charging rate. An effective method for heat evacuation is to embed a heat exchanger within the metal hydride bed. If the heat released is not evacuated from the system, the resulting hydride temperature rise will reduce the hydrogen absorption rate. Hence, during the absorption process, hydrogen storage systems based on hydride materials must include the generated heat evacuation methods. The present work aim to size, design and fabricate a metal-hydrogen reactor plate. in order to study the hydrogen storage in a closed metal-hydrogen reactor. The effects of water cooling temperature (TF), hydrogen injection pressure (PH_2) and cooling fluid flow rate ($\dot{m}$) on the mass absorbed of hydrogen (H_2) are experimentally investigated and analyzed. Results show that the hydrogen absorbed mass by the $LaNi_5$ metal raise when TF decreases and / or when PH2 increases.. To do this, we must carry hydrogen in the vehicle and one of the safest and most effective means of doing this is metal hydride form. Experimental characterization of hydrogen-metal reactor filled with a mass of 30g $LaNi_5$ alloy for different conditions (cooling temperature, water and applied gas (H_2) flow pressure) will be investigated.

Keywords Hydrogen, Hydride Metallic, Temperature, Kinetic of Absorption

ID-200

Effects of Pd Loading and Precursor on the Catalytic Performance of Pd-MCM-41 Catalysts for Methane Oxidation

A. Gannouni[a], B. Albela[b], M. Saïd Zina[a], L. Bonneviot[b]

[a] Laboratoire de Chimie des Matériaux et Catalyse, Faculté des sciences de Tunis, Campus Universitaire, Tunis 2092, Tunisia.

[b] Université de Lyon, Institut de Chimie de Lyon, École Normale Supérieure de Lyon and CNRS, 46 Allée d'Italie, F-69046 Lyon, France. Tel: 0021652330332, 003347272839100216;

Email: anis.gannouni@gmail.com, laurent.bonneviot@ens-lyon.fr

Abstract

The role of palladium precursors and the preparation route in the catalytic properties of PdO/MCM-41 catalysts toward methane oxidation was investigated in this paper. The catalysts were prepared using palladium chloride and nitrate as precursors and the preparation routes employed were template-ion exchange (TIE) of MCM-41 with solutions of these precursors and the hydrothermal method, in which palladium acetylacetonate deposition is carried in surfactant solutions. All catalysts were characterized by a variety of physical techniques such as X-ray diffraction (XRD), N_2 physisorption, H_2 chemisorption, temperature programmed desorption of H_2 (TPR), ^{27}Al MAS-NMR and diffuse reflectance UV–visible spectroscopy. The results obtained suggested that the use of different palladium precursors and preparation routes played an important role on the properties of the catalysts, as palladium particle size, thermal stability of PdO and catalytic properties toward methane combustion. The use of bis(acetonitrile)palladium(II) chloride as precursor by the TIE method generated well-dispersed PdO particles on MCM-41. Regarding the PdO accessibility and the activity toward methane combustion, this catalyst also presented the highest accessibility and catalytic activity.

Keywords: Mesoporous; MCM-41; Palladium; Template Ion Exchange; Hydrothermal, Methane

ID-201

NEXAFS Study of the Influence of Nb Substitution for Co/Fe on Structural Stability of $Ba_{0.5}Sr_{0.5}Co_{0.8}Fe_{0.2}O_{3-\sigma}$ at Intermediate Temperatures

Yu.V.Egorova[1], T. Scherb[2], G.Schumacher[2], H.J.M. Bouwmeester[3], E.O.Filatova[1]

[1]Institute of Physics, St-Petersburg State University, St-Petersburg, Russia,
[2]Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Berlin, Germany,
[3]University of Twente, Enschede, Netherlands
Tel: +7 812 428-42-98, +49 (0)30 8062-42823, +49 (0)30 8062-42400, +31 53 489 2202
Email: Startjuli@gmail.com, tobias.scherb@helmholtz-berlin.de, schumacher@helmholtz-berlin.de
h.j.m.bouwmeester@tnw.utwente.nl, feo@ef14131.spb.edu

Abstract

Due to their good oxygen exchange performance, the highest oxygen permeation and mixed ionic and electronic conductivity $Ba_{0.5}Sr_{0.5}Co_{0.8}Fe_{0.2}O_{3-\delta}$(BSCF) oxides are potential candidates for solid oxide fuel cell (SOFC) application as a cathode material. However, at low and average temperatures BSCF suffers from a slow decomposition of a cubic phase into hexagonal phase and a Co and Ba depleted cubic phase, resulting in strong reduction of performance. One way to prevent decomposition of BSCF at intermediate temperatures is partial substitution of Nb or Zr for Co and Fe. In this work we discuss the possibility to stabilize the crystal structure of $(Ba_{0.5}Sr_{0.5})(Co_{0.8}Fe_{0.2})_{1-x}Nb_xO_{3-\delta}$ by partial substituting niobium for Co and Fe atoms. We are focusing on the study of structures with different content of Nb substitution to establish the amount of the Nb, which allows us to stabilize the crystal structure of BSCF at intermediate temperatures. All the studies were carried out using near edge X-ray absorption fine structure (NEXAFS) technique. It was established that only in the 10% Nb substituted BSCF samples Co atoms occur in oxidation state close to the Co^{2+} oxidation state and is characterized by presumably octahedral symmetry of the nearest environment atoms that allows phase stabilization. In all other structures Co atoms occur in Co^{2+}/Co^{3+} oxidation states. Also the possibility of phase stabilization by partial substituting of zirconium for Co and Fe atoms is discussed.

ID-202

The Improvement of the Electrical Resistivity of Soft Magnetic FeNiB Alloys to Reduce Eddy Current Losses and Improve Energy Efficiency in Transformers

P. Urban[a], F. G. Cuevas[b], J. M. Montes[a], J. Cintas[a]

[a] University of Seville, Department of Engineering and Materials Science and Transportation, ETSI, Camino de los Descubrimientos s/n, Seville, 41092, Spain,

[b] University of Huelva, Department of Chemistry and Materials Science, ETSI, Campus La Rábida, Carretera Palos s/n, Palos de la Frontera, Huelva, 21819, Spain

E-mail: purban@us.es, fgcuevas@dqcm.uhu.es

Abstract

An amorphous FeNiB alloy powders have been prepared by mechanical alloying in a high energy ball mill in argon atmosphere, consolidated by electrical resistance sintering process (ERS) and characterized by means of X-ray diffraction (XRD), optical microscopy, scanning electron microscopy (SEM) and electrical resistivity measurements. The results were compared with crystalline FeNiB alloy compacts, show that the amorphous phase improves the electrical resistivity of soft magnetic FeNiB alloys reducing eddy current losses, and consequently, improve energy efficiency in transformers.

ID-203

Modelling and Simulation of a Hydrogen Sstorage System with Metal Hydrides for on-Board Applications

Rocio Maceiras[a], Victor Alfonsin[a], Angeles Cancela[b], Angel Sanchez[b]

[a] Defense University Center, Escuela Naval Militar, Plaza de España 2, 36920 Marín, Spain
[b] Chemical Engineering Department, EEI, University of Vigo, 36310 Vigo, Spain Tel. +34 986818685
Email: valfonsin@cud.uvigo.es; rmaceiras@cud.uvigo.es; chiqui@uvigo.es; asanchez@uvigo.es

Abstract

One of the greatest problems from the implementation of hydrogen energetic systems is the difficulty to store, especially in on-board systems. This problem can be solved using metal hydrides. These systems have the following advantages: safety and good storage properties. In this paper, the simulation and modelling of a tank with a metal hydride alloy, which provides good performance under ambient conditions is performed. The metal hydride contained in the tank is $Ti_{0.98}Zr_{0.02}V_{0.43}Fe_{0.09}Cr_{0.05}Mn_{1.5}$. A two-dimensional model has been performed for the refuelling process (absorption) and the discharge process (desorption). For that, individual models of mass balance, energy balance, reaction kinetics and behaviour of hydrogen gas has been modelled. The model has been developed under Matlab / Simulink© environment. Finally, individual models have been integrated into a global model, and simulated under ambient conditions. With the aim to analyse the temperature influence on the state of charge and filling and emptying time, other simulations were performed at different temperatures.

ID-204

Heliostat Design for Solar Power Towers

Assoc.Prof.Dr. Okan BINGOL[a], Onur Mahmut Pişirir[b]

[a] Suleyman Demirel Universitesi Teknoloji Fakultesi Elektrik-Elektronik Muhendisligi, Isparta, +90(246)211 14 481
[b] Suleyman Demirel Universitesi Uzaktan Egitim MYO, Isparta, 90(246)211 35 15
E-mail: okanbingol@sdu.edu.tr, onurpisirir@hotmail.com

Abstract:

Nowadays, fossil fuels are being used widely and rapidly being depleted. Fossil fuels can not be saved and does not be recycled. Therefore, alternative energy sources are needed. The sun is a kind of endless alternative energy sources , there are many ways to be utilized. Our country has potential for solar energy projects that can be successfull. Renewable energy projects in solar energy systems are being emphasized and being manufactured.

As a system that being developed in recent years, solar power towers have been built in many countries and became successful. Electricity is being generated by steam or molten salt by focusing the sun . One of the important component of sytem is heliostats, that provides focusing.

In this study, a stepper motor controlled prototype was produced to be used in solar power towers and it was automaticly controlled by a computer that calculates sun's directions in every minutes. Researchers found multiple systems that will be used in the future were completed and results are obtained.

Keywords: Heliostat, Heliostat Control, Solar Power Tower

ID-205

Monitoring of Lactic Fermentation Process by Ultrasound

Besma Alouache [a], Tarek Boutkedjirt[a]

[a] Affiliation: U.S.T.H.B., Faculty of Physics, Physics of Materials Laboratory
66 Boulevard Said Touati, B.E.O Algiers, 0774459723
E-mail: basma_alouache@yahoo.fr, tarek_boutkedjirt@hotmail.com

Abstract

The non-destructive control by using ultrasound technique has become of great importance in food industry. In this work, ultrasound has been used for quality control and monitoring of the fermentation stages of yogurt, which is a highly consumed product. In the contrary to physico-chemical methods, where the measurement instruments are directly introduced, ultrasound has the advantage of being non-destructive and applied without contact, thus reducing the risk of contamination. Results obtained in this study by using ultrasound technique seem to be in a good agreement with those obtained by measuring the acidity by using a PH-meter instrument. This lets us to conclude that ultrasound may be an alternative method for a safety control of yogurt fermentation process.

ID-207

Solid Oxide Fuel Cell with Ni-Al Support

Solovyev A.A.[a], Rabotkin S.V.[b], Shipilova A.V.[b], Ionov I.V.[b], Kovalchuk A.N.[a], Borduleva A.O.[a]

[a] Tomsk Polytechnic University, 30 Lenin ave., Tomsk, 634050 Russia

[a] Institute of High Current Electronics, Siberian Branch of the Russian Academy of Sciences, 2/3 Akademichesky ave., Tomsk, 634055 Russia

Tel./Fax: +7(3822)491-651

E-mail: andrewsol@mail.ru

Abstract

Metal supported solid oxide fuel cells are considered as next generation of fuel cells. In this configuration, the use of metal support allows lowering the cost of fuel cell fabrication and provides improvement in durability. In this paper some results concerning the manufacture and research of metal-supported solid oxide fuel cells with YSZ (yttria-stabilized zirconia) electrolyte are presented. As a metal support the porous Ni-Al plates manufactured by self-propagating high temperature synthesis were used. The effect of synthesis conditions and composition of the Ni-Al samples on their properties were investigated. Solid oxide fuel cells with the structure of Ni-YSZ anode / YSZ electrolyte / LSCF cathode were fabricated by a combination of screen printing, magnetron sputtering and electron beam treatment. The cell performance was analyzed by current-voltage measurements during operation in the temperature range from 650°C to 800°C. The obtained results at such an early stage of research are very promising for the future development of this technology.

ID-208

Deformation Analysis and Monitoring for Extra High Hydropower of 305m

Huaizhi Su[a,c], Meng Yang[b,c], Chenfei Shao[c], Bin Ou[c], Zhiyun Guo[d]

[a] Ph.D. Professor, State Key Laboratory of Hydrology-Water Resources and Hydraulic Engineering, Hohai Univ., Nanjing 210098, China. (Corresponding author); E-mail: suhz@163.com; Telephone number: +8613851642258
[b] Ph.D. Candidate, National Engineering Research Center of Water Resources Efficient Utilization and Engineering Safety, Nanjing 210098, China.
[c] Ph.D. Candidate, College of Water Conservancy and Hydropower Engineering, Hohai University, Nanjing 210098, China;
[d] Undergraduate, Dayu College, Hohai Univ., Nanjing 210098, China.

Abstract

The engineering scale and construction difficulties for super large hydropower station engineering with the height of 305m are beyond people's imagination and many technical indicators have exceeded the current specification. Therefore, it is extremely complex and significant to explore deformation laws and set the deformation monitoring indicators for super large arch dams. A 3-D nonlinear finite element model was built based on the prototype observation data in the article and a method of the difference algorithm of incremental step was put forward, considering the deadweight and the external water loading, which accurately simulate the actual state of arch dam deformation. The load set and load effect set of extremely large arch dams were analyzed and the load set was comprehensively determined by deterministic function and physical inference method. The model factor coefficients were established on the basis of measured data and the load effect was predicted by some group of load set. Then, the deformation monitoring model of special high arch dams were established to diagnose the working state. Through deformation prediction analysis of typical measuring point compared to the Back Propagation Neural Network Method, deformation monitoring index and the better index setting approach are finally identified. The study conclusions are powerful references to the similar engineering investigation and analysis.

Keywords: Super Large Hydropower; 305m, Arch Dam Deformation, Deformation Monitoring

ID-209

Simulation of a Zero Emission Urban Hybrid Bus

Victor Alfonsin[a], Rocio Maceiras[a], Angeles Cancela[b], Angel Sanchez[b]

[a] Defense University Center, Escuela Naval Militar, Plaza de España 2, 36920 Marín, Spain, Tel. +34 986804942

[b] Chemical Engineering Department, EEI, University of Vigo, 36310 Vigo, Spain, Tel. +34 986818685

Email: valfonsin@cud.uvigo.es, rmaceiras@cud.uvigo.es, chiqui@uvigo.es, asanchez@uvigo.es

Abstract

Nowadays, automotive industry is trying to produce more efficient fuels, vehicles with low emissions and new drive system technologies due to heightened concerns over environmental and the importance of conserving fossil fuel resources. One promising technologies to receive attention is the hybrid electric vehicle, which consists of two or more energy sources that supply energy to electric traction motors that in turn drive the wheels.

This paper presents a toolbox for the simulation of a zero emission urban hybrid bus, which combines batteries and fuel cells. This type of vehicle performs predefined routes with a certain frequency, then they are an ideal option to the replacement of combustion engines by renewable systems. The simulation of these vehicles can be made for different standard driving cycles (ECE-15, EUDC, NEDC, SFUDS) or for real routes from GPS device data. This will allow to take into account the orography of the route, considering the slope that overcomes the vehicle at each time, generally this parameter is not included in other models, and yet can become a determining factor for the applicability of these vehicles on certain specified routes. Moreover, this tool permits to study and analyse other not easily quantifiable factors, such as the weather or peak-hour traffic. Finally, the performance of an urban hybrid bus is investigated to assess its theoretical range and the technical feasibility of zero-emission vehicles.

ID-210

Ultra-Pure Hydrogen Generation as Coproduct of Hydrocarbon Materials Utilization

G.P. Glazunov, M. Soursos[a], D.V. Vinogradov[b]

[a] National Science Center "Kharkov Institute of Physics & Technology
Akademicheskaya St., 1, Kharkov, 61108, Ukraine,
[b] Amazonica Corp. d.b.a. Euro American Hydrogen Corp., NV 89119, USA
E-mail: glazunov@ipp.kharkov.ua

Abstract

Ultra-pure hydrogen is required in chemical, electronic and others industries, as well as for carrying out different scientific investigations in many plasma devices, in particular, for solving problems of controlled thermonuclear fusion. Ultra-pure hydrogen (purity higher than 99. 999 % vol.) producing is the actual task of the technological process of hydrogen production. Most of current methods of generating ultra-pure hydrogen consist of two main steps of the technological process: producing low-purity technical hydrogen and its purification. The essential power inputs are required for both steps. Then produced pure hydrogen can be either used by consumers or accumulated in storage devices, or compressed in balloons.

We had suggested the method of hydrogen production (purity is higher than 99.999%) which requires only one step of the process of generating super pure hydrogen (Patent of Ukraine # 86884, Bull. #10, 2009). It is generated by means of placing the diffusion-catalytic membrane into the flame of combustion of hydrocarbons. The membrane serves to separate the volume of hydrocarbon combustion from that of pure hydrogen accumulation. Implementation of this technology allows producing ultra-pure hydrogen simultaneously with combusting hydrocarbon materials, e.g. while water heating. As a result of testing laboratory model (hydrogen capacity of about 1 Ncm^3/s), the principal possibility of implementing the technology mentioned above while combusting ethyl alcohol, gas (butane) and benzene was revealed. The measurements of hydrogen flow through Pd and Ni membranes and temperature dependencies of a specific hydrogen flow were carried out with the method of constant pressure, similar as described earlier (Int. J. Hydrogen Energy. 1999. V. 24. P. 829-831).

The main distinction of the suggested method is that it consists of only one step of the technological process – producing ultra-pure hydrogen. The method generates pure hydrogen simultaneously with combustion of inflammables (hydrocarbon materials), e.g., while water heating. As a result, the power inputs for maintain necessary parameters for hydrogen producing process are saved and the need for a purification procedure is eliminated. The suggested method could be applied in hydrogen energy, chemical, electronic and fuel cells industries as well as in scientific research, in particular, for solving problems of controlled thermonuclear fusion, in many plasma devices. Evidently, it is profitable to introduce this method into the plants where large volumes of hydrocarbon materials (fuels) are used, e.g. in boiler-rooms or other devices. Consumption of fuel for hydrogen production will be negligible compared to that for fulfillment of main functions.

ID-211

Storage of Renewable Energy Using Hydrogen Technology

Petr Moldrik[a,b], Daniel Minarik[a], Michal Ney[a]

[a] ENET Centre - Energy Units for Utilization of non Traditional Energy Sources, VSB - Technical University of Ostrava, 17. listopadu 15, 708 33 Ostrava - Poruba, Czech Republic

tel.: +420 596 995 884

E-mail: petr.moldrik@vsb.cz, daniel.minarik@vsb.cz, michal.ney@vsb.cz

Abstract

The rapid development of renewable energy sources is having a negative effect on the electric power system control. One option for mitigating this effect is to store the energy generated by these sources in times of excess power in the grid and supply it to the grid when required, i.e. during peak periods of the daily load curve. Renewable energy sources in connexion with a hydrogen storage system seems very promising. This energy storage technology is currently the focus of intensive research all over the world. Production and mainly storage of hydrogen is associated with specific hindrances. Hydrogen is highly reactive element of low density. Its molecules are small allowing hydrogen to diffuse through certain materials (plastic, some metals) both in liquid and gaseous state. There are several technical options to solve hydrogen storage. The most common method used deals with storage of gaseous hydrogen in vessels under pressure up to 700 bar. One a modern and perspective alternate option is storage of hydrogen by means of the so called “metal hydrides”, when hydrogen becomes a part of chemical structure of selected metal alloys. This paper deals with our practical experiences with electrolytic production of hydrogen by the help of renewable energy and hydrogen storage which are reached at laboratory of fuel cells at VSB - Technical University of Ostrava (Czech Republic).

ID-213

Turbulent Flame Stability of Lean Premixed Methane-Hydrogen Mixtures

Dragos Isvoranu[a,b], Constantin Leventiu[a], Sterian Danaila[3]

[1] Elie Carafoli Department of Aerospace Sciences, University Politehnica of Bucharest
1, Gheorghe Polizu Street, 011061-Bucharest, ROMANIA,
E-mail:cleventiu@yahoo.com, ddisvoranu@gmail.com, sterian.danaila@upb.ro

Abstract

In lean premixed flames, flame instabilities can occur because the combustion takes place near the lean flammable limit. In order to increase flame stability, small amounts of hydrogen were added into methane, which has ultra low lean flammable limit. The extinction stretch rate increased and total equivalence ratio at extinction decreased with hydrogen addition; consequently, lean and ultra lean premixed combustion were possible and flame stability could be achieved at lower temperature conditions. Various chemical reaction mechanisms were investigated for turbulent combustion bi-dimensional problem. Locations of investigated regimes in the combustion diagram are at a quasi constant integral turbulent length scale, starting from a relatively low turbulence corresponding corrugated flamelets regime to a very high turbulence in the thin reaction zone. The numerical results obtained are compared with experimental data obtained at CORIA Institute, France. The results of the turbulence-combustion interaction proved satisfactory for small and moderate turbulence intensities

Key Words: lean turbulent combustion, methane-hydrogen premixed flames

ID-214

High Performance Facetted Platinum Electrodes for Hydrogen/Oxygen Low Temperature Fuel Cell

Ramos Silvina[a], Contreras Ángela[a], Andreasen Gustavo[a], Triaca Walter[a]

[a]Diagonal 113 y 64, CC 16, Sucursal 4 (1900) La Plata, Buenos Aires, Argentina
Instituto de Investigaciones Fisicoquímicas teóricas y Aplicadas (INIFTA), Departamento de Química, Facultad de Ciencias Exactas, Universidad Nacional de La Plata, CONICET, 54-221-4257430
E-mail: sramos@inifta.unlp.edu.ar

Abstract

The preparation and characterisation of (111)-type facetted Pt crystallites electrodeposited onto gas diffusion electrodes are described and their effect on the performance of a hydrogen/oxygen PEM fuel cell at 60°C and 1 atm gas inlet presure is evaluated. High surface area facetted Pt crystallites on carbon substrates were obtained by applying a square wave potential pulse of high frequency in chloroplatinic acid at 25°C. The morphology of the Pt crystallites was examined by using SEM techniques and the characteristics of the crystalline structure were determined by X-ray diffractrometry. The highly facetted Pt crystallites consist predominantly of (111) oriented facets. Two types of Pt/carbon electrocatalysts incorporated into gas diffusion electrodes were tested: (i) high surface area (111)-type facetted Pt crystallites electrodeposited on carbon substrates and (ii) commercial polycrystalline Pt crystallites supported on Vulcan XC-72 carbon, with a metal loading of about 0.2 mg/cm^2. The two differently prepared electrodes were used as cathodes of hydrogen/oxygen PEM single cells exhibiting a 4 cm^2 electrode geometric area with a Nafion® 117 proton conducting membrane. Over the entire current density range overpotentials in the single cell with the (111)-type facetted Pt crystallites (C1) are significantly lower than those corresponding to the single cell with commercial polycrystalline Pt crystallites (C2). The improved performance of C1 should be assigned to the presence of (111)-type facetted Pt crystallites in the fuel cell cathode, which favours the four electron route in the overall oxygen electroreduction process by diminishing the blocking effect of the electrode surface by intermediate peroxide species.

ID-215

Modification of Si-based Solar Cells by High-Frequency Radiation and Weak Magnetic Fields

Red'ko R.A[a], Semenenko M.O[a]

[a] V. Lashkaryov Institute of Semiconductor Physics of the National Academy of Sciences of Ukraine, 41 Nauky Pr., 03028 Kyiv, Ukraine

Abstract

The samples of silicon-based solar cells with *p-n* junction were exposed to high-frequency (HF) irradiation (f=13.56 MHz, P=95, 225 and 300 Wt) and weak magnetic fields (WMF) treatment (B_1=60 mT, B_2=8 mT, t=21 days). Initial η %/FF parameter of structure under investigation was 11.692/0.746. The radiation results in modification to 12.337/0.775; 12.291/0.783; 11.458/0.752 values, respectively. So, the treatment in HF radiation with power ~95 Wt results to effective increase of η%/FF, while power ~300 Wt – vice versa, to decrease.

Additional WMF treatment was applied to samples, which where irradiated with maximum power. It was obtained, that treatment in field B_1 and B_2 was changed η %/FF parameter to 10.181/0.648 and 11.997/0.753, respectively. So, the treatment with B_2 magnetic induction could be used to restoring of studied properties, probably due to the lower defect concentration.

Interaction of a HF radiation with studied samples is accompanied by semiconductor impurity-defect structure modification that is caused by action of both thermal and non-thermal factors. Apparently, that increasing of power of the radiation results to thermal factor dominance. The physical mechanism of the observed WMF-related transformation is not trivial. It is clear that the traditional approach to the solution of this problem cannot be applied because of "the kT problem". This means that energy obtained by the object under investigation is too small to cause any change. So the alternative mechanisms are needed. It is known that WMF treatment can result in destruct of metastable non-equilibrium complexes, existing in the bulk of multi-layer structure, due to electron spin reorientation. Probably, this mechanism is realized in our case.

The presented method of the modification of η %/FF parameters of Si-based solar cells can be applied for the improvement of the structural perfection and efficiency of already formed devices as well as for the detection of the relative quantities of metastable non-equilibrium centers on their internal boundaries.

ID-216

Characterization By Drx of Si (111) Substrates Implanted with Antinomy Ions and Annealed Under Vacuum

Hamza Serrar[a], Rebiha Labbanı[a]

Department of Physics, Faculty of Exact Sciences, University Constantine 1, Route de Ain El Bey 25000 Constantine Algéria.

E-mail : serhamza@gmail.com

Abstract

In this work, we studied the ionic implantation of antimony in Si (111) substrates. Silicon targets were implanted with Sb^+ ions with various doses (*i.e.* In the interval [1.10 ^{15} Sb^+ cm^{-2} - 5.10 ^{15} Sb^+ cm^{-2}]) and at an energy of 120 KeV. A thermal processing, at 900°C, 30' under ultra vacuum, was carried out for the recovery of the defects induced by ionic implantation and the electric activation of antimony. The analysis of the samples was carried out by diffraction of x-rays (DRX).

The technique of analysis makes use of provided several information. In particular, we showed that the defects induced by ionic implantation are all the more important as the antimony dose is high. We also showed that a good recovery of the damage of irradiation was obtained by the thermal processing carried out. This recovery is better in the case of the substrates implanted with low doses.

Keywords: DRX; ionic implantation; thermal processing; Antimony; Silicon

ID-218

Quantitative Assessment of the Consequences of a Major Industrial Accident by Using an Integrated Computer Package

Nouara Ouazraoui[a], Mouloud Bourareche[a], Rachid Nait-Said[a], Ilyas Sellami[b]

[a] Laboratory of Research in Industrial Prevention (LRIP), Health and Occupational Safety Institute, Safety Department, University of Batna, Road Med El-Hadi Boukhlouf, Batna 05000, Algeria.

[b] Entreprise Nationale des Travaux aux Puits (ENTP Company), B.P. 206, Hassi-Messaoud, Algeria

E-mail: Ouzraoui@yahoo.fr

Abstract

During these last years, the industrial systems knew a considerable increase of the number of the major industrial accidents and the disasters such as the fires and the explosions causing impacts and grave effects on the persons, the properties, and the environment. For that purpose, considerable efforts are supplied to master the safety of the industrial installations. Therefore, several techniques and mathematical models of forecast of the risks were developed. Let us quote as an example, the Process Hazards Analysis (PHA), the Layers Protection Analysis (LOPA) and the Quantitative Risk Analysis (QRA). This last one (QRA) is a rigorous approach aiming at a safer industry and shows itself indispensable for a good estimation and mastery of the industrial risks. This approach consists mainly in identifying the scenarios of potential accidents, in estimating their frequency of occurrence and in analyzing their consequences, and optimizes the risk reduction measures to be implemented. Thus, QRA is a powerful tool to help make the final risk-reduction decisions with regards to acceptable risk criteria. The objective of this paper is to perform a quantitative risk assessment of LPG storage vessels (SONATRACH, Hassi R'mel) using the PHAST software. The study take into account all the elements involved in accidents scenarios. It included storage system, fluid properties, wind roses, and daily psychometric profile. The outcomes show a risk contours and F-N curves can be compared to regulations. PHAST take into account all the expected parameters such as discharge parameter, pool fire, flash fire and explosion effects. This advantage allows a better estimate of safe distances referring to vaporization effect, concentration profile, radiations and overpressures resulting from an accident. It also enables us to determine the safety features to be installed in the plant, e.g. safety relief valves, explosion proof buildings etc. Finally, the BLEVE (Boiling Liquid Expanding Vapor Explosion) model implemented in PHAST and its application to the LPG vessel D_108 are presented in this paper.

Keywords: QRA, consequences assessment, major industrial accident, BLEVE, PHAST software.

ID-219

Energy Efficiency Engineering – Towards an Integrated Method Framework for Energy-oriented Product and Production Development

Dirk Bähre, George Frey, Michael Vielhaber*
Saarland University, Campus E2 9, D-66123 Saarbruecken, Germany
phone +49 681 302 71304,
E-mail*: vielhaber@lkt.uni-saarland.de

Abstract
Energy efficiency is further rising in importance across all areas of the product lifecycle. One focus is put on the products' use phase, generally addressed through technological solutions. Another focus area with strongly rising significance is the production phase, which influences both the product's lifecycle assessment and the organization's environmental footprint. Regarding this area, the method of choice has so far generally been to improve the operation through, e.g., energy value stream optimizations.
With efficiency demands further rising, such operational or end-of-pipe approaches reach their limits. The challenge is then to define approaches targeting already the earlier product and production development phases, which promise higher improvement potentials, but may be more complex to implement. Such approaches are just at their beginning in industrial contexts, as they require longer term improvement focuses as well as the interdisciplinary involvement of product development, production development and operation experts.
This paper focusses on methods which can be applied in the early phases of product and production development and which target energy efficiency optimizations in the production phase. In a first step, it presents an energy efficiency method matrix as a categorization of energy efficiency-related methods by their application area, on the one side, and the life cycle phase whose energy efficiency they are impacting, on the other. Then, it introduces a method framework that targets the development phases and impacts the production phase. The framework consists of analysis/assessment, synthesis/design and optimization components synergetically combined for an integrated application across product and production development.

ID-220

Calculation Model for Pricing of Electric Power Supplied to End Customers

P. Moldrik[a], D. Minarik[a]

[a] ENET Centre - Energy Units for Utilization of non Traditional Energy Sources, VSB - Technical University of Ostrava, 17. listopadu 15, 708 33 Ostrava - Poruba, Czech Republic Tel: +420 596 995 884

E-mail: petr.moldrik@vsb.cz, daniel.minarik@vsb.cz

Abstract

This paper deals with pricing of electric power supplied to end customers by the help of new calculation model. The first part focuses on verification and quantification of assumed dependency of electric power price on selected power commodities using the correlation analysis methods. The second part of this paper concerns setting of profit margins using methods of multi criteria analysis, whereas these results enable further quantification of amount of trader´s margin used to process quotation for supply of electric power to the relevant end customer. The third part describes the specific method for processing of quotation for electric power supply to the end customer. This new calculation model has been applied to model tender for supply of electric power to end customers. Prediction of the future development of electric power prices has been processed by means of time series analysis of electric power prices. Results produced by prediction of this time series are then compared to reality. Conclusion contains assessment with respect to objectives accomplished, besides other, as well as reference to potential benefits of this calculation model for practical applications.

ID-221

Corrosion Inhibition Study of Mild Steel in Normal Hydrochloric Acid Medium by Ketene Dithioacetal

N.Benabila [a], H.B. Ladouani [a], A.Fiala [a]

[a] Laboratoire de chimie moléculaire du contrôle de l'environnement et des mesures physico-chimiques, faculté des sciences exactes, Université Constantine1, Constantine, Algérie

E-mail: benabilanabila@gmail.com

Abstract

The efficiency of Ketene dithioacetal derivatives, namely 2-[1,3]Dithian-2-ylidene-3-oxo-butyric acid methyl ester and Methyl 2-(1,3-dithietan-2-ylidene)-oxobutanoate as corrosion inhibitor for mild steel in 1M HCl, has been determined by gravimetric and electrochemical measurements. This organic compound inhibits the acidic corrosion even at very low concentration, reaching a value of inhibition efficiency up to 94.2% at a concentration of 2.10^{-3} M. Polarization curves indicate that the compound is mixed inhibitor, affecting both cathodic and anodic corrosion currents. Adsorption of Ketene dithioacetal derivatives on steel surface is in agreement with the Langmuir adsorption isotherm model, and the calculated Gibbs free energy value confirms the physical nature of the adsorption.

Keywords: Corrosion Inhibition; Mild Steel; Ketene Dithioacetal.

ID-222

Novel Plating Process and Soldering in Nanoscale Using Ultrafine Sn-3.0 Ag-0.5 Cu Alloy Nanoparticles

Yong Moo Shin and Jong-Hyun Lee

Department of Materials Science and Engineering, Seoul National University of Science and Technology, 232 Gongneung-ro, Nowon-gu, Seoul 139-743, Republic of Korea.

Abstract

We proposed a novel plating process using a Sn-3.0 (wt%) Ag-0.5 Cu (SAC305) ink containing trace flux. The SAC305 plating layer with thickness of several tens of nanometer was formed with heating at 160°C on a hot plate after dropping the ink on a Cu plate. Compared to the Cu plate, the SAC305 plated Cu plate showed enhanced solderability. We also proposed the usefulness of Ag/SAC305 composite ink to reduce sintering temperature, sintering time, and material costs. Compared to commercial pure Ag ink, the Ag/3.2 (vol%) SAC305 composite ink containing ultrafine SAC305 nanoparticles showed outstandingly enhanced processability, enabling faster sintering at low temperatures. The average sheet resistance of the composite ink samples sintered for 25 min at 170°C was as low as 0.011 Ω/□, comparable to that of the pure Ag ink sample sintered for over 30 min at 220°C. The scanning electron microscopic observations and the differenti al scanning calorimetry curves sufficiently explained the changes in the sintering behavior and sheet resistances. The Ag/SAC305 clusters in the composite ink sintered at 170°C grew to ~201.1–226.1 nm through faster local liquid-phase sintering by the melting behavior of SAC305, and most of the Ag particles were mutually linked by soldering in nanoscale, dramatically changing the microstructure. The reaction mechanisms of the plating process and nanoscale soldering at low temperature were also discussed in detail.

ID-223

In-situ evaluation of damage of thermally-exposed lithium ion battery by thermal wave imaging

Min-Jung Park[1], Young-Sook Lee[2], [1]Seong-Mi Lee, Chang-Yong Hyun[1], Jai-Won Byeon[1,*]

[1]*Dep. of Materials Science and Engineering, Seoul National University of Science and Technology, Seoul, Korea*

[2]*Dep. of Materials Science and Engineering, Hanyang University, Seoul, Korea*

Abstract

It was attempted to evaluate damage of thermally-exposed lithium ion battery by using thermal wave imaging. Coin-type commercial battery with $LiCoO_2$ and carbon electrodes was used for this investigation. The battery cells were exposed to 85 ^{o}C for 1, 3, 5, 10, 15 day, respectively. The thermal wave imaging system consists of a 6KJ Xe flash lamp for thermal stimulation and a high resolution infrared camera. With increasing thermal exposure time, discharge capacity was decreased. Microstructural observation of the aged battery after thermal exposure revealed mechanical damages of the electrode such as micro-crack, interface delamination, and surface electrolyte interface, respectively. These microstructural damages were successfully detected by thermal wave image and line profile analysis. Thermal diffusivity of the cathode and anode were obtained from the time chart data, respectively. Thermal diffusivity of cathode increased with thermal exposure time, while that of anode was observed to decrease. In order to show potential of thermal wave imaging technique, the observations by thermal wave were compared with those of optical and electron microscope. The feasibility of thermal wave imaging technique for evaluation of battery degradation was suggested.

ID-225

Silver Nano-Particles Synthesized in Glycerol and Sorbitol by Chemical Reduction for Photovoltaic Solar Cell

N. Moudir[a, c], N. Moulaï-Mostefa[b,c], Y. Boukennous[a], N. Kamel[d], I. Bozetine[a], Z. Kamel[d] and D. Moudir[d]

[a]CRTSE, The Research Centre in Semiconductor Technology for Energetic 2, Bd Frantz Fanon, BP.140 Alger 7-Merveilles, 16038, Algeria.

[b] Laboratory Materials and Environment,, 26001 Médéa, Algeria.

[c] Laboratory of Functional Analysis of Chemical Processes, Route, Soumaa, 09000 Blida1university, Algeria.

[d]CRNA, 2, Nuclear research center Bd Frantz Fanon, BP.399, Alger-Gare, Algeria.

E-mail: moudir2001@yahoo.fr

Abstract

The study focuses on the synthesis of micro and nano silver particles for the preparation of conductive pastes for solar cell metallization powders. In this synthesis, silver nitrate was used as a precursor in the presence of two polyols. Glycerol and sorbitol were tested for experimental temperatures near their boiling points, under moderate stirring.

To evaluate the effect of surfactant (poly-vinylpyrrolidone-PVP), the chemical synthesis was carried out in the presence and absence of PVP.

Four samples were obtained by this protocol; two silver powders obtained without the use of PVP have a metallic appearance. However, the samples produced in the presence of PVP are in the form of stable colloidal dispersions of silver nano-particles.

To determine the size and shape of the particles, the samples obtained were characterized using scanning electron microscopy. The crystal structure was identified by X-ray diffraction, and the thermal decomposition of the samples was examined by DSC and TGA.

Keywords: Silver, Nano-Particles, Chemical Reduction, Sorbitol, Glycerol, PVP.

ID-227

High Thermal Conductivity Structured Bimetallic Catalysts for Low Temperature Ethanol Steam Reforming

V. Palma[a], C. Ruocco[a], F. Castaldo[a], A. Ricca[a], D. Boettge[b]

[a] Department of Industrial Engineering, University of Salerno, Via Giovanni Paolo II 132, 83040 Fisciano (SA), Italy Tel: +39.089.964057

[b] Fraunhofer-Institut für Keramische Technologien und Systeme, IKTS Dresden

E-mail: aricca@unisa.it

Abstract

The increasing world power demand drives scientific interest toward the research of alternative energy sources. In this scenario, hydrogen from renewable feed-stocks (i.e. bioethanol) appears a good clean chance.

This study focuses on the development of bimetallic structured catalysts characterized by improved heat transfer properties for low-temperature ethanol steam reforming. In particular, catalytic performances of Pt-Ni/CeO_2 based catalysts are evaluated, by testing both catalyst powders and catalytically coated SiC open-cell foams at very low contact time.

Powder and foam catalysts were tested in a tubular reactor; further tests on powder catalyst were performed in an annular reactor, in order to reduce heat transfer limitations and then thermal radial-gradient.

By comparing powder catalyst tests, the advantages of annular reactor configuration were confirmed by an higher ethanol conversion and an appreciable approach to thermodynamic equilibrium values in a wide operating temperature range. Conversely, the worst performances recorded in the tubular reactor may be linked to the non-optimal radial thermal profile. Foam catalyst tested in tubular reactor showed the highest EtOH conversion, ensuring gas composition similar to the annular powder system.

Despite the very appreciable hydrocarbon conversions and hydrogen yields, obtained with the different catalytic systems, demonstrated the good catalytic formulation, however heat transfer limitations occurred at high GHSV, and powder catalysts reached interesting results only in an optimized annular reactor. On the other hand, structured catalyst prepared on open cells foams exploits SiC heat transfer properties, ensuring very high performances in an easier tubular reactor.

ID-228

Innovative Structured Catalysts for Methane Steam Reforming Intensification

V. Palma[a], M. Miccio[a], M. Martino[a], A. Ricca[a], E. Meloni[a], P. Ciambelli[a]

[a] University of Salerno, Department of Industrial Engineering, Via Giovanni Paolo II 132, 84084 Fisciano (SA), Italy;
Tel: +39 089964027
E-mail: aricca@unisa.it

Abstract

Nowadays, the main technique to produce hydrogen is catalytic methane steam reforming (MSR), a highly endothermic reaction carried out at very high temperature. The process intensification in this sense was focused on the improved heat and mass transfer management in the catalytic volume.

Many studies focused the attention on the use of monolithic catalysts, more recently also the Wall Flow (WF) configuration was proposed, able to minimizes the mass transfer limitations in respect to the conventional flow-through (FT) monolith.

The reported study focused on the effect of flux geometry in the reaction volume on the catalytic activity.

Silicon carbide monoliths were selected as support for the preparation of the structured catalysts, Nickel was selected as active phase, due to the good activity in reforming reactions. The Ni loaded SiC monoliths were prepared by repeated impregnation phases on both bare and washcoated (CeO_2-ZrO_2) supports, in order to evaluate the chemical support effect.

The experimental tests were carried out in a tubular lab-scale catalytic reactor in isothermal conditions.

The activity tests results highlighted the better performances of the WF configuration than the FT, in terms of hydrogen yield at the same temperature and GHSV. The WF configuration enhancement was more evident in the more extreme conditions, at the lowest operating temperatures and at highest reactants flow rate. On the other hand, the washcoated activated monoliths showed performances very close to the thermodynamic equilibrium predictions, highlighting the role of the chemical support on the SR reactions.

ID-229

On Economic and Technical Prospects of Various Types of Electric Vehicles

A. Ajanovic[a]

[a] Energy Economics Group, Vienna University of Technology, 1040 Wien, Tel: +431 58801 370364,

E-mail: ajanovic@eeg.tuwien.ac.at

Abstract

The growing interest in electric vehicles, mostly due to the different supporting policy measures, could be noticed in the recent years. Electric vehicles (EVs) are often presented as efficient and environmentally friendly automotive technology. However, there are different types of EVs – hybrid electric vehicles, plug-in-hybrid electric vehicles, battery electric vehicles, and fuel cell vehicles - with different characteristics.

The core objective of this paper is to analyse development of EVs with the special focus on the costs and efficiency. Additionally, the overview of the policies and strategies for the promotion of EVs in different countries is provided and evaluated. Finaly, the market prospects of EVs are analyzed and discussed from a technical and economic point of view in a dynamic framework up to 2050.

The major results and conclusions of this analysis are: From a technical point of view EVs are currently clearly preferable to conventional cars. With respect to the economic competitiveness of EVs in comparison to conventional vehicles in the most favourable case battery electric vehicles will enter the market by about 2025. However, competitivnes of hybrid electric vehicles could be reached much earlier.

The major conclusion of this work is that still a number of barriers exists to be overcome in order to increase market penetration of EVs (e.g. technology maturity, high costs of battery, infrastructure, regulation, etc.). In addition, it is important to ensure that EVs are using electricity from RES to really contribute to the sustainability of transport. The use of CO2-based taxes could support this. Furthermore, emission-free zones in urban areas are a very important completing policy tool.

ID-230

Hydrogen Production via Dry Reforming of Methane over Ni/Al_2O_3-La_2O_3-MO, (M= Mg, Ca, Sr and Ba)

R. I. Fertout[a], S. Kacimi [b], M. Ghelamallah [c], V. C. Corberan[d] and P. N. Lopez[e]

[a] Laboratoire de Matériaux et Catalyse, Département de Chimie, Faculté des Sciences Exactes, Université Djillali Liabes, Sidi Bel Abbès, Algérie Tel : +213661231461

[b] Centre Universitaire d'Aïn-Témouchent (CUAT), Aïn-Témouchent, Algérie

[c] Laboratoire de Matériaux, Applications et Environnement, Département des Sciences de la Matière,

[d] Faculté des Sciences et de la Technologie, Université de Mascara, Mascara, Algérie

[e] Inst. de Catalisis y Petroleoquimica, CSIC, C/ Marie Curie 2, 28049 Madrid (Spain)

E-mail: rfertout@yahoo.fr

Abstract

Ni/Al_2O_3-La_2O_3-MO, (M= Mg, Ca, Sr and Ba), Ni-based catalysts supported on Al_2O_3-La_2O_3 oxides doped with alkaline earth elements, were synthesized and characterized by X-ray diffraction (XRD), BET surface area, thermal gravimetric analysis (TGA) and H_2-temperature programmed reduction (TPR) techniques. Then they are tested to dry reforming of methane. It was found that the catalysts have surface areas ranging from 82 to 127 m^2/g. The XRD results revealed the presence of different phases of $La(OH)_3$, $Al(OH)_3$, $La_2O(CO_3)_2$ and $LaAlO_3$. The addition of Ni, Mg, Ca, Sr and Ba give small amounts of MAl_2O_4, NiO-MgO-Al_2O_3 and SrO. These phases are confirmed by TG-DTG and H_2-TPR analysis. Upon utilization of these catalysts for dry reforming of methane with a CH_4/CO_2 ratio of 1 at a range of 100 to 750°C, the NiALSr catalyst were found to have higher activity than the other catalysts. An order of relative ranking, below activities was found for all of the catalysts:

NiALSr> NiALCa ≈NiALMg ≈ NiAl> NiALBa

At 750°C, productivity of H_2 does not exceed 50% of all catalysts with H_2/CO ratio of less than 0,7.

ID-231

Performance Analysis of Dye Sensitized Solar Cells under Different Light Intensities

M. Khatani[a], N. M. Mohamed[a], N. H. Hamid[a], A. Z. Sahmer[a],S. N. A. Zaine[a]

[a] Centre of Innovative Nanostructures & Nanodevices (COINN), Electrical Engineering Department, Universiti Teknologi PETRONAS

E-mail: mkhatani@hotmail.com

Abstract

Dye sensitized solar cells (DSCs) have significant advantage over the current silicon cells by having low manufacturing cost, potentially high conversion efficiency and work well in low light conditions. DSCs are expected to be used as the next generation solar cell device that covers wide range of new applications. In order to achieve highly efficient DSCs for practical application, performance analysis of DSCs under different light intensities need to be carried out. In this study DSCs of area 1cm^2 were fabricated with and without $TiCl_4$ treatment and characterized by solar simulator and electrochemical impedance spectroscopy (EIS) under light intensities of 100, 33 and 10 mw/ cm^2 respectively. From the analysis it was observed that efficiency of DSCs at 33 and 10 mw/cm^2 intensities was 25% higher than the 100 mw/cm^2.It was also observed that the efficiency of DSCs fabricated with $TiCl_4$ was 35% higher than the DSCs fabricated without $TiCl_4$ under 100, 33 and 10 mw/cm^2 respectively. EIS analysis shows the electron lifetime that is an indicator of the efficiency of a cell is higher when fabricated with $TiCl_4$ treatment and the internal resistance of the cell is also lower than the cell fabricated without $TiCl_4$ treatment.

ID-232

Assessment of Air Pollution Impacts on Population Health in Béjaia City

B. Fatima[a], A. Rezak[b], A. –M. Isabella[c]

[a] Département d'écologie
[b] Laboratoire de Génie Electrique
[c] INSERM U 707: EPAR, Paris, France
E-mail : isabella.annesi-maesano@inserm.fr

Abstract

Air pollution is one of the major global problems. It can be defined as the emission of pollutants into the atmosphere by natural or anthropogenic sources and displays one of the main issues in environmental medicine. Today the major sources of anthropogenic air pollution are factory emissions, the burning of fuels and street traffic. In Algeria, where automobile is the principal source of the air pollution in its urban area there are no studies about this global problem health.

To assess the health impact of the air pollution on the population of Béjaia, we carried out a descriptive epidemiologic inquiry near the medical establishments of three areas. From the registers of hospital admissions, we collected data on the hospital mortality and admissions relating to the various cardiorespiratory pathologies generated by this type of pollution. In parallel, data on the automobile fleet of Bejaia and other measurements were exploited to show that the concentrations of the pollutants are strongly correlated with the concentration the urban traffic. This study revealed that the whole of the population is touched, but the sensitivity to pollution can show variations according to the age, the sex and the place of residence. So the under population of the town of Bejaia marked the most raised death and morbidity rates, followed that of Kherrata. Weak rates are recorded for under rural population of Feraoun. This approach enables us to conclude that the population of Béjaia could not escape the urban pollution generated by her old automobile fleet. To install a monitoring and measuring site of the air pollution in this city could provide a beneficial tool to protect its inhabitants by them informing on quality from the air that they breathe and measurements to follow to minimize the impacts on their health and by alerting the authorities during the critical situations.

Keywords: Air, Urban pollution, Health, Impacts

ID-233

Synthesis, Antimicrobial Activity of Benzoyl Acetone Shiff Base of Di-Aminoprophan and Metal Complexes

A. R. Rahimova[a], P. Sh. Mamedova[a], M. N. Aliyeva[a]

[a] ANAS Institute of Chemistry of Additives named academician A.M.Guliyev, Azerbaijan, Badamdar, +9945688746, E-mail: rahimova_aysel@mail.ru

Abstract

Shiff bases and metal complexes have been synthesied by the condensation of benzoyl asetone and di-aminoprophan.The structure of the synthesied compounds assigned on the basis of elemental analysis, IR, HNMR spectral studies.All the products were evaluated for their in vitro antimicrobial activity against various strains of fungi.

ID-236

A Comparative Study of the Influence of Metallic Concentration in the Starting Solution on the Optical, Electrical and Electrochrochromic Properties of Spray Pyrolized WO_3:Mo and WO_3:Ti Thin Films

D. Acosta[a], C. Magaña[a], F. Hernández[a], I. Garduño[a], J. Ortega[a]

[a] Instituto de Física, Universidad Nacional Autónoma de México, A.P. 20-364, 01000 Mexico D.F., Mexico
E-mail: dacosta@fisica.unam.mx

Abstract

In this work we report results of metallic doping of WO_3 films produced with a low cost equipment, in order to improve their optical and electrical properties. Tungsten trioxide in thin film configuration is a very interesting material with optical and electrical properties which make it suitable for practical and advanced technological applications. The use of electrochromic and thermocromic materials for energy saving purposes is a subject of intensive research around the world. Electrochromic behavior of tungsten trioxide thin films have been studied extensively for last 30 years due to their potential applications in display devices, rear view windows and smart windows for energy saving purposes. Also the sensing properties of WO_3 films make them suitable for uses in numerous applications in environmental and industrial contamination monitoring. WO_3:Mo and WO_3:Ti thin films have been deposited on FTO/Glass substrates by the pulsed chemical spray technique at a substrate tempertature of T_s = 450°C.The effects of doping concentration in the starting solution on structural, electrical and electrochromical properties were followed by the XRD, SEM, HREM, AFM, van der Pauw and cyclic voltammetry experimental techniques. The WO_3:Mo and WO_3:Ti thin films present for all the cases, a regular and compact surface but grain size distribution and morphology show differences as the metals concentration is increased. There is a noticeable improving in conductivity and carrier density when the Mo and Ti concentrations are increased in the starting solution. Also the electrochromic properties Mo and Ti doped films are re-visited and correlated with the parameters used for the synthesis of our films and with the physical properties previously determined.

ID-237

Effect of Ternary Cement Manufactured by the Natural Pozzolan and Waste Marble Powder on Fresh Properties of Self-Compacting Concrete

A. S. E. Belaïdi[a], S. Kenai[b], E. -H. Kadri[c], B. Benabed[a]

[a] Civil engineering department, University of Laghouat, Algeria
[b] Civil engineering department, University of Blida, Algeria
[c] Laboratoire L2MGC, University of Cergy-Pontoise, France

Abstract
Self-compacting concrete (SCC) requires filler materials in the mix for adequate rheological properties. Limestone fillers, pulverised fuel ash, granulated blast furnace slag and natural pozzolana have been reported to produce suitable SCC. The combination of some of these cementitious materials and other powders could also improve some of the SCC properties at both the fresh and hardened states. This paper discusses the effect of using either natural pozzolana (PZ) or a combination of natural pozzolana and marble powder (MP) on the performance of SCC. A total of 12 SCMs and SCCs were prepared having a constant water-binder (w/b) ratio of 0.40 and total cementitious materials content of 475 kg/m^3. Then, the fresh properties of the mortars were tested for mini-slump flow diameter and Slumps flow test, L-Box height ratio and sieve stability for SCCs. Moreover, compressive strength of the hardened SCC's were determined up to 90 days. The use of PZ and MP in ternary blends improved the fresh properties when compared with SCC made with only Ordinary Portland cement. The compressive strength of concrete decrease to increase the percentage of substitution on additions.

Keywords: SCC, Natural pozzolana, Marble powder, Compressive strength

ID-238

Catalysts for the intensification of the Water Gas Shift process

V. Palma[a], D. Pisano[a], M. Martino[a], A. Ricca[a], P. Ciambelli[a]

[a] Univ. of Salerno, Dep. of Industrial Engineering, via G. Paolo II 132, 84084, Fisciano, Italy.
Tel: +39089964027
E-mail: dpisano@unisa.it

Abstract

Nowadays, energy security and environmental care are very important. Hydrogen is arising as a clean energy vector that can fulfil these requirements. It is produced by the MSR, a process that also produces CO, undesirable if hydrogen is used in applications such as PEM fuel cells. WGS, industrially carried out in two stages (HTS and LTS), removes CO from the syngas. Unfortunately, due to the pyrophoricity of LTS catalyst, this configuration cannot fit applications requiring frequent start-up, as fuel cells based distributed generation plants. An attractive alternative could be noble metals. Many studies reported the use of Pt supported on CeO_2, ZrO_2, TiO_2; among the others, Pt/CeO_2 could be considered doubtless the most promising. In this paper we report a comparative study on the performances of 1%Pt based catalysts supported on commercial CeO_2 and CeO_2-ZrO_2. Both catalysts showed high conversion above 200°C, but 1%Pt/CeO_2-ZrO_2 reached the equilibrium conversion up to 180°C, while the conversion fell to 60% at 180°C for the 1%Pt/CeO_2 sample.

XRD patterns of CeO_2 and CeO_2-ZrO_2 supported catalysts showed shifted peaks in CeO_2-ZrO_2 sample, due to the formation of a solid solution. This reflects the TPR data, showing a lowered support reduction temperature in the case of CeO_2-ZrO_2 based catalyst. TPD experiments performed on both samples after CO adsorption, showed only CO_2 peaks. For 1%Pt/CeO_2-ZrO_2, the CO_2 desorption peaks are centered at lower temperatures with respect to the 1%Pt/CeO_2, suggesting that zirconia enhances the oxygen mobility in the crystalline lattice, and so the reaction products superficial desorption.

ID-240

Effect of Additive Concentration and X-ray Irradiation on the Thermal and Color Properties of Polyvinyl Alcohol

M. M. Abutalib[a]

[a] Physics Department, College of Science (Girls Branch), King Abdulaziz University, Jeddah, Saudi Arabia

Abstract

Thermogravimetric analysis TGA was carried out to obtain the activation energy of thermal decomposition for Polyvinyl alcohol PVA stabilized by Polyethylene glycol PEG. The effect of addition of PEG, with different concentrations, to PVA was studied. The results indicated that the addition of PEG with 0.015 g/1 g PVA led to a more compact structure of pure PVA which resulted in an improvement in its thermal stability with an increase in the isotropic character of the polymer samples.

Samples from the 0.015 g PEG/1 g PVA were irradiated with X-rays in the dose range 10-100 Gy. The variation of onset temperature of decomposition, activation energy of thermal decomposition and refractive index has been investigated. In addition, the transmission of these samples in the wavelength range 370–780 nm, as well as any color changes, was studied. The color intensity ΔE was increased with increasing the X-ray dose indicating that the color difference is largely dependent on the proportions of the red and yellow color components.

Keywords: PVA, PEG, X-ray irradiation, TGA, Refractive index, Color difference

ID-241

Electronic and Optical Properties of Graphene Doped with Zigzag Boron Nitride Chains: A DFT Study

A. Bakhtiari[a]

[a] Department of Chemistry, Faculty of Basic Sciences, Payame Noor University, 19395–3697 Tehran, Iran, Tel: +98 443 6263400, +98 914 7036716
E-mail: bakhtiari.a1@gmail.com

Abstract

Graphene and the related graphene-based hybrid materials have attracted considerable attention as building blocks of functional materials. Graphene is shown to possess outstanding potentials for many fields such as optoelectronics, photonics and energy conversion and storage. Several papers report the promising application of graphene-based materials for fuel cells, water splitting, hydrogen storage, hydrogen separation, organic light emitting diodes, active layer in solar cells and also electrode materials of solar cells, supercapacitors and lithium ion batteries.

However, the absence of a band gap limits the application of graphene to be used as a semiconductor in many fields. Several theoretical and experimental attempts have been demonstrated to open up a tunable band gap in the electronic structure of graphene by doping. Experimentally, it has been shown that doping of graphene sheets by equal numbers of B and N atoms results in finite band gap.

In this context, the effect of doping of graphene with zigzag boron nitride chains on its electronic and optical properties will be demonstrated using DFT method. The calculated band structure indicates that the suggested material has a direct band gap of 0.524 eV. According to the calculated density of states (DOS), the top of valence bands (VBs) and bottom of conduction bands (CBs) are mainly C-2p states. The calculated linear optical properties indicate a maximum absorption at 286 nm while a medium absorption is calculated for the visible range. Also, the reflectivity of the compound is calculated to vary between 3.8%-6.9% for the radiation wavelengths of 400-700 nm.

Keywords: Graphene, Doping, Boron nitride, Band structure, Optical properties, DFT

ID-243

Flat Roof Systems Solar Panel Efficiency Analysis Based on Simulation

O. Bingöl[a], B. Kiriş[b]

[a] Suleyman Demirel University Faculty of Technology Department of Electrical and Electronic Engineering, 32260 Isparta/Turkey Tel: +90 246 2111481

[b] Süleyman Demirel University, Department of Electronic Computer Education, Isparta/Turkey Tel: +905543653615

E-mail: okanbingol@sdu.edu.tr

Abstract

Solar cells are photovoltaic (PV) devices that convert energy of sun directly into electric energy. Solar panel occur multiple solar cells that combining together. Depending on the power demand solar panels connected to each other in series or parallel thus building energy systems are created to meet the needs.

Roofs are most suitable building surfaces for solar panel application. Based on geometric shapes that can be applied solar panel roof types are a lot. With less than 5% of the surface slope is called the flat roof. Solar panel on a flat roof design can be applied to the desired place and angle of inclination with the optimal position.

Affecting the operation of solar panels factors are include that radiation, temperature, shading, surface impact angle and a series-parallel connection. Before the solar panels application on the flat roof, considering all these factors will be obtained from the solar panel efficiency should be analyzed and calculated. In this work, the location of the solar panel which can be applied on the flat roof calculations were performed with the aid of simulation that yearly power and efficiency ratio can be produced with different panel groups.

Keywords: Solar panels (PV), Flat roof, Solar array, PV panel efficiency analysis

ID-244

Fabrication and Characterization of Indium Doped SnO_2 Deposited on n-type Silicon by Ultrasonic Spray Pyrolysis

C. E. Benouis[a], M. Benhaliliba[a], Z. Mouffak[b], F. Yakhuphanoglu[c], M. S. Aida[d], A.Tiburcio-Silver[e], Y. S. Ocak[f]

[a] Material Technology Dept., Phys. Fac., Oran University of Sciences and Techology USTOMB Oran , BP1505 Oran, Algeria

[b] Department of Electrical and Computer Engineering , California State University, Fresno , CA, USA

[c] Firat University, Physics Dpt., Faculty of Sciences and Arts, 23119, Elazig, Turkey

[d] Thin films & Plasma Lab, Physics Dept, Mentouri university, 25000Constantine, Algeria

[e] ITT- DIEE. Apdo. postal 20. Metepec 3, 52176 Estado de México, México

[f] Dicle University, Education Faculty , Science Dpt., 21280, Diarbakir, Turkey

E-mail: babimo31@gmail.com, babimo14@yahoo.fr

Abstract

The SnO_2:In /nSi heterojunction has been fabricated by ultrasonic spray pyrolysis technique and its current–voltage and capacitance-voltage characteristics, at various level doping, have been measured. The Al front contacts were achieved by thermal evaporation in vacuum at 10^{-6} Torr. Several parameters, such as idealty factor, height barrier, saturation current, series resistance and carriers density, have been extracted from the I-V and C-V characteristics. The current -voltage in dark presents a rectification property. It is observed that the rectification ratio, ideality factor are strongly dependent on level doping. The barrier height and the idealty factor are found to be respectively around 0.66 eV and 4. Under illumination, we observed an increase in reverse current compared to dark current but no significant change in forward current. A photo electric behavior is observed. The dark capacitance - voltage and conductance -voltage measurements within frequency range 100Hz-1MHz gave information on interfaces states. This latter decreases with increasing frequencies and level doping. From the capacitance profle, the p type conductivity of 4% indium doped SnO_2 film was revealed. The fabricated diodes are used as photodiodes due to their important photosensitivity.

Keywords: Indium doped tin oxide, Heterojunction, Ultrasonic spray pyrolysis, Al contact, current-voltage, Capacitance-voltage

ID-245

Active and Reactive Power Control of DFIG Wind Turbines Using Fractional Order One Cycle Controller

A. Ketabi[a], A. Yazdekhasti[a], N. Haratian[a]

[a] Department of Electrical Engineering, University of Kashan, Kashan,87317-51167, Iran
Tel.: +98-3615555333; Fax: +98-3615559930
E-mail: aketabi@kashanu.ac.ir

Abstract

In this paper, a One Cycle Control (OCC) with fractional order PID for wind turbines equipped with doubly-fed induction generators (DFIGs) is presented. The OCC is used to control back-to-back converter which includes generator-side converter and grid-side converter. Generator-side converter regulates speed and grid-side converter controls reactive power and voltage of the DC-Link. Also, particle swarm optimization (PSO) is used to improve the accuracy of parameters of fractional order PID controllers. Proposed approach is studied under different conditions, including load change, fault, and nonlinear loads. Also, uncertainty of wind speed is considered. Moreover, a comparison between pulse width modulation (PWM)-based and OCC-based controllers is done. The OCC is a non-linear PWM method so its control technique turns a non-linear switch into a linear path. In contrast to the traditional PWM method, OCC control realizes PWM and fast/nonlinear control simultaneously by modulating the slope of the saw-tooth waveform. The simulation results show that accuracy and speed control of DFIG converter by OCC are superior in comparison with conventional control strategies from tracking reference signal and oscillations point of view.

Keywords: One-Cycle Control (OCC), Fractional order PID, Particle Swarm Optimization (PSO), Doubly Fed Induction Generator (DFIG), Wind power generation, Back-to-Back converter

ID-246

Inverse Scattering Using A Combination of Linear Sampling Method and Adjoint Sensitivity Analysis

A. R. Eskandari[a], M. R. Eskandari[b]

[a] Department of Engineering, East Tehran Branch, Islamic Azad University, Tel: +98-2133584912, Tehran, Iran
[b] Electrical and Computer Engineering Department, Isfahan University of Technology, Isfahan, Iran
E-mail: areskandari@iauet.ac.ir

Abstract

This paper describes a technique for complete identification of a two-dimensional scattering object using microwaves where the scatterer is assumed to be a homogenous dielectric medium. The employed technique assumes no prior knowledge of the scatter's material properties like electric permittivity and conductivity, and the far-field pattern is used as the only primary information in identification. The hybrid approach proposed consists of initially retrieving the shape and the position of the scattering object using a linear sampling method and then determining the electric permittivity and conductivity of the scatterer using adjoint sensitivity analysis. The technique results in high computational speed, efficiency and stability. In addition, the technique can be generalized for any scatterer structure. Numerical results are used to validate the feasibility of the proposed approach.

Keywords: Inverse scattering, Microwave imaging, Linear Sampling Method (LSM), Adjoint Sensitivity Analysis (ASA)

ID-247

Removal of Pesticide 2,4 Dichlorophenol by Organic Red Clay

Z. Bouberka[a, b], K. Bentaleb[a, b], K. Benabbou[a], A. Nadim[b], U. Maschke[b]

[a] Laboratoire Physico-Chimie des Matériaux- Catalyse et Environnement, Université des Sciences et de la Technologie d'Oran « USTO », BP 1505, El M'naouar, 31000 Oran, Algeria.

[b] UMET (Unité Matériaux et Transformations), UMR 8207, Université Lille 1 – Sciences et Technologies, 59655 Villeneuve d'Ascq Cedex, France, Tel. +33 (0) 3.20.33.63.81

E-mail : bouberkazohra@yahoo.fr, ulrich.maschke@univ-lille1.fr

Abstract

Red Clay (RC), modified by two organic molecules Cetyltrimethylammonium (CTAB) and Dodecyltrimethylammonium (DTAB), has been investigated as adsorbent for pesticide 2,4-dichlorophenol (2,4-DCP) in 0.1N KCl aqueous solution (background solution). The modified red clays were characterized by XRD, FTIR and BET analysis. Batch experiments were carried out for the adsorption process in terms of effect of pH, adsorbent dose, presence of salts, and different pesticide concentrations. The adsorption kinetics were examined for intra-particle diffusion, Elovich and pseudo-second order reaction. The adsorption capacity on organoclay increases with increasing organoclay amount. The 2,4-DCP adsorption decreases with increasing pH, suggesting that the undissociated species were adsorbed more readily. The adsorption equilibrium data for 2,4-DCP onto DTAB-RC fit well with the Freundlich adsorption model (R^2 = 0.974). The Langmuir and Temkin models were successfully applied in the case of the absorption of 2,4-DCP onto CTAB-RC (R^2 = 0.989 for both equations). The adsorption capacities obtained from DTAB-RC and CTAB-RC were found around 1.83mmol/L and 1.24mmol/L, respectively.

ID-248

The Impact of Installing Variable Frequency Drive for the Cooling Towers in Kuwait on Energy Consumption

E. Al-Bassam[a], R. Alaseeri[a]

[a] Kuwait Institute for Scientific Research, Address: P.O.Box 24885, Safat 13109, Kuwait
Phone: +96524989200
E-mail: ebassam@kisr.edu.kw

Abstract

The application of Variable Frequency Drive (VFD) as water and energy efficient control scheme for operation of cooling tower (CT) was experimentally verified using summer and winter seasons field data. The major concern during the CT operation is the large flow of air required for cooler water temperatures that help to improve performance of the air conditioning systems. However, this improved performance increases the fan power, and water consumption in the dry and hot countries such as Kuwait due to self-cooling of air that result in additional water evaporation.

The technical viability of variable frequency drives for the cooling towers (CTs) as a water and energy efficient device and quantify the potential savings of water and electricity were experimentally verified using summer and winter seasons field data. The CT fans in the selected site, originally fitted with dual speed motor, were retrofitted with VFDs. The site was adequately instrumented to assess energy and water consumption of the cooling production system while operating the CTs fans alternatively with constant air flow either low or high speed through the building management system (BMS), and the VFD scheme keeping CT leaving water temperature constant. The results were in favor of selecting CT with VFD as the best option to reduce electricity and water consumption.

ID-249

Optimization of Superconducting Magnetic Energy Storage Systems by Using IPSO Method

G. Ciuprina[a], A. Egemen Yilmaz[b], D. Ioan[a], A. Duca[a], A. –S. Lup[a], R. Barbulescu[a]

[a] Politehnica University of Bucharest, Spl.Independentei 313, 060042, Bucharest, Romania
[b] Ankara University, Turkey
E-mail: lmn@lmn.pub.ro, aeyilmaz@eng.ankara.edu.tr

Abstract

This paper presents a new improved version of Intelligent Particle Swarm Optimization algorithm (IPSO) [1], where particles are instructed to avoid tabu regions, used to solve the TEAM-SMES (Superconducting Magnetic Energy Storage) Optimization Benchmark no.22 [2].

Both Particle Swarm Optimization and Tabu Search are metaheuristic search methods used for mathematical optimization. The IPSO algorithm offers more intelligence to particles by using concepts such as: group experiences, unpleasant memories, local landscape models based on virtual neighbors, and memetic replication of successful behavior parameters. The new individual complexity of the particles is likely to be amplified at group level and to consequently generate more efficient optimization procedures.

Local optimization procedures take a potential solution to a problem and check its neighbors hoping to improve this solution. These methods have the tendency to become stuck in local suboptimal regions or on plateaus. Tabu Search enhances performances of these techniques by using memory structures that describe the visited solutions. If a potential solution has been previously visited, it is marked as forbidden, so that the algorithm does not consider that possibility repeatedly [3].

In our approach these regions are stored in the swarm memory, therefore it can be considered as a hybrid optimization technique, taking advantages of both metaheuristics, thus improving the optimal design of advanced energy storage systems.

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ID-250

Effect of Ultraviolet/Visible Radiation on Decabromodiphenylether in Tetrahydrofuran

A. Nadim[a, b], Y. Agguine[a, b], Z. Bouberka[c], S. Eddarir[b], U. Maschke[a]

[a] UMET (Unité Matériaux et Transformations), UMR 8207, Université Lille 1 – Sciences et Technologies, 59655 Villeneuve d'Ascq Cedex, France. Tel. +33 (0) 3.20.33.63.81

[b] Laboratoire de Chimie Bioorganique et Macromoléculaire (LCBM), Faculté des Sciences et Techniques, Université Cadi Ayyad, Guéliz, Marrakech, Morocco

[c] Laboratoire Physico-Chimie des Matériaux- Catalyse et Environnement, Université des Sciences et de la Technologie d'Oran « USTO », BP 1505, El M'naouar, 31000 Oran, Algeria

E-mail : ulrich.maschke@univ-lille1.fr

Abstract

Decabromodiphenylether (DBDE) represents a brominated flame retardant which belongs to the group of the polybromodiphenylethers (PBDEs). It is often used as fire resistant additive in certain well known polymeric systems like polystyrene, acrylonitrile-butadiene-styrene (ABS), polypropylene. This compound can be considered as a persistent organic pollutant and presents certain risks for the environment, owing to the fact that it is bioaccumulable and not biodegradable.

In this present work, we carried out a detailed investigation on the effect of ultraviolet/visible radiation on DBDE in tetrahydrofuran (THF), with the aim to study the photolytic reactions of this molecule. The experiments were carried out at room temperature, while using like radiation source, a lamp equipped with an optical fiber, whose range of radiation was comprised between 460 and 780nm.

This study presents new aspects in photochemical degradation. The kinetics of the reaction was followed in particular by high performance liquid chromatography (HPLC), and the by-products of degradation were characterized using gas chromatography coupled with mass spectrometry (GC-MS). The obtained results show that the photodegradation of DBDE can be described by pseudo-first order kinetics, and will be discussed in the framework of the Langmuir-Hinshelwood model. It is interesting to mention a strong presence of dibenzofurane and diphenylether as final products, which proves the efficiency of the radiative treatment, since these products do not contain bromine any more.

ID-252

A New Approach in Solar Radiation Estimation Based on Regression and Genetic Algorithm

A. Razeghi[a]

[a] Department of Mechanical Engineering, Islamic Azad University South Tehran Branch, Tehran, Iran, No. 209, North Iranshahr St., Tehran 11365-4435, Iran, Phone: +98-21-33010401, fax: +98-21-3310402
E-mail: st_a_razeghi@azad.ac.ir

Abstract

Solar radiation is known as fundamental information for many different research subjects. Regarding the fact that measuring the exact amount of direct solar radiation is not applicable, the estimation models can provide acceptable results. In this research, we present a review of solar radiation estimating methods, and then sunshine duration, minimum temperature, maximum temperature and relative humidity which had measured from 2009 to 2011 in Aghdasieh - Tehran synoptic weather station were used to approved regression models to estimate incoming solar radiation. Also the most accurate model has been produced by using a new approach in combination of genetic algorithm and regression models. In this way, first we have tried to find the best function represented the relationship between solar radiation and each meteorological parameter, separately. So, sum of linear, exponential, hyperbolic, trigonometric and polynomial functions which each one multiplies by a constant was imported in a genetic algorithm and coefficients were calculated. Function that had the greatest coefficient was selected as the exponent of that meteorological parameter. Then a model approved by these selected functions and optimized by genetic algorithm. Results of this research indicate that using the subtracting of maximum and minimum (ambient) temperature accompany by the number of day, propose minimum amount of mean square error as 3.5741. The significant advantage of this method is that we have used the function has the greatest effect on radiation. Also obtained results indicate that applying all different parameters in regression models simultaneously, increase the estimation error.

Keywords: Solar radiation, Regression, Genetic algorithm, Estimation

ID-254

Integration of Solar Energy in the Development of Palms Irrigation System and Long-term Bio-ethanol Production in the South of Algeria

B. Dokkar[a], A. Dokkar[a], N. Chennouf[a], K. Benchikh[a], N. Settou[a], B. Negrou[a]

[a] Laboratoire de Valorisation et Promotion des Ressources, Sahariennes, University of Kasdi Merbah, Ouargla Algeria
E-mail: boubekeur.orgx@gmail.com

Abstract

During the history, the economy of Ouargla city and surrounding (in south of Algeria) is based on date palms. These trees are very resistant to hot climate and their dates are rich in sucrose substance, so they considered as promoter candidates for ethanol production. Promoting this potential necessarily involves cost reduction of agriculture palms and mainly the irrigation cost. The application of a photovoltaic pumping system on medium well operating can achieve a payback period not exceeding 15 years even if grid extension cost is not included. The investigation by using Arcgis software shows that Ouargla basin has in important underground water sources with high flow rates and low depths. The wide flat area around this city allows huge agriculture expansion to develop a profitable bio-ethanol industry. In this work, ethanol extraction is limited to waste dates as row material. For 2013, the bio-ethanol extraction from only three date varieties (Ghers, Deglet-Nour and Deglet-Beida) is estimates about 695,000 liters, by using a trend model it can reach 2,629,000 and 10,364,000 liters in 2018 and 2038 respectively. The estimation by a voluntary model by taking into account an exploitation rate as 80% of reserved agriculture land, forecasting bio-ethanol production will at least quadruple in 2038.

Keywords: Palm trees, Solar pumping, Waste dates, Bio-ethanol, Prospecting

ID-255

Current and Voltage Prediction of PV on Cloudy Weather Using ANNs

M. Khademi[a], A. Razeghi[b], M. Moadel [c]

[a] Department of Applied Mathematics, Islamic Azad University South Tehran Branch, Tehran, Iran, No. 209, North Iranshahr St., Tehran 11365-4435, Iran, Phone: +98-21-33010401

[b] Department of Mechanical Engineering, Islamic Azad University South Tehran Branch, Tehran, Iran, No. 209, North Iranshahr St., Tehran 11365-4435, Iran, Phone: +98-21-33010401

[c] Department of Energy Systems Engineering, Islamic Azad University South Tehran Branch, Tehran, Iran, No. 209, North Iranshahr St., Tehran 11365-4435, Iran, Phone: +98-21-33010401

E-mail: Khademi@azad.ac.ir

Abstract

Photovoltaic (PV) efficiency significantly reduces in shaded condition. Despite this fact that sudden clouds are the most important cause of shadow, no much study have been done to investigate and model the effect of sudden clouds on current/voltage (I / V) of photovoltaic panels. In this research, we were able to investigate this condition by definition of novel radiation based approach for designation of the sudden clouds. In this way, when clearness index was lower than 0.4 and also the times that the radiation decrease suddenly (more than 20%), the sky was considered cloudy and occurrence of sudden cloud respectively. We have used datasets related to Tehran University photovoltaic plant (Mono crystal PV), located in Tehran, Iran (N 35/43, E 51/23) which were registered in 5-minute intervals for approximately five months (from October to March). An ANN_MLP was trained to produce a predictor of PV's I/V by irradiance, ambient temperature, wind speed, relative humidity and extraterrestrial radiation as input parameters. The average values of the mean absolute percentage error (MAPE) and mean bias error (MBE) were 3.57% and 0.16% respectively. This research shows the influence of shadow on PV output once again, so that it can even cause reduction of more than 50% of power and forfeiture in economic view subsequently. But a specialized control system for this condition could greatly reduce losses. The results of this study can be used in the design of a control system for rainy cities on cloudy conditions to find the optimum operating point.

Keywords: Photovoltaic, ANN, Cloud, Prediction, Current, Voltage

ID-256

Utilization of Response Surface Modelling for the Prediction of Flux in the Pervaporation Process

N. Moulai-Mostefa[a], M. Krea[a]

[a] Materials and Environmental Laboratory, University of Medea, Ain D'Heb, 26001 Medea, Algeria

Email: moulai_nadji@yahoo.fr

Abstract

Membrane technologies are very promising because they present a certain number of advantages. In addition, they can be more effective in the field of weak concentrations and offer alternatives to the conventional processes.

Pervaporation is a process of separation of liquid mixtures through a dense permselective membrane. During this operation, the permeate is vaporized under reduced pressure then condensed on a cold wall. The driving force is the gradient of the chemical potential which is established by applying a difference in pressure of the permeate on the two sides of the membrane.

The polysiloxaneimides (PSI) are polymers obtained by polymerization by stage i.e. polycondensation of a stoechiometric mixture of dianhydrides and aromatic diamines, aliphatic and derivatives siloxanes. The properties of PSI can be enormously modified by a minor variation of their structure. The subtle variations in the structures of the dianhydrides or diamines have a great effect on the properties of resulting materials.

In this study, the permeability of PSI membranes was undertaken on four various samples. Three samples in a series of homologous materials T2 and T4 and another PSI containing dianhydride P900.

In order to predict the effects of the membrane nature on the pervaporation fluxes, a response surface modelling was used. This makes it possible to obtain estimated models of the studied response, as well as the optimal conditions. Three factors were retained for this study: temperature, activity and membrane type. The responses retained for this study are permeate flux and selectivity.

Separation of water-propanol mixture made by pervaporation using polyimidesiloxane membranes (PSI) was studied. The fluxes were calculated using a model based on resistances in series and a response surface method (RSM) was used in order to evaluate the effects of operational parameters on flux and membrane selectivity.

RSM is a statistical method that uses quantitative data from appropriate experiments to determine multiple regression equations between the factors and experimental results. In recent years, RSM was used in many applications. However, there have been few investigations of the function of RSM in membrane field.

Keywords: Pervaporation, Membrane, PSI, RSM, Optimization

ID-257

Photocurrent Improvement in Organic Solar Cells Using A Tri-layer Anode TCO/Ag/TCO

D. Hatem[a] , M. S. Belkaid[a]

[a] Laboratory of Advanced Technologies of Electrical Engineering (LATAGE), Faculty of Electrical and Computer Engineering, Mouloud Mammeri University (UMMTO), BP 17 RP, 15000, Tizi-Ouzou, Algeria

Abstract

The use of TCOs in organic solar cells application requires deposition at low temperatures and a limited heat treatment. This process results in high resistivity materials. To achieve practical resistivity levels, we need to replace the conventional electrode with TCO/Metal/TCO tri-layer anode. This material yielded the desired electrical properties without a significant effect on its optical properties. The use of these tri-layer anodes in organic solar cells led to the modification in optical field distribution in the structure of the solar cells, and improve the external power conversion efficiency by maximizing the absorption into the photoactive layer.

ID-258

Investigation and Fabrication of Au/AZO/pSi Schottky Diode: Effect of Nitrogen Amount on Current-Voltage Characteristics

I. Senouci-Zenaidi[a], C. E. Benouis[a], Y. S. Ocak[b], A. Tiburcio-Silver[c], M. Benhaliliba[a], Z. Mouffak[d]

[a] Material Technology Dept., Phys. Faculty, Oran University of Sciences and Technology USTO-MB, BP1505 Oran, Algeria

[b] Dicle University, Education Faculty, Science Dpt., 21280, Diyarbakir, Turkey

[c] ITT- DIEE. Apdo. postal 20. Metepec 3, 52176 Estado de México, México

[d] Department of Electrical and Computer Engineering , California State University, Fresno , CA, USA

E-mail: babimo31@gmail.com

Abstract

Au/AZO/pSi Schottky diode was fabricated by DC sputtering using argon and its current-voltage characteristics were measured. Gold front contact was formed by thermal evaporation in vacuum at 10^{-6} torr. We investigated the influence of nitrogen concentration added to argon, which varied within 0-40 ccm, on current-voltage characteristics. The Al level dopant, the deposition temperature, the pressure, and the power were respectively kept at 2%, 300°C, 10^{-3} mTorr and 100 watts. Under dark condition, the microelectronic parameters such as ideality factor, rectification factor, saturation current , height barrier are extracted and found to be,1.70, 10^{6}, 0.1 nA, 0.9 eV. Due to their well rectification, the diodes were studied under illumination.

Keywords: DC sputtering , AZO, N_2 gaz, Current-Voltage , Ideality factor, Height barrier

ID-260

Regenerative AC Drive System based on the Three Phase Induction Machine

M. Gaiceanu[a], C. Nichita[b]

[a] Dunarea de Jos University of Galati, Romania
[b] University of Le Havre, France
E-mail: Marian.Gaiceanu@ieee.org

Abstract

The three phase induction motors are the most used electrical machines. The efficiency during the dynamical regimes (starting, braking, and reversal) is under 40%. Therefore, this aspect should be taken into consideration by the research community. One simply method is to use a regenerative drive system. The proposed solution consists of a modular topology in which the three-phase active front end power converter is connected in series with the three phase power inverter. This configuration is based on the vector control in synchronous reference frame and improve the energy efficiency, assures the unity power factor operation of the grid power converter in all operating modes, the fast compensation of the disturbance by introducing a feedforward load torque compensation component based on the power balance concept, less than 5% current THD factor and a small DC-link voltage variation during regenerative regime. The field oriented control of the three-phase induction machine is used to independently control the magnetic flux and the torque. In this way, the efficiency of the three phase induction machines is increased. Additionally, by using the third harmonic injection increased efficiency of the power converter is obtained. In order to confirm the feasibility of the solution the Matlab Simulink simulation results are performed. The cascaded control of the grid power converter and the three-phase induction machine is used. The tuning process of the controller parameters is provided. Moreover, this configuration can be used to connect wind power turbine to the grid.

ID-261

Adsorption of Cationic Dye on Activated Carbon from Aqueous Solutions: Equilibrium and Kinetics

O. Benturki[a], A. Benturki[b], A. Donnot[c]

[a,b] Laboratoire physicochimique des matériaux et application à l'environnement,de Chimie, USTHB, Bp 32 El-Alias, 16111, Bab Ezzouar, Algiers, Algeria

[c] Laboratiore d'Etude et Recherche sur le Matériau Bois, UMR INRA 1093, Faculté des sciences et techniques, Université, Henry Poincaré Nancy I, BP 239, 54506 Vandoeuvre-lès- Nancy, France

E-mail : obenturki2013@gmail.com

Abstract

The preparation of activated carbons from local biomass "jujuba seeds" with chemical activation (NZP, NZZ and NZM) and its ability to remove cationic dye, Methylene blue (MB), from aqueous solutions by adsorption.. The adsorbents were characterized with Fourier transform infrared spectrophotometer (FT-IR), and scanning electron microscope (SEM). Various physiochemical parameters such as, contact time, initial dye concentration, pH of dye solution and temperature were investigated in a batch-adsorption technique. Result showed that the adsorption of both MB was favorable at acidic pH. The adsorption uptake was found to increase with increase in initial dye concentration, and temperature of the system. The pseudo-first-order and pseudo-second-order kinetic models were applied to test the experimental data. The pseudo-second order exhibited the best fit for the kinetic studies, The equilibrium data were evaluated using Langmuir and Freundlich isotherms. Thermodynamic parameters such that (MB) dye adsorption was spontaneous and endothermic. The activated carbon NZM was found to be very effective as adsorbent for MB from aqueous solutions.

Keywords : Activated carbon, Adsorption, Isotherm, Kinetics, Thermodynamics, Biomass

ID-262

Study of Synthetics Dyes Adsorption onto Poly (Vinyl Alcohol)/Glutaraldehyde/β-Cyclodextrin Polymer Membranes

G. Djamila[a], A. Djamel[a]

[a] Laboratory of Fibrous Polymers Treatment and Forming. F.S.I, M'Hamed Bougara University, Boumerdes, 35000, Algeria.

E-mail: ghemati_d@yahoo.fr

Abstract

Crosslinked poly(vinyl alcohol)/glutaraldehyde (PVA/GA) membranes were prepared and attempts to obtain hydrophilic crosslinked PVA membranes were made by adding various amounts of β-cyclodexrin, which is a typical cyclic oligosaccharide able to form inclusion complexes with organic host molecules (host-guest complexes). Thus, membranes of poly(vinyl alcohol)/glutaraldehyde/β-cyclodextrin (PVA/GA/β-CD) were synthesized.

The membranes were characterized by infrared spectroscopy (FTIR) and swelling measurements. The ability of cyclodextrin to include a wide variety of chemicals was also exploited for the dye adsorption to show the potentialities of the membranes in the textile liquid waste processing.

Adsorption of reactive, methyl orange and methylene blue dyes on (PVA/GA/β-CD) membranes was consequently studied using UV-Vis spectroscopy at wavelengths of 547, 463 and 660 nm respectively. Adsorption reached equilibrium after 24 hours.

Results indicated that there is no covalent bond formation between PVA and β-CD; the β-cyclodextrin is completely mixed into the PVA matrix polymer. The adsorption capacity increase with increasing amount of cyclodextrin; the maximum adsorption capacity was obtained with 8% β-CD. Therefore, change in adsorption capacities may be due to dye structure effect, the negative value of free energy indicated the spontaneous nature of adsorption.

Key words: Poly (vinyl alcohol), β-cyclodextrin, Dyes, Adsorption, Swelling

ID-263

Energy Conversion Conjugate Conduction with Mixed Convection and Radiation over Exponentially Stretching Surface with Multimedia Physical Effects

K. -L. Hsiao[a]

[a] Department of the Digital Recreation and Game Design, Taiwan Shoufu University, 168, Nansh Li, Madou District, Tainan City, Taiwan, Republic of China

Email: hsiao.kailong@msa.hinet.net

Abstract

In this study, an energy conversion problem has been performed for conjugate mixed convection heat transfer with radiation effect of a steady laminar boundary-layer flow past exponentially flow field over stretching surface. The well-known Boussinesq approximation has been used to represent the buoyancy term adding to the governing equation. All of the important energy conversion parameters M, Gt, Gc, k, Pr and Ncc have been represented the dominance of the magnetic energy effect, mixed convection effect, radiation energy effect, fluid heat transfer effect and conduction-convection effect, respectively. The similarity transformation and the finite-difference method have been used to analyze the present problem. The results have been shown that the mixed convection effect will be produced larger heat transfer effect better than the forced convection, but the radiation effect will be reduced heat transfer effect. This work is also one kind of multimedia effect study for different physical parameters.

Keywords: Energy conversion, Exponentially stretching sheet, Mixed convection, Finite-difference, Radiation energy effect, Magnetic energy effect, Multimedia effects

ID-264

Silicon-Metamaterial Solar Cell Waveguide Structure

H. Hamouche[a], M.M.Shabat[b], et M. F. Ubeid[b]

[a] Centre de Développement des Energies Renouvelables, CDER, BP 62 Route de l'Observatoire, Bouzaréah, 16340, Algiers, Algeria,

[b] ,Department ofPhysics, The Islamic University of Gaza, P.O. Box 108, Gaza Strip, Palestine

E-Mail: shabat@iugaza.edu.ps

Abstract

Solar cell device converts directly sunlight energy into electrical energy. The major problems facing the silicon solar cell are the losses due to the reflection and the limited absorption capability of the solar cell. To raise the low efficiency of solar cells, the concept of the waveguide solar cells was introduced. This work is devoted to the numerical study of a multilayers waveguide structure containing new artificial metamaterials. Metamaterials have both negative electric permittivity and negative magnetic permeability which tend to absorb and focus a large amount of the incident light. The proposed structure consists of three layers, the metamaterial film layer is sandwiched between a dielectric cover layer and a silicon substrate layer. We first analyze the electromagnetic parameters of metamaterials. We then determine the optical parameters of this multilayer structure. This study is based on the use of the transfer matrix method which is a very useful algorithm for reflection, absorption and transmission calculations of multilayer structures. Numerical simulations by using MAPLE software, show the high amount of light absorption in the metamaterial film. This is very important amelioration of cell performances compared to conventional waveguide structures containing thin films of silicon oxide and silicon nitride as anti-reflection coatings. The proposed waveguide structure solar cell design paves a promising way to increase light absorption for solar cell technology applications.

Keywords: Solar cell, Metamaterial, Permittivity, Permeability, Film layer, Waveguide, Transfer matrix method

ID-266

Shale Gas: Environmental Conflicts and Prospects of This Production

Á. C. de Lima[a], J. Â. S. A. dos Anjos[a]

[a] Biologist, Master in Energy, Salvador University, +55(75)9159-1448

[b] Geologist, Professor of the Master in Energy UNIFACS/LAUREATE, Associate Professor Masters and Doctorate in Geology at IGEO/UFBA, Salvador, +55(71)9988-8027

E-mail: jangello@unifacs.br; jose.anjos@ufba.br

Abstract

Analyzes regarding the availability and feasibility of access to hydrocarbon reserves in the world are of considerable importance when one observes the current energy demand. In this context, even though the resources and unconventional gas and oil are generally most abundant are difficult to be produced. Reservoirs developed in shale formations, known as shale, are characterized by low porosity and permeability of the rock, hindering thus the exploitation of these resources. The reserves of unconventional natural gas represent a new and attractive business for the global oil industry. Preliminary calculation of the Agência Nacional do Petróleo (ANP) indicates that the volume of recoverable unconventional gas onshore sedimentary basins could reach 200 trillion cubic feet (TCFs) if they repeated the same conditions found in the pioneer area Barnett in Texas, United States. In this 12th Bid Round ANP, awarded exploration blocks, with the potential for extracting unconventional in Brazil, and subsequently issued Resolution No. 21/2014 regulating their operation. In this article the environmental aspects of the exploitation of shale gas in the international market, and the challenges to the Brazilian energy policy are discussed. In addition, the potential environmental impacts for its implementation in the Reconcavo Basin in the state of Bahia.

Keywords: Shale gas, Fracking, Environmental

ID-267

Energy Conversion for Stagnation Point Heat and Mass Transfer for Micropolar Flow with Radiation Effect and Magnetic Effect Past A Nonlinearly Stretching

Kai-Long Hsiao[a]

[a] Department of Digital Entertainment and Game Design, Taiwan Shoufu University, 168, Nansh Li, Madou Jen, Tainan, Taiwan, Republic of China

E-mail: hsiao.kailong@msa.hinet.net

Abstract

In this study, an analysis has been performed for stagnation point heat and mass transfer of a steady laminar boundary-layer flow of a micropolar flow past a nonlinearly stretching sheet with radiation effects. The similar transformation and the finite-difference method have been used to analyze the present problem. From the results indicate that the heat transfer rate is positive proposing to Pr, k0 and negative proposing to Ec. The effect of Schmidt number Sc on mass transfer process show that the increase of value of Schmidt number Sc results in the increase of mass transfer effect.

Keywords: Stagnation point, Micropolar flow, Nonlinearly stretching sheet, Heat and mass transfer, Finite-difference, Radiation effect

ID-270

Phase Transformation and the Giant MCE in Ni-Mn-In-Co Heusler Alloys

A. Madiligama[a], P. Ari-Gur[a], Y. Ren[b], S.Calder[c], V. O. Garlea[c], V. Shavrov[d], V. Koledov[d], A. Kamantsev[d]

[a] Western Michigan University, Kalamazoo, MI 49008, USA

[b] Argonne National Laboratory, Argonne, Il 60439, USA

[c] Quantum Condensed Matter Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831, USA

[d] Kotelnikov Institute of Radio-engineering and Electronics of the Russian Academy of Sciences, Moscow, Russia

E-mail: amila.bandara@wmich.edu

Abstract

Nature-friendly magnetic cooling technology based on the Giant Magnetocaloric Effect (MCE) is a highly energy efficient, viable alternative to the vapor compression technology [1]. Economically feasible materials are needed that exhibit large entropy changes near room temperature under moderate magnetic field (~2 T). Compared to other extensively studied materials, Ni-Mn-X (X-In, Sn, Sb) Heusler alloys are highly promising magnetic refrigerants operating around room temperature, thanks to their giant inverse MCE driven by merged structural and magnetic transformations [2]. The substitution of small percentage of cobalt with nickel in these alloys intensifies their magnetocaloric performances significantly and results in higher adiabatic temperature changes under moderate magnetic fields [3]. The governing role of the large cooling effect occurs under magnetic field plays by the structural transition. Yet, the magnetic spin alignment contribution is equally important as the driving force of the metamagnetic transformations [3]. The effect of Co substitution on the martensite crystalline structure is critical to the understanding of its contributions to the magnetocaloric effect. In this work, three Ni-Mn-In-Co samples with different Co concentrations were studied for crystalline structures, magnetic ordering and nature of the martensitic transformation using constant wavelength neutron and synchrotron diffraction data collected at Oak Ridge and Argonne National Laboratories, respectively. Rietveld refinements of the neutron diffraction data of $Ni_{40.3}Mn_{39.4}In_{11.8}Co_{8.4}$ (Fig. 1) revealed martensitic phase with a mix of 8-M and 6-M modulations. The chemical compositions was determined by Rutherford Backscattering Spectroscopy and confirmed by Rietveld refinement of synchrotron and neutron data.

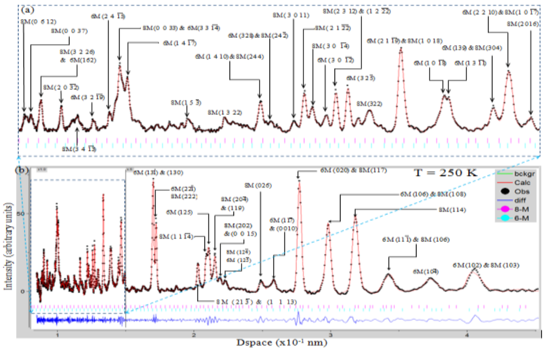

Fig.1: Rietveld refinements of neutron diffraction data of $Ni_{40.3}Mn_{39.4}In_{11.8}Co_{8.4}$ alloy collected at 250 K. At this tempetaure alloy is a mix of two martensitic phases: 6-M modulated and 8-M modulated martensite, both belong to the P 1 2/m 1 monochinic space group. An enlarged portion of the diffraction pattern up to d-spacing is 0.15 nm is shown above (b) of the whole diffraction pattern (a)

Support by Award No. RUP1-7028-MO-11 of the US CRDF Global is acknowledged. Use of the Advanced Photon Source was supported by the U.S. DOE, office of science, under Contract No. DE-AC02-06CH11357, the use of the High Flux Isotope Reactor at ORNL was sponsored by the Scientific User Facilities Division, U.S. DOE, office of science.

ID-271

Renewable Energy Monitoring Using Arduino - Android Platform

F. Dragomir[a], O. E. Dragomir[a]

[a] Automation, Computer Science and Electrical Engineering Department, Valahia University of Targoviste, Targoviste, Romania

E-mail: florin@yahoo.com

Abstract

This paper presents a low cost solution for monitoring system using an embedded smartboard, with IP connectivity for accessing devices. I propose to develop a smartboard, an monitoring system that provides real time update of the energy production and environmental parameters at the device level. The proposed device is using an Arduino Uno board with Atmel microcontroller, a sensor for humidity and temeperature, a anemometer, and two different sensors for radiation (a pyranometer and a PV cell). The energy production from renewable sources is purchased directly from the inverter. The User Interface of the device is to be developed in Android for Tablets and Smartphones, and the data will be uploaded onto a server using the ethernet connection. The final output will be a smartboard that can monitor a remote device using arduino-android platform.

The architecture presented in this article can be customized in different ways in order to accommodate different application scenarios with minimum recoding and design i.e. each time a new device is added to the smartboard-server, a new thread dedicated to the device is automatically created in the smartphone application. The architecture is divided into three layers:

1. production the energy (photovoltaic panels and invertor - 10 panels distributed in only one string and are connected in series)
2. acquisition parameters (smartboard and the sensors)
3. creating Android application (application name being InDeSEn)

Keywords: Energy, Smart grids, Smartboard, Arduino, Android, Monitoring

ID-272

Improvement of the Biomass Combustion Chracteristics

I. Barmina[a], R. Valdmanis[a], M. Zaķe[a], A. Arshanitsa[b], G. Telysheva[b], V. Solodovnik[b]

[a] Institute of Physics, University of Latvia, 32 Miera Str., Salaspils, LV-2169, LATVIA, phone 29891137
[b] Latvian Institute of Wood Chemistry, 27 Dzerbenes Str., Riga, LV-1006, LATVIA
E-mail: mzfi@sal.lv

Abstract

The main aim of this study is to improve the biomass combustion characteristics composing and pelletizing mixtures of biomass residues (wood residues, agriculture residues) with an addition of fine disperse coal residues or vegetable oils to biomass To appreciate the effect of additives on the gasification/combustion characteristics, the complex research and analysis of the chemical composition of the produced mixtures and correlating variations of gasification/combustion characteristics was carried by varying a mass fraction of additives in biomass. The processes of thermo chemical conversion of pelletized biomass mixtures were studied experimentally using a pilot-scale device with an integrated gasifier and combustor. Kinetic study of thermo chemical conversion of mixtures includes the complex measurements of a weight loss rate during the thermal decomposition of biomass mixtures and the measurements of flame temperature, combustion efficiency, produced heat energy and the composition of products during the combustion of volatiles. The results show that additions of fine disperse coal residues or vegetable oil to biomass improves gasification/combustion characteristics of biomass promoting a faster thermal decomposition of biomass pellets, faster ignition and more complete combustion of the volatiles with higher average value of the flame temperature and combustion efficiency, higher value of produced heat energy and higher average volume fraction of CO_2 in the products.

ID-273

Polymer Films with Multilayer Low-E Coating

A. A. Solovyev[a], S. V .Rabotkin[a], N. F. Kovsharov[b]

[a] Tomsk Polytechnic University, 30 Lenin ave., Tomsk, 634050 Russia, Tel./Fax: +7(3822)491-651
[b] Institute of High Current Electronics, Siberian Branch of the Russian Academy of Sciences, 2/3 Akademichesky ave., Tomsk, 634055 Russia
E-mail: andrewsol@mail.ru

Abstract

This paper presents the experimental results on depositing a multilayer low-e coating with oxide-metal-oxide structure on lavsan and polyethylene films by magnetron sputtering. The TiO_2/ZnO:Ga/Ag/ZnO:Ga/TiO_2 coatings were suggested to obtain a high water-resistance and a capability to be used outside of sealed double-glazed pane. The optimal thickness of the coating layers was determined. It allowed obtaining the best transparency in the visible spectrum to reflection in the infrared spectrum ratio. It was shown that the low-emission coatings based on Ag layer have the transparency in the visible spectrum of 82% and reflection in the infrared spectrum of 91%. The research of prospects for the use of the polymer film with a low-emissivity coating to reduce heat loss through the transparent constructions of buildings, as well as heat saving covering material in greenhouses was studied. The heat engineering investigation of translucent models with the low-emission film was carried out. It showed the growth of resistance to heat transfer up to 0.73 $m^2 \cdot °C/W$ for the windows with the low-emission film. The resistance to heat transfer of the windows without the film was 0.38 $m^2 \cdot °C/W$.

ID-274

Synthesis and Characterization of ZnO Nanoparticles

S. Harouni[a], N. Boulares[a], L. Arabe[a], K. Guergouri[a]

[a] Laboratoire Physique-Chimie des Semiconducteurs (LPCS), Department of Physics, University mentouri Constantine 25000, Algeria, Tel: (213)551254532
E-mail sof.harouni@gmail.com

Abstract

The present paper examines ZnO nanoparticles, these particles are prepared using two techniques, sol-gel and sublimation condensation with a solar furnace technique (SCT). The nanoparticles prepared by the last technique are highly crystalline with crystallite size of 21 nm. While the Sol-gel route shows that the crystallite size are above 47 nm. The crystallinity and the crystallite size are examined by X-ray diffraction (XRD) and Scanning Electron Microscopy (SEM). Variation in ZnO bandgap as a function of crystallite size is determined using the absorption spectra obtained by UV-Vis spectrophotometer.

Keywords: ZnO nanoparticles, Sublimation condensation, Sol-gel

ID-275

Analysis of the Performance a PV System Based on Empirical Data in a Real World Context

S. A. Tabatabaei[a], J. Treur[a]

[a] Agent Systems Research Group, Department of Computer Science, VU University Amsterdam, Amsterdam, The Netherlands

E-mail: j.treur@vu.nl

Abstract

The performance of solar energy production systems consisting of photovoltaic solar panels strongly depends on the position and orientation in which the solar panels are installed. For example, the horizontal orientation, the vertical angle, and obstacles throwing shadow during some periods are relevant factors to consider.

In this paper an agent based simulation method is used to analyze the performance of solar panels according to their position and orientation. As a first step a previously developed model (see [1]) is evaluated based on newly available real empirical performance data. These empirical data have been collected from a number of solar panels in different positions day-by-day and panel-by-panel for a whole year. This data is used both to evaluate and improve a previous model for the performance of a PV system. This improvement is done by finding more accurate and realistic values for the parameters in order to minimize the difference between real data and the predictions of ther model.

In the next phase, according to the improved model, some pre-analyses are discussed about what are the better positions for solar panels, and how many solar panels are reasonable for different houses and different roofs. These kinds of pre-analysis is useful as a basis for decision making before placing the solar panels to estimate how much loss the different locations have.

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ID-276

The Origin Of Electrocatalytic Activity of Gold Nanoparticles Modified Pt-Based Surfaces Towards Formic Acid Oxidation

G. A. El-Nagar[a], A. M. Mohammad[a, b], M. S. El-Deab[a, b], B. E. El-Anadouli[a]

[a] Chemistry Department, Faculty of Science, Cairo University, Cairo 12613, Egypt, Phone:010-25-89416
[b] Department of Chemical Engineering, Faculty of Engineering, The British University in Egypt, Cairo 11837, Egypt
E-mail: bahgat30@yahoo.com

Abstract

The electrocatalytic oxidation of formic acid (FA) at Pt-Au nanoparticle (NP)-modified oxidized glassy carbon (GC_{ox}) electrode has been investigated. The Pt and Au nanoparticles supported on oxidized glassy carbon electrode (GC_{ox}) are prepared by an electrodeposited process. The obtained catalysts were characterized by scanning electron microscopy and cyclic voltammetry, which reveal the formation of Pt (grained shaped) and Au (Flower like structure) nanoparticles with average diameters of 25 and 50 nm, respectively. Electrochemical measurements show that oxidative treatment of GC resulted in increase the activity by factor 2-4 times than un-oxidized GC and Au-Pt/GC_{ox} has 85, 860 times higher catalytic activity towards FA oxidation than Pt/GC_{ox} and bulk Pt, respectively. This significantly enhanced activity of Au-Pt/GC_{ox} catalyst can be attributed to noncontiguous Pt sites formed in the presence of the neighbored Au sites, which promotes direct oxidation of FA which called Ensemble effect. On the other hand, the Au-Pt/GC_{ox} catalyst has satisfactory stability and reproducibility when stored in ambient conditions or continues cycling. These results indicate that the system studied in the present work is the most promising system for use in direct formic acid fuel cells.

Keywords: Formic acid oxidation, Electrocatalyst, Ensemble effect, Pt-Au nanoparticles, Direct formic acid fuel cells

ID-277

Behavior of Marble Powder Modified Steel Fiber Reinforced Self-Compacting Mortars in Aggressive Environments

Z. Hamid [a], C. Rabah[a]

[a] UR-MPE boumerdes Algérie

Abstract

The marble has been commonly used as a building material since ancient times. Disposal of the waste materials of the marble industry, consisting of very fine powders, is one of the environmental problems worldwide today. However, these waste materials can be successfully and economically utilized to improve some properties of fresh and hardened self-compacting concrete (SCC).

The aim of this work is to study the behavior of equivalent self-compacting mortars modified by a marble powder conserved in aggressive environments (sea water, sulfated water, drinking water) .Several tests such compressive strength , split-tension strength , sorptivity and porosity at 7,28 and 90 days were performed for hardened mortars,. In conclusion, the substitution of cement by marble powder in self-compacting mortars ameliorate their behavior on aggressive environments.

Keywords: Marble powder, Self-compacting mortar, Durability

ID-278

Two Colored Rainbow System and Calculation of Flat Plate Collector Utilization in Istanbul

Z. Er[a]

[a] Istanbul Technical University, Faculty of Science and Letters (Maritime Faculty), Physics Engineering Department, 34940 Maslak, Istanbul-Turkey, GSM: +905336806804

E-mail: erzuh@itu.edu.tr

Abstract

Solar heating is known as one of the most clean, reliable and cost-effective technology that is reducing utility bills for thousands of homes and businesses. Today, is being widely used in industrial applications in the gamut of manufacturing of goods, heating properties and so forth that significantly reduce dependence on imported fuels. Solar water heating systems are composed of three main elements: the solar collector, insulated piping, and a hot water storage tank.

"2 Colored Rainbow" is a term used to represent two different applications, not to be confused with solar thermal electric:

1. solar water heating
2. solar space heating

Rainbow System traps the heat from the sun (solar radiation) and transfer the heat to water or air for use as thermal energy. While both 2 Colored Rainbow systems involve collector panels, they are very different technologies.

The 2 Colored Rainbow System was used in this study that encapsulates the solar water heating and solar space heating mainly based on trapping the solar radiation to utilize it as thermal energy by the aid of solar panels. The vacuum tube and flat type collectors were used as an experimental portion of this study while the effective utilization of solar energy in terms of each day have been identified by the algorithm that has been developed in C# to determine the how many percentage of an hotel in Istanbul that serves to five hindered guest capacity need could be compensated with providing optimum size and quantity of solar collectors.

ID-279

Analysis of Electricity Usage for Domestic Heating Based on An Air-to-Water Heat Pump in A Real World Context

S. A. Tabatabaei[a], J. Treur[a]

[a] Agent Systems Research Group, Department of Computer Science, VU University Amsterdam
Amsterdam, The Netherlands
E-mail: s.tabatabaei@vu.nl

Abstract

In this paper a new mathematical model to estimate the performance of an air to water heat pump in relation to outdoor temperatures is proposed and evaluated. This model is an extension and refinement of the model proposed in previous work [1]. In the new model the following has been taken into account:

- Real empirical data for usage of a heat pump over a whole heating seasonhave been used to obtain accurate parameter values
- The energy which is used for heating sanitation water for the bathroom is taken into account in a separate submodel. According to some reports, around 15% of domestic energy usage is for hot water. From the ne empirical dataset, the fraction of energy which is consumed for this purpose is known, and it is used to model the usage for sanitation water heating as separate from the usage for heating.
- In this model the amount of energy which is used to keep the system working (standby mode) is taken into account as well
- The now available empirical data for the whole heating season have been used for validation of the model

To estimate the parameter values for this model on the one hand and valiudation on the other hand, the empirical data have been divided in two subsets and used the first part to tune the parameters (training data) and the other subset to validate the model (test data). Moreover, this new model has been compared to previous models.

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ID-280

Influences of the Annealing Temperature On Zno Nanowire Arrays

H. Tugral[a], N. Baydoğan[b], H. Cimenoglu[a]

[a] Department of Metallurgical and Materials Engineering, Istanbul Technical University, Turkey, Phone: +90212 285 34 92

[b] Energy Institute, Istanbul Technical University, 34469, Istanbul, Turkey

E-mail: *cimenogluh@itu.edu.tr;*

Abstract

Zinc oxide (ZnO) nanowires with controlled nanowire diameter was prepared on substrates with different pretreatment conditions. The changes of optical density of ZnO nanowire arrays are found to be strongly dependent on the formation mechanism of ZnO nanowires related with the heat treatment of the surface. Scanning electron microscopy and a double beam spectrophotometer were used to evaluate the characteristic properties. X-ray diffraction (XRD) and X-ray fluorescence (XRF) techniques were applied to analyze the quality of the ZnO nanowire arrays. The annealing process at the surface has played an important role on the changes of optical properties of the ZnO nanowire arrays. The tunning of optical band gap was discussed with change of the heat treatment.

ID-281

Efficiency and CO_2 Emission of Heat Engines Operating with HRG Gas Addition

G. Niculae[a], R. Chiriac[b], N. Apostolescu[b]

[a] Department Heat Engineering, Engines, Thermal and Refrigeration Equipments, University ”POLITEHNICA” of Bucharest, Romania

[b] Department of Heat Engineering, Engines, Thermal and Refrigeration Equipments, University ”POLITEHNICA” of Bucharest, Romania, Phone + 40 21 402 9451

E-mail: raduchiriac2001@yahoo.com

Abstract

The effects of gas addition, on efficiency and CO_2 emission were investigated with a compression ignition (CI) engine and a spark ignition (SI) engine operating with hydrocarbons based fuels. HRG, provided by a water electrolyzer, was aspirated into the air stream inducted in the engine cylinders. Investigation was conducted at engine light and medium loads and speeds, with relative low concentrations of HRG. For the CI engine, HRG addition lowered CO_2 concentration (ppm) in the engine exhaust up to 8% and BTE up to 1%. CO_2 specific emission (gCO_2/kWh) was correspondingly lower with maximum 10%. For the SI engine fueled with gasoline, the effect of HRG addition was depending not only on engine load and speed, but also on the relative air-fuel ratio λ. It was found a maximum decrease of 5% by HRG addition. BTE was improved in a limited domain of HRG fraction, with maximum improvements between 2.5% and 21%. As a cumulative effect, a maximum lowering by 20% of the CO_2 specific emission was reached. The effect of HRG supplementing LPG gas in the same SI engine was alternatively studied with similar results: CO_2 concentration reductions by maximum 3%, improvements of BTE up to 33% at optimal HRG fraction and finally a lowering of CO_2 specific emission by maximum 22%.

Keywords: HRG, CI engine, SI engine, CO_2 emission, BTE

ID-282

Synthesis of Palladium Nanoparticles Supported on Reduced Graphene Oxide and Their Application towards the Hydrogen Evolution Reaction

F. Chekin[a]

[a] Department of Chemistry, Ayatollah Amoli Branch, Islamic Azad University, Amol, Iran
Phone.: +98 121 2517000; Fax: +98 121 2517043
E-mail: fchekin@yahoo.com

Abstract

The hydrogen evolution reaction (HER) is an electrochemical process that has received wide attention because of its importance in both fundamental and technological electrochemistry such as fuel cell technology [1-3]. In this work, the synthesis and characterization of palladium nanoparticle-reduced graphene oxide hybrid (Pd-rGO) material is reported. Techniques of X-ray diffraction (XRD), transmission electron microscope (TEM), energy dispersive X-ray (EDAX), FT-IR spectroscopy, thermogravimetric analysis (TGA) and cyclic voltammetry (CV) were used to characterize the structure and properties of the Pd-rGO. The average particle size of the Pd nanoparticles supported on rGO obtained from TEM is about 12–18 nm. Moreover, glassy carbon electrode modified with palladium nanoparticle-graphene oxide hybrid (Pd-rGO/GCE) was prepared by casting of the Pd-rGO solution on GCE. The electrochemical and catalytic activity of the Pd-rGO/GCE was studied in 0.1 M H_2SO_4 solution. The Pd-rGO/GCE electrode exhibited remarkable electrocatalytic activity for the hydrogen evolution reaction (HER). Finally the kinetic of the hydrogen evolution reaction is also discussed on the Pd-rGO/GCE.

Keywords: Reduced graphene oxide, Palladium nanoparticles, Hybrid, Hydrogen evolution reaction

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ID-283

Effect of Sol-gel MgO Spin-coating on the Performance of TiO_2-based Dye-Sensitized Solar Cells

F. Al-Subai[a], A. Merazga[a], A. M. Albaradi[a], A. Badawi[a]

[a] Taif University, Faculty of Science, Physics department, Taif, Saudi Arabia
E-mail: merazga_amar@yahoo.fr, aamerazga@tu.edu.sa

Abstract

A simple sol-gel technique, involving magnesium acetate as precursor, ethanol as solvent and nitric acid as stabilizer, is applied to prepare solutions of suspended MgO nanoparticles at different precursor concentrations. It is demonstrated that spin-coating at 3000 rpm of the so-prepared 0.1M MgO onto the surface of the TiO_2 electrode and subsequent dye-loading for six hours can cause an efficiency increase of the associated dye-sensitized solar cell (DSSC) by up to three times with respect to the normal uncoated TiO_2 DSSC. On the basis of measured optical absorption spectra of the different films, before and after dye-loading, and examination of the dark I-V characteristic and the photo-voltage decay from steady state, the results are interpreted in terms of two competing factors: The formation of an energy barrier by the coating MgO layer, which increases the photocurrent by reducing the rate of interfacial electron back-recombination, and the reduction of the dye-adsorption efficiency of the TiO_2 film with increasing MgO amount in the coating layer.

ID-285

Preparation and Characterization of $BaO-B_2O_3-SiO_2$ Glass-Ceramics for Possible Use in SOFC

Z. Hamnabard[a], L. Rezazadeh[b]

[a] Laser & Optic Research School, Tehran, Iran ,+982182063150

[b] Department of mechanic, faculty of *Technical* and *Engineering*, Marand Branch, Islamic Azad University, Marand, Iran, +984912263444

E-mail: zohrehhamnabard@yahoo.com

Abstract

In the present work, two glass composition from the different compositional triangles in $BaO-B_2O_3-SiO_2$ system with constant B_2O_3/SiO_2 ratio and different BaO/SiO_2 molar ratios (named as Ba32, Ba37) were fomulated and ability of them as sealant in solid oxide fuel cells were studied.

Structure of the glasses was characterized with FTIR and Raman spectroscopy. According to the results, the structure of the glass with 32%molar BaO (Ba32) mainly contained of Q^2 structural species and B_2O_3 formed the triangular units (BO_3). In glasses with 37% molar BaO (Ba37), with the substitution of SiO_2 by BaO, distribution of Q^n units broadened, silicate glass network depolymerized and concentration of Q^1 structural units increased at the expense of Q^2 units and boroxyl groups (BO_3) gradually converted into groups including BO_4 units.

X-ray diffraction analyses revealed that in Ba32 and Ba37, initially $Ba_3Si_5O_{13}$ and $Ba_5Si_8O_{21}$ phases were crystallized respectively, and it seems that these crystalline phases act as the sites for nucleation and subsequent growth of $BaSi_2O_5$ phase.

Leakage test of Ba32 specimen was highly desired. The leak rate of Ba37 glass was in the range of $10^{-7}$to 10^{-8} Pam^3s^{-1} (big leak).

It was apparent that the interfaces of Ba32 and Ba37/steel were continuous and without pores or cracks and delamination. It appears that among the compositions, Ba37 glass has the best desired potential to use as sealant for SOFC but flow and wetting behavior of this glass were not very good, and bonding with the metals was weak.

ID-286

Initiating Stakeholder-driven Sustainable Transport Planning Developing A Process Tool for Traffic Management at A Regional Scale

M. Robèrt[a]

[a] The Royal Institute of Technology, Department of Chemical Engineering and Technology, 100 44 Stockholm, Sweden

Abstract

Traditionally, sustainable transport analyses are carried out through two fundamentally different perspectives:

a) Internal travel analysis at an organizational level, often as part of corporate environmental follow-ups to develop internal travel policies and company travel plans for emission audits.

b) Macro Analysis of the transport system at large, in order to assess traffic flows in relation to alternative infrastructure measures and policy actions at a regional level.

From a holistic global perspective, both these subsystems ought to share common visions and long-term targets for sustainability. This would ask for derivation processes by which subsystems at different scales could be interlinked and informed by global principles for sustainability. A key component identified in this study for this to happen, is to synthesize approach a) and b) in order to facilitate consensus formation between private and public actors, and between public transport authorities governing supply of transport services. In the current situation there is rarely active consensus formation between these parties which risk creating watertight bulkheads between users and providers in the transport system.

This study presents a case study of a local travel plan network in the largest business district of Sweden, Kista Science City, where according to the development in larger urban business districts in the world, travel demand is likely to exceed the capacity of the transport system in the coming decade. From this perspective it is urgent to create visions and strategies for economically and socially optimized sustainable travel strategies at the leading companies in the area. For this to happen, companies were invited in the decision process in a joint venture with public authorities. The strategic transport efficiency model CERO developed in doctoral research at KTH was identified as a transparent and well-tried assessment- and change management framework for initiating an implementation process of company travel plans in line with economic payoff and employee acceptance in the companies.

In this study we display the project outline, some key findings from the analysis, and directions for further research focusing on the creation of a transport simulator utilizing the power of visualization in the decision process. Based on empirical data from organizational commute and business travel, the simulator enables clear visualizations of how alternative travel policies correspond to emissions, travel costs, accidents, time efficiency and accessibility. This in turn might highlight motives for more organizations to initiate a travel planning, and thus, lower the entry threshold for more active key players in the transition toward a sustainable transport system. Moreover, the simulation tool potentially serves a purpose for bridging the gap between local/regional perspectives, to more holistic perspectives of the transport system, since it allows experimentation on the effect of spreading good local examples within larger system boundaries of the society.

ID-288

Polythiophene/Silicon Nanowires for Detection of Para-Nitrophenol

S. Belhousse[a], N. Belhaneche-Bensemra[2], K. Lasmi[a], S. Sam[a], F. Z. Tighilt[b], N.Gabouze[a]

[a] Centre de Recherche en Technologie des Semi-conducteurs pour l'Energétique (CRTSE), Bd. Frantz Fanon, B.P. 140, Alger-7 merveilles, Alger, Algérie

[b] Ecole Nationale Polytechnique (ENP), 10, Avenue Hassen Badi, B.P. 182-16200, El Harrach, Alger, Algérie

Phone : 00 213 21 43 35 11

E-mail : all_samia_b@yahoo.fr

Abstract

A para-nitrophenol (p-NPh) is a toxic derivative of the parathion insecticide and is considered as major toxic pollutant because it is soluble and stable in water so it can affect soil. Therefore, an increasing number of analytical methods are being developed to detect the presence of this compound and its degradation products, some of which are more toxic that the original pesticide. In this work, we use a hybrid structure silicon nanowires/ polythiophene for detection of p-NPh. Silicon nanowires (SiNW) have received increased interest due to their unique one-dimensional physical morphology and the associated electrical, mechanical, chemical, optoelectronic and thermal properties. SiNWs are synthesized metal assisted chemical etching in HF/$AgNO_3$ solution. The fonctionnalization of SiNW surface was shown to have a huge effect on the electrical mobility [1]. Polythiophene (PTh) is an interesting class of conducting polymers due to their stability in different environments, it were grown on SiNW surface using electropolymerization in acetonitrile in the presence of thiophene monomer, this conducting polymer confers to the SiNW new and improved properties. The effect of functionnalization of silicon nanowires surface and concentration of p-NPh on the sensitivity of the structure have been investigated. The morphology of the fabricated PTh/SiNW hybrid structures were characterized by scanning electron microscopy (SEM). Cyclic voltammetry and amperometry were used to study the electrodetection of p-NPh. The performance of the sensor was tested under different conditions and a very high sensitivity was noted; in particular, the linearity of the sensor for the detection of para-nitrophenol was observed from 4×10^{-8} to 1.5×10^{-4}M.

Keywords: Polythiophene, Paranitrophenol, Silicon nanowires, Electrodetection

ID-289

Efficiency of A Hybrid Solar Gas-Turbine Power Plant

A. Medina[a], D. Olivenza-León[a], A. Calvo Hernández[a]

[a] Departamento de Física Aplicada, Universidad de Salamanca, Salamanca, Spain
E-mail: amd385@usal.es

Abstract

Finite natural resources, rising energy prices, increasingly competitive global markets, and environmental emissions regulations are four key points in the search of sustainable technologies for efficient and clean energy conversion and utilization processes. A thermodynamic model and analysis is a basic step for any system to be optimized. One of the most promising concepts for the efficient generation of clean electricity is the consideration of a partial solar energy input in a Brayton cycle. This concept is expected to reduce the generation costs of solar thermal electricity. These systems are the so-called hybrid solar Brayton plants. They receive input energy either from a solar concentrated system and/or from the combustion of fuels (fossil or bio-) in a combustion chamber.

In this work we present a thermodynamic model for a hybrid solar gas-turbine plant. The model includes the main irreversibility sources in the solar collector, in the combustion chamber, and in the heat engine itself. Analytical equations for the efficiency and the power output are presented. They depend on the main parameters of the solar collector and the correponding heat losses, the combustion efficiency and the effectivenesses of the involved heat exchangers, and the losses associated to the Brayton heat engine. The last includes losses in the turbine and compressor, pressure losses and losses in the recuperator.

The predictions of the model are validated by comparing with a real plant and the sensitivity of the efficiency, the fuel-conversion efficiency, and the power output is analyzed in terms of several plant variables.

ID-290

Hydrothermal Synthesis of Lithium Meta Titanate Nanocrystallites

A. R. Abbassian[a], M. R. Rahimipour[b], Z. Hamnabard[c]
[a] Materials Research School, Isfahan, Iran
[b] Ceramic Department, Materials and Energy Research Center, Karaj, +982636204131, Iran
[c] Laser and Optics Research School, +982182063150, Tehran, Iran
E-mail: ahmadabbassian@gmail.com

Abstract

Lithium meta titanate (Li2TiO3) is one of the most promising tritium breeding candidate materials. In this study, the nanocrystallites lithium-titanate with hexagonal and cubic crystal structures were synthesized at low temperature, 200°C for 12h by the hydrothermal method. The results showed that the monoclinic phase of Li2TiO3 nanostructure with high purity can be synthesized by further heat treatment of the hydrothermal synthesis powder above 700°C. In despite the heat treatment, electron microscope and X-ray diffraction analysis showed that the synthesized compounds had grain size smaller than 120 nm. In order to study the influence of the synthesis process on the morphology and particle size, Li2TiO3 was also prepared by a solid-state reaction.

ID-292

Optimization of Manifold Geometry in PVT Solar Collector-Simulation Approach

M. Hosseinzadeh[a], F. Amani[b], Q. Esmaili[c]

[a] Department of mechanical engineering, ayatollah amoli branch, Islamic Azad university, Amol, Iran, +98 121 2517208
[b] Department of mechanical engineering, ayatollah amoli branch, Islamic Azad University, Amol, Iran. +98 121 2517208
[c] Department of mechanical engineering, ayatollah amoli branch, Islamic Azad university, Amol, Iran, +98 121 2517210
E-mail: M_hoseinzadeh59@yahoo.com

Abstract

Renewable energy sources have important role in human life. During of all technologies, solar energy is one of attractive technologies which can be used directly for electricity production or as heat source for other systems. Solar thermal collectors generally can be divided in 3 groups: 1- thermal collector, 2 – photovoltaic collector and 3 – PV/T collector. PV/T collectors can produce electrical and thermal energy together. To increase thermal performance, using of microchannel was supposed by some researchers. but the pressure drop penalty is very important issue in implementation of them. A suitable design of microchannel manifold can effect on both pressure drop and thermal performance of PV/T collectors. In this study, after verification of simulation, three configurations of manifold were studied numerically. By using FLUENT software, the laminar flow of water simulated at the Reynolds number 250, 500, 750 and 1000 and heat transfer and velocity distribution for each case was studied. The result showed that manifold with angle of 16.38 has minimum pressure drop and maximum heat transfer. Furthermore, it can be deduced that angle of housing has important effect in thermal performance of PV/T collectors.

Keywords: PVT sollar collector, Microchannel, Numerical simulation

ID-293

Heterogeneous Cracking of Tars on Surface of Charcoal

V. Kosov[a], V. Kosov[a], V. Zaichenko[a]

[a] Joint Institute for High Temperatures of the Russian Academy of Sciences (JIHT RAS) Izhorskaya str. 13, 125412 Moscow, Russia

E-mail: kosov@ihed.ras.ru

Abstract

One of the most urgent problems of biomass gasification is cleaning of the product gas from pyrolysis tars and carbon dioxide. Joint Institute for High Temperatures of the Russian Academy of Sciences suggests the gas cleaning technology based on the heterogeneous cracking of pyrolysis tars on surface of charcoal. For the practical implementation of this method it is important to know efficiency of the hot charcoal filter for pyrolysis liquid products cracking. There are two cracking processes take place: homogeneous cracking in volume and heterogeneous cracking on the surface of porous charcoal matrix. In this paper the results of experimental determination of the efficiency of heterogeneous of pyrolysis tar cracking depending of the hot charcoal filter parameters are presented.

ID-294

Mechanical and Fatigue Properties of Ferritic, Martensitic and Austenitic Steels in Contact with Lead and Lead-Bismuth Melts

O. I. Yaskiv[a], V. M. Fedirko[a], I. Kukhar[a]

[a] Institute for Physics and Mechanics, Lviv, Ukraine, 5, Naukova str., Lviv, Ukraine, 79601, Phone: +380 67 2552301
E-mail: oleh.yaskiv@ipm.lviv.ua

Abstract

The influence of stagnant liquid-metal environments (Pb and Pb-Bi) on mechanical properties (strength and plasticity), low cycle fatigue and creep rupture strength of ferritic Fe-11Cr, martensitic Fe-13Cr and austenitic Fe-18Cr-10Ni steels in the temperature interval of 250…750°C have been investigated. These results were compared with tests in vacuum at the same temperature interval. It was shown that heavy liquid metals facilitate decreasing in ultimate strength of Fe-13Cr steel by 10–20% against that in vacuum and the increase in temperature enhances this effect. Ferritic/martensitic steels is susceptible to liquid-metal embrittlement in the temperature interval of 350…450°C, which manifests itself more substantially in lead–bismuth eutectic. The mechanical properties of austenitic steel are not considerably affected by heavy metals melts. Liquid metal environments significantly reduce fatigue life of studied steels. Pb-Bi has a more negative impact. Liquid metal environments significantly reduce creep rupture strength of studied steels. One of the reasons is corrosion effect, when chromium dissolution along grain boundaries and formation of Fe-based oxides take place.

Keywords: Ferritic/martensitic and austenitic steels, Lead, Lead-bismuth eutectic, High temperatures, Strength, Plasticity, Low cycle fatigue, Creep rupture strength

ID-296

Effects of Marble Powder on the Rheological and Hardened Properties of Self-Compacting Concrete

B.L Aboubakeur, A. Lakhdar, B. A. S. Eddine, B. benchaa

Laboratoire de Recherches de Génie Civil (LRGC), Université Ammar Telidji, Laghouat, Algérie
boukhalkhal_ul@yahoo.fr

Abstract

Self-compacting concretes (SCC) are highly fluid concretes that can flow and be placed in formwork under their own weight without requirement of intern or extern energy. This fluidity is obtained with the use of high paste volume and superplasticizer. The paste of SCC is made principally of cement, which is the most expensive component of concrete. As a result, the production of SCC is more costly compared to that of conventional concrete. However, to reduce the cost of production of SCC, the binder is often a binary even ternary compound: Portland cement mixed with limestone fillers, blast furnace slag, natural pozzolana, silica fume, fly ash, etc. The primary aim of this work is to study the effect of incorporating the marble powder (MP) as a supplementary cementations material on the rheological, physical and mechanical properties of SCC. The rheological properties of SCC were measured using the modified slump flow. The properties of hardened SCC such strengths, ultrasonic pulse velocity and density were determined. The obtained results show that a substitution content of 20% of the marble powder in SCC enhances their fresh properties. At the hardened state, the incorporation of a marble powder decreases the mechanical strengths, ultrasonic pulse velocity and density.

Keywords: Self-compacting concrete, marble powder (MP), binder, rheology, mechanical properties, physical properties

ID-297

Experimental Investigation on Concrete Water Desalination Still Coupled with Flat Plate Solar Collector

TIGRINE Zahia, ZIOUI.D, ABUHIDEH.H, BELHOUT.D, BELGROUN.Z,HOUT.S, BELLATRECHE.R, ABBAS.M

Unité de Développement des Equipements Solaires UDES /Centre de Développement des Energies Renouvelables CDER, Bou Ismail, 42415, W. Tipaza
Email: phyzahia@yahoo.fr

Abstract

The present work presents an experimental study on innovative concrete solar still with energy storage system that was designed and realized in UDES center. It deals with some geometry effects of the equipment and energy storage during the daytime and in nocturnal period. We have studied the effects of the energy storage system which is placed in tow specific areas on the yield of distillation process with and without energy storage. The dual heat exchanger system has been used connecting it between the desalination chamber and the concrete heat exchanger to provide the heat to the water in the distillation basin. The heat exchanger system provides the energy to the water to be treated at the daytime while the concrete part provides the energy storage in the desalination evaporator at the night hours. The experimental test results showed that, the increase of distilled water through the heater system is very important in comparison with the productivity of the conventional solar still. A significant improvement of the productivity rate is achieved. We note from the obtained results that the use of energy storage increases the productivity by 50% in the nocturnal period. Indeed, the daily productivity of the concrete solar still is strongly affected by the heat transfer produced from concrete to the evaporator water are presented in this study. It was found that the average daily distillate output of concrete solar still with energy storage is more significant than a solar still without energy storage

Keywords: Solar Still, Distillation,Water treatment, Energy, Thermal collector

ID-298

Electrocatalytic Materials for Water Splitting and Solar Energy Conversion

Khurram Saleem Joya

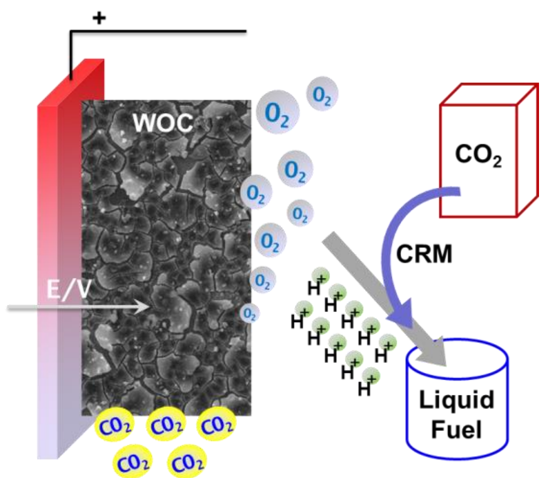
KAUST Catalysis Center, King Abdullah University of Science and Technology (KAUST), 4700 KAUST, Thuwal 23955-6900, Saudi Arabia

Leiden Institute of Chemistry, Leiden University, Einsteinweg 55, 2300 RA, Leiden, The Netherlands

E-mail: khurram.joya@kaust.edu.sa

Abstract

In order to construct a solar to fuel conversion system, the "Artificial Leaf", the development of a robust and efficient water oxidation electrocatalyst (WOE) is a bottleneck. For the proof-of-principle and long-term performance, WOEs need to be employed on conducting surfaces, i.e. electrodes as well as on light-harvesting photo-responsive materials. For the last five years, we have been developing both molecular systems and inorganic materials for electro-driven water oxidation assemblies. In molecular catalysis, we show that immobilization of metal complexes to electrode exterior can make a working model of a half-cell device for anodic oxygen evolution. We also have prepared nanoscale inorganic materials formed in-situ under benign conditions. They exhibit remarkable activity for anodic oxygen evolution, and are stable over a wide pH range for long time catalysis (Figure 1). At present, we focus on the inter-connection of molecular catalysts and nanostructured materials with photo-responsive materials to make light-driven water oxidation systems.



ID-299

Policy Implementation of Energy-Efficient and Sustainable City Measures: Complications and Conflicts

A. TERECİ, D. KESTEN

KTO Karatay University, Stuttgart University of Applied Science

Abstract

Currently around half of all urban residents live in cities, so cities play a vital role in the social and economic development of countries. Energy-efficient and sustainable development will play a key role for the future of cities and countries. Around the world on the city scale or district level, many energy efficiency and sustainable development projects are ongoing, based on implementation of new technologies and transformation of the urban fabric. As a part of the energy turnaround in Europe, the urban development planning needs a strategic energy concept at urban level. Recently, European Commission Research Council has been stared to support the projects and studies that are addressing scientific and policy challenges at the interface system transformations, the environment and cities. One of the important point in these projects is setting is to set clearly defined criteria for evaluating the energy efficiency and sustainability. These measures should be defined well for the implementation of policy. In many countries the comprehensive planning system is composed of formal and in formal plans. As building codes are referred to create legally binding instruments, at the greater scale – neighbourhood, district, urban etc.- non legally binding (informal) instruments like “energy action plans” and “integrated development plans” can appear in the sustainable urban development policies. On the national or regional level, in order to reach the specified target all the stakeholders have a part to play on policy implementation. Consideration of the benefits, risks, options and barriers plays an essential role on the policy implementation. In this research, for all stakeholders on the policy implementation phase complications and conflicts are defined and discussed considering environmental, economic and social priorities for their site.

Keywords: Planning, development and management

ID-301

Hydrogen Production by Steam Conversion of a Model Biogas over the Co-Based Supported Catalysts

.S. Itkulova, G.D. Zakumbaeva, Y. Y. Nurmakanov, N.N. Nurgaliyev, A.M. Abdullin, A. Ospanova, and S. Imankulova

D.V. Sokolsky Institute of Organic Catalysis and Electrochemistry,142, Kunaev str., Almaty, Kazakhstan
E-mail: sholpan.itkulova@gmail.com

Abstract

Biogas is one of the most abundant and versatile energy sources in the world. Biogas mainly consists of methane and carbon dioxide. In fact, biogas can serve as a feed for the catalytic production of syngas (H_2/CO) by the dry reforming of methane according to the reaction

$$CH_4 + CO_2 \rightarrow 2CO + 2H_2$$

Adding steam to provide the combining dry and steam reforming of methane can allow increasing hydrogen yield by the easy adjustment of the feed composition. The main challenge is to develop the catalyst, which should be active in both the dry and the steam reforming of methane and resistant to coke formation.

In this work, the new multicomponent Co-based catalysts promoted by additives of VIII Group metal and rare earth element and supported on alumina have been synthesized and tested in dry and steam conversion of a model biogas. The processes were carried out at a flow quartz reactor under conditions: atmospheric pressure, GHSV - 1000 hr^{-1}, and varying temperature within 300-800^{o}C. The catalysts were characterised by using electron microscopy, BET, and X-Ray analysis.

Adding steam in amount up to 40 vol.% leads to increasing both the methane conversion and the hydrogen yield at lower temperatures. Almost complete methane conversion is occurred at T<700^{o}C at steam reforming of biogas. Syngas is enriched with hydrogen, H_2/CO > 1.5. The catalysts are high effective ones. The 5%Co-M_1-M_3/Al_2O_3 catalyst has showed the stable activity during 80 hours of its continuous test in the steam conversion of a model biogas.

ID-302

Material Degradation due to Ageing in the Extraction Steam Piping of a Power Plant

Owais A. W[a] , A. H. Syed[a] , M. Tufail[b] , Mahmood K[c]

[a]Pakistan Institute of Engineering and Applied Sciences (PIEAS), Lehtrar Road, Nilore, Islamabad, Pakistan
[b]NED University of Engineering and Technology, University Road, Karachi-75270, Pakistan
[c]National Center for Non-Destructive Testing, Street No: 7, I-9/2, Islamabad, Pakistan

[a]E-mail: owais_waseem@mail.com, *anwarulhasson@hotmail.com
[b]E-mail: mtufail@neduet.edu.pk
[c]E-mail: mahmoodkhan77@gmail.com

Abstract

Degradation due to ageing in the Extraction Steam Piping of a Nuclear Power Plant was assessed by using destructive and non-destructive tests. Samples of twelve years old seamless carbon steel SA 106B pipe were examined. Metallographic examination, hardness testing, radiographic examination and ultrasonic thickness measurement were performed to investigate and analyze ageing effects in the piping material. The properties of the virgin and aged pipes were compared. Microstructure of virgin pipe sample show bands of pearlite and ferrite phases. Metallographic examination of aged sample revealed formation of irregularly distributed graphite nodules in ferrite grains and on grain boundaries as well. The pearlite phase, from 40%, reduced to 25%. Consequently, the hardness of steel has been reduced up to 20.4% on internal surface, and 0.7% on external surface of the pipe material. Internal surface experienced more reduction in hardness as it comes in direct contact with steam. Radiograph of aged pipe revealed wall thinning due to material removal from internal pipe surface. This methodology adopted in this work is appropriate for ageing assessment of conventional plants as well.

Keywords: Corrosion; Hardness; Material Ageing; Degradation; Extraction steam piping; SA 106B; Nuclear Materials; Microstructure

ID-303

The Effect of Humidification Strategies on Efficiency and Durability of Hydrogen Fuel Cells in Automotive Application

Fortunato Migliardini, Pasquale Corbo

Istituto Motori - National Research Council of Italy
Italy. E-mail: f.migliardini@im.cnr.it

Abstract

Hydrogen fuel cell systems represent very promising on-board power generators for hybrid electric vehicles, as they can effectively exploit both the environmental benefits of the fuel and the high efficiency of the electrochemical device. Polymeric electrolyte fuel cells (PEFC) are the most suitable for transportation application since they are characterized by low operative temperature, quick start-up, high efficiency, good transient response, and absence of corrosive liquid electrolytes. Furthermore the on-board fuel cell system requires the choice and integration of suitable balance of plant components, together with the optimal management finalized at maximum efficiency and durability.

The polymeric membrane needs to be properly humidified in all working conditions, in order to guarantee satisfactory ion conductivity during stack operation. In this respect water management inside the system represent a critical issue to be faced for the optimal design and management of the electrochemical generator.

The aim of the present paper is to evaluate the effect of different humidification strategies on stack and fuel cell system performance, analysing both steady-state and dynamic conditions, typical of application in automotive field. In particular the following approaches were investigated: water injection into the cathode manifold, saturation of reactant streams at different temperatures, humidification by selective membranes, and self-humidification without external devices. The experiments were carried out on fuel cell systems of different power, all based on PEFCs, ranging from 0.5 to 16 kW. The results show that the optimal humidification strategy is function of stack operation mode and energy management inside the overall power train.

Keywords: Hydrogen, Polymeric Electrolyte Membrane, Humidification Strategy, Fuel Cell Power Train

ID-304

Energy Harvesting from Open Fireplaces

M. Nesarajah ,G. Frey

Saarland University, 66123 Saarbrücken, Germany
E-mail: marco.nesarajah@aut.uni-saarland.de

Abstract

This contribution presents a green barbecue or fireplace, which recovers electrical energy from the heat of the fire by the use of thermoelectric generators (TEGs). TEGs use a temperature difference to generate electrical energy based on the Seebeck effect. To generate a sufficient temperature difference, the fireplace was designed to ensure a good heat transfer to the hot TEG sides. Furthermore, CPU cooling elements using heat pipes were mounted on the cold TEG sides. As a side effect, the recirculation of the preheated air from these coolers into the fire can improve the burning process. The gained energy is used to load a mobile device via an USB plug and to supply 12 V DC via a vehicle plug.

Possible applications of the system are of cause barbecues where the DC power may be used to support mobile devices or entertainment systems. A more serious application is found in rural areas without electrification where the electricity generated during cooking may replace expensive batteries or environmentally unfriendly diesel generators.

An object-oriented model of an energy harvesting system was already developed in Modelica®/Dymola® for an oil-fired household heating system [1]. The modeling of the thermoelectric device itself is presented in [2]. Based on these both, a simulation model for the green barbecue is now created.

The contribution will describe the construction of the green fireplace and the developed simulation model. Finally the simulation results are compared with real test readings and an outlook on further developments to a controlled fireplace is given.

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ID-305

Vortex Dust Structures in Non Ideal Viscous Dusty Plasma

E. Nebbat , R. Annou

Faculty of Sci. and Technology, University of Dr. Yahia Farès, Médéa, Algeria
Faculty of physics, USTHB, Algiers, Algeria
E-mail : nebbatelamin@yahoo.fr

Abstract

The dusty plasma is a partly ionized gas, containing electrons, ions and massif particles highly charged. This particles move inside plasma and can sometimes give a nonlinear structure lake void, vortex and solitary wave. These vortices are formed by a collective behavior of grains which under certain conditions move in rotational movement to a center point. This structure is observed in many laboratories [1]. Recently Nebbat and Annou have proposed a theoretical models that explain the characteristic of this structure [2,3], where the vortex is generated by a variation of RF power in magnetoplasma. The vortex structure in viscous dusty plasma is already study by Nebbat and Annou in ideal dusty plasma [4] where the results revealed the decreases of grain energy by the viscosity effect, but in the most of experimental work the density of gaz is high that lead to the non ideal case. To investigate this case we propose another approach consisting of removing the grain-grain interaction force to include it in the pressure term. As such, the fluid is no longer considered ideal; hence the pressure term is to be modified accordingly to account for non–ideality. The results are compared with that found in Ref. [4]

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ID-307

Determination of Optimum inSulation Thickness through the Artificial Neural Networks Method

H. Altunay[a], K. Bulut[b]

[a]Firat University, Department of Industrial Engineering, Elazığ
[b]Kirikkale University, Department of Industrial Engineering, Kırıkkale

Abstract

As far as energy efficiency in heating is concerned, it is clear that implementing a proper thermal insulation system is an indispensable part of any energy saving project. As it is known, most of the previous studies on the thermal insulation systems are conducted by using traditional optimization methods. Instead of traditional methods, this study applied Artificial Neural Networks (ANN) method in determination process for the optimum insulation thickness for any external wall. Furthermore five different energy types and four different insulation materials with different concrete structures were used in the determination process.

To summarize, utilized ANN method and those variables were applied in this study in following three steps: Firstly, a multi-layer feed-forward ANN model that based on backpropagation training algorithm was developed. Secondly, this model was used for determination of optimum insulation thickness in case of different value of the input variables. In the final stage, the performance of this ANN model was evaluated by regression analysis between the network outputs and calculated values.

Keywords: Thermal Insulation, Building Materials, Artificial Neural Networks.

ID-308

Determination of Building Thermal Insulaton Materials Using Multi-Criteria Decision Making Methods

O. Altunay[a], H. Altunay[b], K. Bulut[c]

[a]Firat University, Department of Computer Engineering, Elazığ
[b]Firat University, Department of Industrial Engineering, Elazığ
[c]Kirikkale University, Department of Industrial Engineering, Kırıkkale

Abstract

With the rapid depletion of energy resources energy conservation has become a crucial issue. A large portion of the energy wasted as heat energy is the fact that lead to the necessity of thermal insulation. Thermal insulation has a great importance in terms of preventing unnecessary loss of energy and reducing environmental damage from fossil fuels. Many thermal insulation materials which have different characteristics are manufactured with evolving technology. Including fibrous and foamed materials, these materials that can be analyzed in two groups according to thermal insulation method and usage, have various advantages or disadvantages. The choice of the most appropriate one from these materials, is extremely important with regard to be able to obtain of desired thermal insulating performance. In this study, insulation materials are evaluated by Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method which is defined in a Multi-Criteria Decision Making techniques. Finally, the rank of most suitable thermal insulating materials is carried out with comparing all alternatives according to weights of determined criteria.

Keywords: Thermal Insulation Materials, Multi-Criteria Decision Making, TOPSIS.

ID-309

Gaps in Energy and Environmental Performance of New Low Energy Buildings in Scotland

T Sharpe

Mackintosh Environmental Architecture Research Unit, GSA, 167 Renfrew Street, Glasgow G3 6RQ
E-mail: t.sharpe@gsa.ac.uk

Abstract

This paper reports on a range of Technology Strategy Board funded projects that are examining the performance of a range of new build low energy houses throughout Scotland. These are two-year monitored projects that capture quantitative data on energy consumption and environmental conditions, including air quality, but also qualitative data through interviews and surveys with occupants and designers. The projects (n=26) have a number of different characteristics, including different types of construction and design intention, including some Passivhaus, and more mainstream social housing. The paper will examine and compare the energy and environmental performance of these houses. Whilst it is clear that these houses are resulting in reduced energy use, there are gaps in both energy and environmental performance, which may have implication to both reduced energy and CO_2 targets, but also health effects on occupants. Factors include occupancy and ventilation behaviours, but also include room volume, openings, and mechanical systems.

Keywords: Indoor Air Quality, CO_2, Occupancy, Behaviour, Comfort, Health, Ventilation

ID-310

Highly Porous Nanocomposites Based on Carbonized Metal-Organic Frameworks

E. Mijowska, K. Cendrowski, X. Chen, P. Spera, P. Skumiał, R. J. Kalenczuk

Institute of Chemical and Environment Engineering, West Pomeranian University of Technology, Szczecin, ul. Pulaskiego 10, 70-322
Szczecin, Poland

Abstract

The aim of the study was to reveal a synthesis route and structural, electrochemical properties of highly porous nanocarbon forms with high surface areas and large pore volumes. In order to improve their mechnical properties carbon nanospheres (CNS) was added into the nanoporous carbon matrix.

Here, carbonized metal-organic frameworks (MOF) with and without additional carbon source (fulfuric alcohol) was explored. Porous MOFs are usually thermally robust and have nanoporous space suitable for small molecules to access and participate in "ship-in-bottle" reactions. Therefore, they were used as hard templates, to allow the reactions of small carbon precursors inside the pores, affording porous carbons.

First, carbon nanospheres with controlled diameter were prepared using hard template technique (silica nanospheres)[1]. Next, the nanocomposite was prepared during the insitu process when carbon nanospheres are directly introduced into the substrate forming metal organic frameworks (MOF-5)[2]. Optionally, additional source of carbon was added as well. The carbonization process was performed in high vacuum conditions at elevated temperature.

The detailed analysis by high resolution transmission electron microscopy revealed that carbon nanospheres are homogeneously dispersed in MOF-5 matrix. The phase composition of the nanocomposite confirmed the succesful formation of the metal-organic frameworks structure. Detailed analysis on the influence of the carbonization parameters and the presence of the additional carbon source on specific surface still requires further studies. The samples with the best parameters will be tested as hydrogen storage medium and components of supercapacitors[3,4].

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ID-311

Adapting Steady State Solar Power Models to Incorporate Transients

M. Abutayeh

Mechanical Engineering Department Khalifa University PO Box 127788, Abu Dhabi, UAE

Abstract

Quite a few computer programs have been developed to model power plant performance. These software codes are geared towards modeling steady state operations which is usually sufficient for conventional power plants. Solar thermal power plants undergo lengthy start–up and shut–down operations due to the sporadic nature of solar radiation; therefore, valid modeling of their performance must address those transient operations.

A novel scheme has been developed to fine–tune steady state solar power generation models to accurately take account of the impact of those transient operations. The suggested new scheme is implemented by adjusting solar radiation input data and has been shown to significantly improve modeling accuracy by moving modeled results closer to matching real operating data.

Keywords: Solar energy, solar power, transient modeling

ID-313

Polymer Inclusion Membranes (PIM). Synthesis and Application in Extracting of Basic Dyes

S..AITALI, O..KEBICHE-SENHADJI,M..BENAMOR

Laboratoire des Procédés Membranaires et des Techniques de Séparation et de Récupération (LPMTSR)
Université 20 aout 1955 SKIKDA
Faculté de Technologie, Université Béjaïa, route targa ouzamour bejaia, DZ
E-mail: aitali_salima@yahoo.fr

Abstract

Studies were carried out to remove a basic dye (Methylene Blue; MB and Rhodamine B RB) from their aqueous solutions using polymer inclusion membranes (PIMs) consisting of Cellulose Triacetate (CTA) as the base polymer, 2-Nitrophenyl octyl ether (2-NPOE)as the plasticizer and Di-(- Ethyl hexyl) phosphoric acid (D2EHPA) as the carrier. The manufactured membranes have been characterized by Scanning Electron Microscopy (SEM) (morphology) and TGA (thermal analysis). The membranes thickness was measured by digital micrometer.

The fractions of base polymers and of the carrier D2EHPA were varied to determine the optimum composition with respect to extraction capability of the membranes. After optimization of the pH of the aqueous solution, the concentration of D2EHPA in the membrane, the concentration of dyes and the stirring speed, more than 93% and 97% for the BM and RB respectively extraction efficiency has been reached at pH =6.0.

Keywords: :Polymer Inclusion Membrane (PIM); D2EHPA; Extraction; cationic dye, Methylene Blue (MB), RhodamineB (RB)

ID-314

Recombination of Hydrogen and Oxygen Catalyzed by Platinum and Palladium in Safety Point of View in Nuclear Power Plants; Role of Alkali Modifiers (Li, Cs) in Catalyst Deactivation due to Water

R. Kosydar, A. Drelinkiewicz, E. Lalik, R. Tokarz-Sobieraj, T. Szumełda

Jerzy Haber Institute of Catalysis and Surface Chemistry, Polish Academy of Sciences Poland
E-mail: nckosyda@cyf-kr.edu.pl

Abstract

The strongly exothermic reaction (H_2 + 1/2 O_2 = H_2O, +240kJ) is safety problem in nuclear power plants because of hydrogen generation in chemical and radiation processes. Massive hydrogen generation could appear in accidents (TMI-2,1979; Fukushima,2011). Several solutions were considered. The option based on catalytic recombination of hydrogen using oxygen from the containment atmosphere is preferred and realized in safety devices “passive autocatalytic recombiners” (PAR) with Pt or Pd catalysts. They are “passive”; self-starting, self feeding, acting without external power and human intervention.

Existing PAR contains metal-plates - alumina wash-coat - Pt / Pd. PAR's atmosphere includes water vapor (up to 60%) a poison for Pd/Pt. Present work focuses on alumina supported Pt, Pd catalysts and their deactivation by water. The role of alkali (Li, Cs) in their activity, deactivation for H2+O2 reaction is studied. Characterization techniques (BET, XRD, XPS, SEM-EDS, HRTEM, STEM, CO-chemisorption) showed well-dispersed Pd particles, incorporation of alkali into alumina and their interactions with Pd-particles. The performance was studied in flow reactor at 25-75^{o}C. The accompanying thermal effects were studied by microcalorimetry.

Pd-containing catalysts were more promising than Pt-based catalysts because of lower sensitivity to water, making Pd-catalyst more stable in humid atmosphere. This found confirmation in DFT-calculations showing stronger water - Pt-clusters interaction. Li or Cs in Pd/Al_2O_3 catalyst decreases resistance against water. Effect of Cs-ions was stronger, making Cs-containing catalyst highly prone to water.

Keywords: Hydrogen recombination, nuclear power plant, palladium, platinum catalysts.

ID-315

Synthesis and Characterization of PVA-Acid Salt Polymer Electrolytes

R. M. Khalil[a], E. Sheha[b], T. A. Hanafy[a], O. Al-Hartomy[a]

[a]Physics Department, Faculty of Science, Tabuk University, KSA
[b]Physics Department, Faculty of Science, Benha University, Benha, Egypt
Email: rkhalil@fsc.bu.edu.eg, redakhalil67@gmail.com

Abstract

A solid acid membranes based on poly (vinyl alcohol) (PVA), magnesium bromide ($MgBr_2$) and phosphoric acid (H_3PO_4) were prepared by a solution casting method. The morphological, x-ray and electrical properties of the $(PVA)_{(1-x)}(MgBr_2)x/2(H_3PO_4)_{x/2}$ solid acid membranes where x = 0.0, 0.1, 0.2, 0.3 and 0.4 wt.% were investigated. The PVA polymer electrolyte directly blended with acid salt shows improvement in ionic conductivity and transport properties. The maximum ionic conductivity value of PVA/acid salt polymer electrolyte with x = 0.40 wt.% of acid salt is around 1.64×10^{-4} S cm^{-1} at 20 ◦C and the ionic transport number (t+) is in the range of 0.98–0.99. In this work, the data shows that the $(PVA)_{(1-x)}(MgBr_2)x/2(H_3PO_4)_{x/2}$ solid acid salt membrane is promising for intermediate temperature phosphoric acid fuel cell applications.

Keywords: Polymer electrolytes; Ionic conductivity; Phosphoric acid

ID-316

Perspectives of Industrial Separation of Boron Isotopes by the Laser Assisted Retardation of Condensation Method

K.A.Lyakhov , H.J.Lee

Institute for Nuclear Science and Technology, Plasma Physics Lab, Department of Nuclear and Energy Engineering, Jeju National University, Ara-dong 1, Jeju 690-756, South Korea
E-mail: lyakhov2000@yahoo.com, hjlee@jejunu.ac.kr

Abstract

Demand in isotopically pure boron is steadily increasing in industry and medicine. It makes necessary to look for more cheaper ways of boron isotopes production. It is demonstrated that laser assisted retardation of condensation(SILARC) scheme has higher potential for industrial deployment than traditional methods. Rarefied gas flow dynamics in external specifically tuned laser field, corresponding to SILARC method, is treated within the transport model developed in Ref. [1]. Because product cut and enrichment factor corresponding to the optimal conditions are rather small we propose a new iterative scheme. By developing appropriate model for gas flow separation we have found the optimal values of laser intensity, gas flow temperature, nozzle throat area, and number of nozzles in the industrial setup.

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ID-317

Preparation and Flame-Retardant Properties of Nanocomposites Based on Graphene and Polyolefins

B. Zielińska, X. Chen, E. Mijowska, K. Wenelska, R. Kaleńczuk

Institute of Chemical and Environment Engineering, West Pomeranian University of Technology, Szczecin, ul. Pułaskiego 10, 70-322, Szczecin, Poland

Abstract

There are various methods of improving fire retardancy of polymers as required in many applications for safety considerations[1-3]. However, to some degree, these methods are limited with respect to environment requirements and performance of polymers. It is believed that adding carbon nanomaterials (such as carbon nanotubes and graphene) to polyolefin can remarkably improve the flame retardancy of polymer. However, the possibility of improving flame retardancy of polymer nanocomposites through catalyzed carbonization of the polymer itself during combustion has to be still explored. Carbon formation of polymer itself during combustion will be helpful to improve fire retardancy of polymer. If graphitic carbon structure can be formed in situ during the combustion of polymer nanocomposites, the fire retardancy of the polymer nanocomposites would be improved through reducing or stopping evaporation of gaseous flammable components.

The aim of this contribution was to reveal flame retardancy of polyolefin (e.g. polypropylene and polyethylene) and graphene based nanocomposites. First, graphene oxide was prepared via modified Hummers methods4. Next, iron nanoparticles will be deposited on the surface of reduced graphene oxide. Finally, nanocomposites of polyolefins and iron modified graphene were synthesized.

The samples were characterized by transmission electron microscopy (TEM), scanning electron microscopy (SEM), atomic force microscopy (AFM), Raman spectroscopy and X-ray diffraction (XRD). The thermal stability and flame retardancy of investigated samples were studied by means of thermal gravimetric analyzer (TGA) and microcalorimeter, respectively.

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ID-318

Electrocatalytic Activity of NiO_x Modified Electrodes towards Oxidation of Small Organic Molecules

Sayed. M. El-Refaei[a], Gumaa A. El-Nagar[a], Ahmed M. Mohammad[a,b], Mohamed S. El-Deab[a,b], Bahgat E. El-Anadouli[a]

[a]Chemistry Department, Faculty of Science, Cairo University, Cairo 12613, Egypt

[b]Department of Chemical Engineering, Faculty of Engineering, the British University in Egypt, Cairo 11837, Egypt

Abstract

The present study addresses the electro-oxidation of formic acid (FA), Glucose and methanol at nickel oxides nanostructured modified electrodes. Cyclic voltammetry (CV), scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDX) are used for characterization of the prepared electrodes. A significant enhancement of glucose and methanol oxidation has been observed at the NiO_x modified GC electrodes, while the same electrode doesn't show any electrocatalytic activity towards FA oxidation which means FA oxidation is substrate dependent. On the other hand, binary modified GC electrode with NiO_x and PtNPs electrodes have significant enhancement towards FA, glucose and methanol oxidation. Interestingly, for FA NiO_x/Pt/GC electrode resulted in a superb enhancement of the direct oxidation pathway (desired, I_p^d) with a concurrent suppression of the indirect pathway (undesired, I_p^{ind}). Also, the NiO_x modified Pt electrode is shown to give a much higher current for methanol oxidation compared to that obtained at Pt/GC electrode concurrently with a favorable significant shift of the onset potential of methanol oxidation. On the other hand, NiO_x/Pt/GC electrode shows a superb catalytic activity towards glucose oxidation, that is, the peak potential for the peak A1 is more negative than Pt/GC electrode. In addition, the peak current of the NiO_x/Pt/GC for the peaks A1, A2 and A3 is substantially higher than that of Pt/GC electrode. Generally the superb catalytic activity of NiO_x/Pt/GC electrode may be attributed to NiO_x presences, which provide oxygen species at the catalyst surface at lower potential compared to the unmodified Pt electrode that facilitates electro-oxidation processes of the studied fuels.

Keywords: Electrocatalysis, Nickel oxide nanoparticles, Platinum nanoparticles, Fuel Cell

ID-319

Synthesis and Characterization of a Natural Hydroxyapatite (derived black phosphate) for the Retention of Organic Pollutants

N.Kadim, H.Khireddine, L. Takorabet, S. Meski

Laboratoire de Génie de l'environnement
Université Abderrahmane Mira de Béjaïa, Algeria
Khiredine.hafit@gmail.com

Abstract

The apatite used in this work is taken from a clay which itself comes from an Algerian mining site. it is made by the dissolution-precipitation process. This material has a thermal and chemical stability remarkable; it is intended for application in the environmental field (retention of organic pollutants, heavy metals or radioactive waste).

The Apatite obtained was characterized by XRD, SEM, IR, BET and TG. The results are the same to those reported in the literature for a synthetic hydroxyapatite. XRD spectra showed a majority phase of hydroxyapatite whatever the sintering temperature (600, 800 and 1000°C). The surface area is from the order of 60 m^2 / g.

This bioadsorbant (apatite, utilised at 2 g/l) is used for removal phenol with concentration included in interval 10 mg/l to 150 mg/l , the first results are encouraging compared to the results given in the literature. However, these can be further improved by doping the hydroxyapatite matrix. This is what we have achieved during this work.

ID-320

Characteristics Parameters of Arc in a High Voltage Circuit Breaker

A. Ziani , H. Moulai, A. Nacer

Laboratory of Electrical and Industrial Systems, Faculty of Electronics and Computer Science, University of Science and Technology Houari Boumediene, BP 32, Bab Ezzouar, Algiers, Algeria

Abstract

The temperature value at the opening of a high voltage circuit breaker is crucial to avoid the failure of the arc extinguishing The purpose of this paper is to present a new approach to thermoelectric coupling between Mayr arc equation and heat transfer by convection on matlab simulink environment. The opening time of the circuit breaker, the nature of breaking medium and the different physical parameters of the arc, the line characteristics were simulated through Differential Equation Editor on matlab. We also show that for highly inductive transients lines of rétablissemnt s' établisent on the breaker with an oscillatory regime. We chose to work with a breaker 60kV/50kA/50Hz lines used in high-voltage networks and for which several studies have been made testable. The simulation results were compared with experimental measurements.

ID-321

Sol –Gel Preparation of Hg (II)-Doped TiO_2 Nanorods and Their Application as CO_2 Gas Sensors

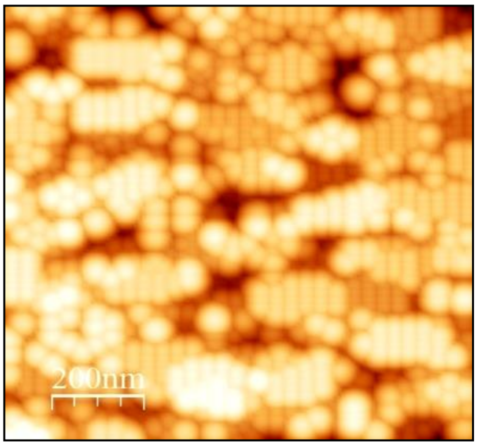
R. Bensaha, F.Abbas

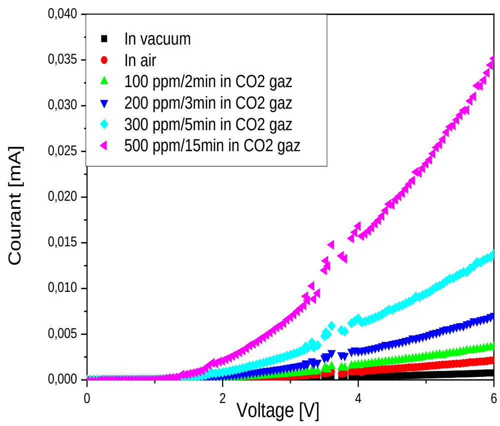
Ceramic Laboratory, University of Constantine 1, Road Ain El Bey, 25000 Constantine, Algeria
E-mail: bensaha@umc.edu.dz

Abstract

Hg (II) doped TiO_2 thin films have been synthesized from Hg (II) acetate and titanium tetrabutyl-orthotitanate precursors on deposited on silicon and glass substrates using a sol-gel dip-coating technique. Annealing temperatures and layer thickness were found crucial for thin film nanostructures morphology which was characterized by X-ray diffraction (XRD), differential scanning calorimetric (DSC), Raman spectroscopy, scanning electron microscopy (SEM) and atomic force microscopy (AFM). XRD and Raman results show that the 5% Hg (II) doping stimulates crystallization at lower annealing temperatures compared to undoped TiO_2, which remains amorphous under the same conditions. Higher annealing temperatures are associated with smaller particle size. SEM and AFM reveal spheroidal surface agglomerates of radially-arranged TiO_2 nanorods 2-18 nm in diameter. The CO_2 gas sensing properties of TiO_2 doped thin films were investigated by current–voltage (I–V) characteristics. Rectifying Schottky barrier diodes were fabricated by aligning single ultra-long Hg (II)-doped nanorods a cross paired Ag was associated with rapidly increasing forward and reverse currents, indicating a high sensitivity to CO_2 gas

Keywords: TiO_2-Hg, sol-gel, nanostructures, nanorods, structural properties, gaz sensor.





ID-322

Identification of Power Appliances Causing Poor Power Quality in Smart Grid Using Multi-stage ICA and MPS

Rai Sachindra Prasad[a], Anshuman Anshu[b], Amandeep Kushan[b], Sunil Semwal[c]

[a]Senior Prof (R & D), KCCEIT
[b]Asstt Prof, KCCEIT, Nawanshahr, Punjab Technical University, India;
[c]Asstt Prof, Graphic Era University, Dehradun, India
[a]E-mai:l drsachpd@yahoo.com,
[b]E_mail: aanshumann@rediffmail.com,[b]E-mail: amandeepkushan@gmail.com
[c]sunil.111213@gmail.com

Abstract

There is growing need for reliable on-line power quality monitoring systems with large number of power appliances in use. Some of these appliances may be non-linear and rich in harmonics. Monitoring of power quality is vital to maintain proper functioning of utilities, consumer services and equipments. Several factors may be responsible for poor power quality, but this paper is concerned to identify online those domestic power appliances which are responsible for contributing 'dangerous level' of harmonics in the micro grid. So far not a single reported procedure has been commercially exploited. Motivated by this scenario, we demonstrate the design and implementation of a non-intrusive on-line identification system for domestic power appliances causing harmonics. The procedure is based on a new application of Independent Component Analysis (ICA) in appliance identification, and first time use of multi point sensing (MPS) against the single point sensing (SPS) approach where a single current sensor is used for sensing current waveform (CW) of all the power appliances clubbed in a single circuit. The SPS approach renders aggregate CW highly complex and difficult to disaggregate and hence impractical for use. Using internal electrical wiring platform with recommended specifications for domestic premises in India, the new procedure was developed in laboratory environment using as many as twelve commonly used power appliances in Indian homes. Results indicate that ICA in multi stage mode, and MPS together provide a most viable and practical solution in identification of power appliances for detecting contribution of their harmonics level in smart grid.

Keywords: NIALM, Independent Component Analysis, Power Quality, Smart Grid, Multi Point Sensing

ID-323

Food Manufacturing Energy Conversion for Nanofluid MHD Mixed Convection with Slip Boundary and Heat Source/Sink with Multimedia Physical Effects

I-Hua Lin, Kai-Long Hsiao

Taiwan Shoufu University, 168, Nansh Li, Madou District, Tainan City, Taiwan, Republic of China.
E-mail: hsiao.kailong@msa.hinet.net

Abstract

In this study, a food manufacturing energy conversion problem has been performed for conjugate mixed convection heat transfer with Magneto-Hydrodynamic (MHD) and heat source/sink effects for nanofluid flow field over slip stretching surface. The well-known Boussinesq approximation has been used to represent the buoyancy term adding to the governing equation. All of the important energy conversion parameters M, Gt, Gc,λ, Pr, Sc, Ncc, S and δ have been represented the dominance of the magnetic energy effect, mixed convection effect, heat generation/absorption energy effect, heat transfer effect, mass diffusion effect, heat conduction-convection effect and slip boundary effect, respectively. The similarity transformation and the Finite-Difference method have been used to analyze the present problem. The results have been shown that the mixed convection effect will be produced larger heat transfer effect better than the forced convection. This work is also one kind of multimedia feature study for different physical parameters.

Keywords: Energy conversion, Nanofluid, Slip stretching sheet, Mixed convection, MHD, Heat source/sink

ID-324

The Lake Ourmiah Case : Using the Solar Energy to Improve the Environment

Ajabshirizadeh[a, c] S. Koutchmy[a,c], C. Bazin[a,c], Y. Sakho[a,c] , E. Tavabi[a, b, c]

[a]Research Institute for Astronomy & Astrophysics of Maragha (RIAAM), 55134-441 Maragha, Iran

[b] Payame Noor University of Zanjan, Zanjan, Iran

[c]Institut d'Astrophysique de Paris & UPMC, UMR 7081, 98 Bis Boulevard Arago, F-75014 Paris, France

E-mail: a-adjab@tabrizu.ac.ir (A. Ajabshirizadeh), koutchmy@iap.fr (S. Koutchmy), tavabi@tabrizu.ac.ir (E. Tavabi)

Abstract

The dramatic evolution of the lake Ourmiah (E- Iran) eco- system for the last decade is considered and several suggestions are made to start its re-habilitation. The first step is to cover a very limited part with P-V panels to provide energy to be stored for the needs of a modest research lab with living facilities, including cooled areas under the shadows where prospects can be done. Several wind- power plants units could also be used. Research will be done, including on-site research, for defining and optimizing an efficient Helio-Eco- Systems (HESS) based on the possible use of the huge amount of locally available salt and the left artesian water. We suggest using Fresnel type 10 kW efficiency cylindro- parabolic mirrors for concentrating the solar energy and storing it in melted- salt system used for desalination and for producing electricity. A network of mirrors can then be developed (similar to the "AREVA solar- Molten Salt Energy Storage" project) in case it is successfully demonstrated it works and can resolve the huge environmental problems of the whole lake area.

ID-326

Prospect of Run-of-River Hydro Power Development for Remote Communities in Indonesia

A. Sunarso, H. Sihombing, Agato, I. G. Widodo, D. Sulistiono, H. Cahyono

Politeknik Negeri Pontianak, Jalan Achmad Yani, Pontianak, Indonesia 78124
E-mail: sunarso@dosen.polnep.ac.id

Abstract

Remote communities usually suffer from the lack of public facilities such as educational facilities, health care center, clean water supply as well as electricity. Therefore, more efforts are required to provide the facilities and to accelerate development of the communities. This paper presents an initial effort to develop un-of-river hydro power systems for remote communities. Here, we assess the run-of-river hydro power resources and analyze the prospect of the run-of-river hydro power development for remote communities in West Kalimantan - Indonesia. Field surveys have been conducted to investigate the flow characteristics (flow velocity, width, depth) of rivers at several remote locations and the potential hydro power is calculated from the flow characteristics. It is found that the rivers have a wide range of characteristics. Assessment based on velocity, depth and width of the river flows shows that total kinetic power of the rivers is ranging from several watts to several kilowatts. Furthermore, the possibility of increasing the hydro power by using weir and constricted flow channel has been analyzed. It is should be noted that channel constriction would increases the hydro power significantly, but in the other hand, would increase the upstream water level that should be kept as small as possible. As the optimized hydro power of the rivers reaches tens of kilowatts, which meets the amount of energy required by remote communities, the run-of-river hydro power is considered as a prospective technology to solve the electricity problem in remote communities.

Keywords: Run-of-river hydro power, river flow characteristics, hydro power optimization, remote communities development.

ID-327

Experimental Analysis on Energy Conversion Efficiency of Eupatorium Adenophorum Spreng Using Anaerobic Digestion for Hydrogen and Methane Co-Generation

F. Yin , W. Zhang, J. Liu, H. Yang, C. Wang, Y.Mao

Yunnan Normal University, Kunming 650092, China
E-mail: yf6709@sina.com

Abstract

Implement the co-production for hydrogen and methane generation of Eupatorium adenophorum Spreng by control pH value of anaerobic digestion. For hydrogen production followed by methane production stage, TS and VS hydrogen production rate is 49.09L/kg and 63.66L/kg, as well hydrogen content 30.85%. While for methane production followed by hydrogen production stage, TS and VS hydrogen production rate is 14.16L/kg and 17.77L/kg, hydrogen content 32.26%. By determination of gas-production and gas-rate of the different process of hydrogen production followed by methane production and methane production followed by hydrogen production, and content of cellulose, semi-cellulose, and lignin in the co-production hydrogen and methane fermentation system, we conclude that the hydrogen production followed by methane production is beneficial for energy conversion efficiency by reduction of fermentation period and improvement of degradation of organic material.

Keywords: Anaerobic digestion for Eupatorium adenophorum Spreng, Co-production for hydrogen and methane generation, Energy conservation rate

ID-328

It is a Material World: The Role of Materials in Engineering Education for Sustainable Professional Practice

J.Rojter

College of Engineering and Science ,Victoria University, Melbourne
Josef.Rojter@vu.edu.au

Abstract

The presence of material science and engineering in undergraduate engineering disciplines, other than materials engineering, has generally undergone diminishing presence over the last twenty years. The materials engineering subject curricula are generally focused on the utilitarian contexts of particular engineering disciplines. The material structure-property relationships have been largely replaced by properties in discipline contexts. The loss of the empowering role that materials engineering and science plays in professional practice has been due to perception of hegemony of functionality in engineering curricula. However in observing professional engineering discourses in the world of practice it is not difficult to realize that the epistemologies of engineering education and professional practice diverge. In broad terms, professional engineering practice is increasingly anchored in environmental and sustainability issues. The role of materials engineering subjects in undergraduate engineering curricula at Victoria University (VU) is seen at exploring the sustainable and environmental dimension in engineering education. The teaching of materials at VU has taken a pro-active role from a contextual service subject to a more central role. Students are exposed to ideas that design practices are no longer based on costs, durability and reliability but using costing in terms of energy and consequently the carbon footprint. Material science subjects at VU are underpinned by a holistic philosophy in understanding both physical and the real world, and the role Life Cycle Analysis plays in developing professional judgements in sustainable practice. Students through constructivist pedagogies follow materials from their production till their final demise via manufacturing, recycling, reuse and energy recovery. The subject syllabi has been successful with some students opting out to other universities to undertake materials/manufacturing/product engineering whereas a significant proportion of remaining students choose the final year projects in materials technology and engineering.

ID-329

Silicide/Silicon Thermoelectric Module Packaging with Hybrid Cu Paste

H.C. Bae[a], W. Choi[a,b], J. Son[a], H. Lee[a], K.S. Choi[a], M. Jang[a], Y.S. Eom[a]

[a]Components & Materials Research Laboratory, ETRI, Daejeon 305-700, KOREA
[b]Department of Electrical Engineering, KAIST, Daejeon 305-701, KOREA
E-mail: hcbae@etri.re.kr

Abstract

Solid-state thermoelectricity is a promising green technology for power generator applications. Bulk Bi2Te3 and its alloys are the most widely used thermoelectric materials because they show high conversion efficiency. However, these materials are predicted to become scarce in the near future. On the other hand, silicon is one of the most abundant materials, and the process technology has been well developed. To reduce the thermal conductivity of silicon without degrading its electrical conductivity, a silicide/silicon hetero-structure is introduced in this paper.

A p-type and a n-type silicon substrates were prepared for silicide/silicon hetero-structure thermoelectric devices. The wafer was double-side polished for cross-plane seebeck coefficient measurement. After a normal wafer cleaning process, the native oxide was removed by dipping in a buffered oxide etchant (BOE) solution. Fabrication of the thermoelectric device began with the deposition of platinum onto the silicon substrate by sputtering. After the platinum layer was formed, silicon was consecutively sputtered onto the platinum layer. For the layered structure, platinum and silicon layers were repeatedly deposited. After the final thermal process, the wafer was cut into small chips measuring 1.8 mm×1.8 mm. The fabricated silicide/silicon hetero-structure silicon chips were bonded with ceramic substrate having thick Cu electrode using a hybrid Cu paste.

In general, a conductive paste as a composite material is composed of polymeric resins and metallic filler. Ag paste is widely used for thermoelectric module packaging. The conductivity of Ag paste was achieved by a mechanical contact between Ag particles due to the shrinkage of the polymer matrix during the cure processing. However, it is well known that Ag powder is still too expensive as a raw material for the production of conductive paste. In the present work, an isotropic conductive paste, called hybrid Cu paste, is proposed. The hybrid Cu paste is formulated by the mixing of three components: Cu flakes, solder powder, and fluxing resin. The fluxing resin has an ability to remove the oxide layer in the Cu and solder powder during the curing process.

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It is well known that the price of raw Cu material is approximately 100 times cheaper than that of raw silver material.

In this paper, the silicide/silicon laminated hetero-junction structured thermoelectric device was interconnected using the novel hybrid Cu paste. Three different types of thermoelectric modules were fabricated using the solder paste, Ag paste and hybrid Cu paste, respectively. The thermal reliability and DC resistances of the fabricated thermoelectric modules were compared and measured.

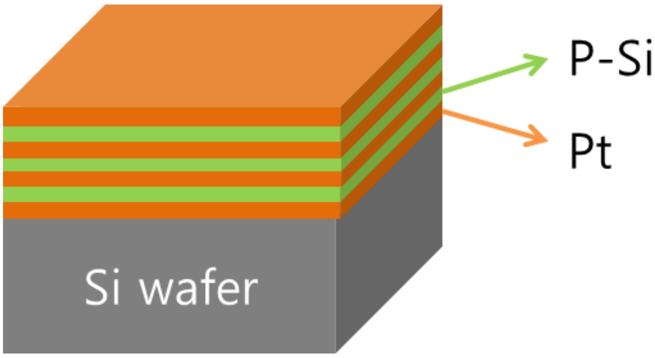

Fig. 1. A simple schematic diagram of the p-type device with platinum silicide and silicon hetero structure

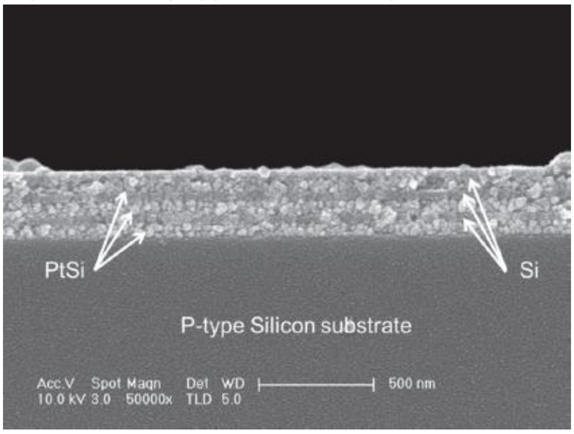

Fig. 2. A cross-section SEM image of a laminated silicide and silicon hetero-structure.

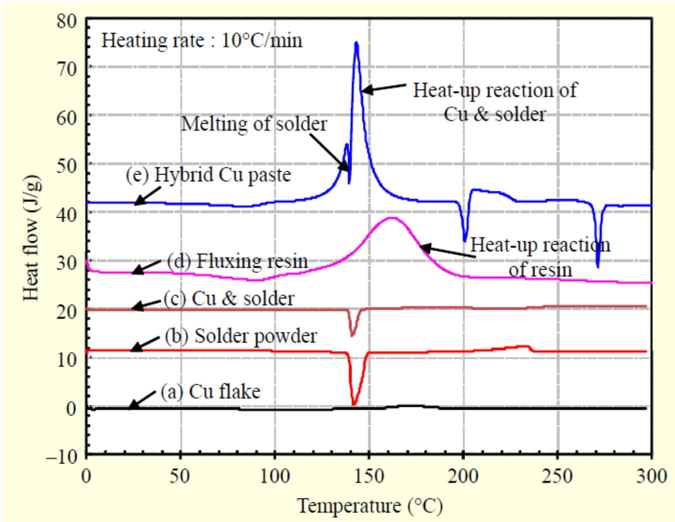

Fig. 3. Comparison of DSC thermograms: (a) Cu flake, (b) solder powder, (c) Cu flake and solder powder, (d) fluxing resin, and (e) hybrid Cu paste

ID-330

Investigation of Input Energy Efficiency in Corn (Ksc704) Farming in Khoy City, Iran

N. Hosseini

Researcher Club, Khoy, Islamic Azad University Khoy Branch, Iran
E-mail:eng.naser.hosseini@gmail.com

Abstract

Energy cycle is one of the essential points in agricultural ecosystems all over the world. Corn is one of the important products in Khoy city. Knowing input energy level and evaluating output energy from farms to reduce energy and increase efficiency in farms is very important if one can reduce input energy level into farms through the indices like poisons, fertilization, tractor energy and labour force. In addition to the net income of the farmers, this issue would play a significant role in preserving farm ecosystem from pollution and wrecker factors. For this reason energy balance sheet in Corn farms as well as input and output energy in 2012-2013 researched by distributing and questionnaire among farmers in various village in Khoy city. Then, the input energy amount into farms via energy-consuming factors, mentioned above, with regard to special coefficients was computed. Energy was computed on the basis of seed corn function, chemical compound and its content as well. In this investigation, my colleague and I evaluated the level of stored energy 10792831 kcal per hectare. We found out that the greatest part of energy depended on irrigation which has 5136141.8 kcal and nitrate fertilizer energy with 2509760 kcal and the lowest part of energy depended on phosphor fertilizer, the rate of posited energy equaled 36362500 kcal and energy efficiency on the basis of seed corn function 3.36 were estimated. We found some ways to reduce consumptive energy in farm and nitrate fertilizer and, on the other hand, to increase balance sheet. They are, to name a few, using alternative farming and potherbs for biological stabilizing of nitrogen and changing kind of fertilizers such as urea fertilizer with sulphor cover, and using new generation of irrigation, the compound of water super absorbent like colored hydro gels and using natural fertilizer to preserve.

Keywords: Corn(ksc704), output and input ,Energy efficiency, Khoy city

ID-331

Catalytic Effect of Ni and Co-Decorated MWCNTs on the Dehydrogenation Behavior and Stability of $LiAlH_4$

C.Y.Tan[a], W.T.Tsai[a,b]

[a]Department of Materials Science and Engineering,National Cheng Kung University, Tainan 701, Taiwan
[b]Research Center for Energy Technology and Strategy,National Cheng Kung University, Tainan, Taiwan
E-mail address: wttsai@mail.ncku.edu.tw

Abstract

A complex catalyst consisting of transition metal particles and multi-walled carbon nanotube (MWCNT) was developed in an attempt to enhance the dehydrogenation reaction of $LiAlH_4$. The complex catalyst was prepared by decorating MWCNTs with electroless chemical reduced Ni and Co particles. The dehydrogenation behavior of $LiAlH_4$ admixed with various amount of complex Ni(or Co)-MWCNT was investigated by using thermal gravimetric analysis (TGA), differential scanning calorimetry (DSC) and in-situ synchrotron X-ray diffraction (XRD) technique. The TGA and DSC results showed that both freshly added Ni-MWCNT and Co-MWCNT could reduce the dehydrogenation temperature of $LiAlH_4$ to as low as 90^oC, while an amount of 4.6 wt% desorbed hydrogen was obtained. Catalytic role of Ni-MWCNT addition on the dehydrogenation reaction of $LiAlH_4$ was also observed for the mixture stored at ambient temperature, but with rather slow hydrogen desorption rate. The in-situ XRD analysis confirmed the two-step dehydrogenation reaction of $LiAlH_4$ with or without complex catalyst addition. The progressive changes of intermediate reaction products during dehydrogenation process were also identified.

Keywords: $LiAlH_4$; MWCNT, complex catalyst, dehydrogenation, in-situ synchrotron X-ray diffraction

ID-332

Technoeconomic Analysis of the Impact of Tilt Angles for PV Solar Power Generation Plant in Afyonkarahisar in Turkey

L. ÇOLAK, B. EYÜBOĞLU

Başkent University, Department of Mechanical Engineering Ankara – Turkey
lcolak@baskent.edu.tr

Abstract

In PV solar power plants, in order to produce maximum power from solar radiation, the tilt angle of the panels have to be changed continuously. On the other hand, solar tracking systems increases the investment and operation cost for these systems. In this study, for a selected PC power plant in Afyonkarahisar in Turkey, techno economic analysis of tilt angle change for yearly, seasonally and monthly cases. During the analysis, the negative impact of temperature increase on PV modules for the PV module efficiency was taken into consideration. The selected PV solar power plant have 840 multi crystal silicon PV panels each has a capacity of 250 W.

At the beginning of analysis, solar radiation data incident on tilted surfaces were determined for Afyonkarahisar by using hourly global radiation on horizontal surface data between 1993 – 2013, by using Liu and Jordan model. Then the maximum panel efficiencies and the hourly electrical power production by the selected PV panels were calculated. Due to these calculations optimum yearly, seasonally and monthly tilt angle values were determined. According to these calculations, techno economic analysis were done for four cases. First one is yearly constant tilt angle which is equal to latitude angle, second one is constant yearly optimum tilt angle, third one is seasonally constant optimum tilt angles and finally as fourth one monthly constant optimum tilt angles. For seasonally constant and monthly constant tilt angle cases, a mechanism for changing tilt angles is necessary, which increases the investment and operation cost.

By considering the above mentioned criteria, the results was obtained as the maximum annual energy production, which is 1667 MJ, can obtained for monthly changing optimum tilt angles case. On the other hand the minimum payback period for the power plant, which is 9.7 year, can be obtained for constant yearly optimum tilt angle case.

As a result, for the selected PV plant in Afyonkarahisar, constant yearly optimum tilt angle application will be the optimum case, with a payback period of 9.3 year and annual energy production of 1567 MJ

Keywords: PV Panels, Solar Energy, Tilt Angle, Techno economic Analysis

ID-333

Segmentation of Hospital Health Managers Towards Attitudes, Behaviors and Knowledge about Global Warming, Energy and Environmental Issues by Latent Class Approach

M. YAVUZ COLAK[a], L.t COLAK[b]

[a]Faculty of Health Sciences, Baskent University, Ankara, TURKEY

[b]Engineering Faculty, Mechanical Engineering Dpt , Baskent University, Ankara, TURKEY

E-mail:meric@baskent.edu.tr

Abstract

Hospitals are of special interest for health promotion and the hospital sector is one of the biggest entrepreneurs in Turkey. Hospitals could be a strong partner for public health issues and also hospital sector has a heavy consumption of material and energy and a huge production of waste and carbon dioxide. The theories of reasoned action and planned offer some of the best explanations of how attitudes and perceptions relate to behavior; there is increasing evidence to show that the relationship between intention, attitudes and habit with behavior is strongest when they are specifically defined. Studies on consumer behaviour are commonly utilized by policy makers to solve environmental policy problems and the theories of reasoned action and planned offer some of the best explanations of how attitudes and perceptions relate to behaviour. This study summarize research findings concerning knowledge, attitudes and behavior relevant to energy and environmental subjects of a health managers. A survey was conducted with 47 decision-makers in nine leader private hospital in Turkey. Survey examines what the healthcare leaders are thinking about the energy management, green hospitals and what healthcare organizations are doing in response to rising energy costs, what factors are motivating efficiency improvements, how many organizations are planning to make investments, what payback they expect on energy efficiency investments, and what technologies and practices they have been implementing in their facilities. The attitudinal, perception and knowledge questions are usually asked during the contingent valuation survey but seldom used in econometric models due to possible correlation among those questions. In this study, latent class approach was applied to observe heterogeneities among the respondents. Energy performance monitoring is doing in 50% of hospitals and in 40% of hospitals, there is a budget for energy. There are energy mangers in 45% of hospitals. Only 18% of healthcare leaders are defining the hospitals as environmentally friendly and just 2% of hospitals have Leed certificate. Unfortunately only the 2% of hospitals are using just cogeneration systems and are not using the other renewable energy resources. According to 30% of healthcare leaders the most importance of energy management using in hospitals is decreasing the costs and the second importance is the safety to global warming. Three classes of respondents are identified using latent class model. Results indicated that there are significant differences among classes. People in most sensitive group were concerned about energy and the environment. Energy efficiency is getting more attention among healthcare facility leaders. They were very or fairly concerned about climate change, they are paying attention to energy management in hospitals and most of them are thinking that energy efficiency and the usage of renewable energy resources in hospitals are very important

Keywords: Silica, Microstructure, Inclusions, Micro cracks, Micro hardness, PV

ID-334

Thermal Effect Behavior in Operating Characteristics of Plain Cylindrical Journal Bearings in the Turbulent Flow Regime

BENDAOUD N., MEHALA K.

University of the Sciences and Technology of Oran “Mohamed Boudiaf” 1505 El Ménaour Bir El Djir Algeria
E-mail address: nadiamehala@yahoo.fr/ postegraduation@yahoo.com

Abstract

An investigation of the fluid flow regime and the thermal effect, is carried out in a plain cylindrical journal bearing subjected to highly severe operating conditions, such as the speed of rotation of the shaft and the radial load in order better predict the behavior of the bearing for the Turbulent flow regime.

A numerical analysis of the behavior of a thermohydrdynamic for cylindrical journal bearing finite dimension coated with antifriction material in turbulent regime, is implemented using the code-ANSYS CFX. This analysis is performed by solving the equations of continuity Navies-stocks by the method of finite volume. For rotational speeds ranging from 6000 to 15 000 rev / min, that is to say for different Reynolds number. Radial loads up to 150 kN.

The results clearly show that significant pressures are in the extreme case of speed that is to say to the turbulent regime. There is an emergence of new rupture zone pressure, we do not usually see the regime established; the level of the supply groove. Displacement of shaft relative to the bearing is remarkable by introducing the thermal effect and the turbulent regime

Keywords: Thermal effect, turbulent regime, plain cylindrical journal bearing

ID-335

Dielectric Analysis of a Leaf of Vegetation for the Modeling of Forest Fires

K. Khelloufi, O. Harouz, Y.Baara, O. Mosbah, N. Zekri

Laboratory of physical studies of materiel LEPM University of Sciences and Technology of Oran Algeria -USTOMB
E-mail : phkhadij@yahoo.fr, omar47203@hotmail.com, nzekri@yahoo.com

Abstract

The work done in this paper is in the line of research on the modeling of forest fires. In this context, our efforts have focused on characterizing the ability of plants to spread fire – fuel and water behavior-, in order to create a database and integrate it into our model of fire.

Understanding the behavior of plants in a fire form the subject of this experimental work, where we have used the dielectric spectroscopy on plant species submitted to different fields of temperature and humidity, in order to characterize the pyrolysis and the ignition of each type of vegetation.

The preliminary results allow us to characterize the loss of water contained in the leaf vegetation and therefore the detecting the activation energies of each phase transition occurred during the pyrolysis.

The goal now is to going to much higher temperatures to achieve flammability, and thus a characterization of the behavior of plant essential oils.

Keywords: Forest fires, physic-chemical properties, vegetation, dielectric spectroscopy

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ID-336

Design and Performance Optimization of Multi-Staged Solar Assisted Absorption Cooling System for Pakistan Climate

Muzaffar Ali, H. M. Ali, Umair Khalid, M. Muzammil Mukhtar, A. Adeel-ur-Rehman, Uzair Awan

Department of Mechanical and Aeronautical Engineering, University of Engineering and Technology Taxila, Pakistan

Abstract

Remarkable rise in energy demands and cost has shifted researchers' focus towards renewable energy sources. The share of energy consumption of air conditioning systems is significant. Therefore solar cooling systems can be viable alternatives compared to the conventional cooling systems for potential energy savings. In the current study, a 1 ton (3.517 kW) capacity multi-staged solar assisted absorption cooling system is design for Pakistan climate. Initially, parametric analysis of each stage design is performed in EES in which the effects of various design parameters on system performance are investigated like temperatures of condenser, evaporator, generator and absorber. The parametric investigations showed that the C.O.P of triple staged absorption system is maximum value. Afterwards, the transient analysis of each configuration is conducted in TRNSYS. Finally, the multi-staged system design is optimized with respect to different system design and configuration parameters, such as mass flow rate, collector area, tank height; and three types of solar collectors, respectively. The system design and configuration optimization is performed by coupling TRNSYS with optimization program, GenOpt. The proposed strategy of model-based system optimization proved very significant at initial design stage for selection of optimal system design.

Keywords: Solar cooling, absorption system, EES, TRNSYS, GenOpt, Pakistan

ID-337

Electric Field Computation in Air Insulation Materials for Safety Assessment Against Flashover Occurrence

T. Ainouche, S. Belkhir, A. Boudjema, A. Nacer, H. Moulai

USTHB, University of Science and Technology Houari Boumediene, FEI/LSEI, BP 32, Bab Ezzouar, Algiers, Algeria

Manager of Electricity Transport Grid, GRTE, SONELGAZ, Les 500 bureaux, Gué de Constantine, Algiers

E-mail: belkhir.s@hotmail.com

E-mail: f.soukeur@sonelgaz.dz

Abstract

The arc initiated by overvoltage creates an ionized medium that makes the ensuing current practically equal to the short-circuit current. This will result in service interruption triggered by the over-current protection, which is naturally to be avoided. They appear when ultimate stresses, depending on various electro-geometrical parameters (geometrical dimensions on the sample, nature of voltage, etc.…) and physicochemical material characteristics, are reached. Among all these stress, the electric field remains the most significant factor.

This work is devoted to the computation of the electric field distribution around the pertinent parts of high voltage structures and its relation with flashovers occurrence thresholds, especially between continuity straps and 220kV anchorage line tower structure. The analysis of the line properties and over-voltages susceptible to be induced enabled us to better understanding this phenomenon and to propose corrective solutions for such shortcomings.

Keywords: Electric field; conductor-pylone; flashover

ID-338

Optimal Selection and Management of Power Sources of Microgrid Using Two-Layer Particle Swarm Optimization Algorithm

M. Kazemi[a], A. jamshidi[b]

[a]Zanjan Regional Electrical Company (ZREC)
. [b]Zanjan Power Generation Management Company (ZPGMC)
E-mail: m.kazemi.zr@gmail.com

Abstract

This study presents general microgrid architecture with optimal power management to evaluate potential economic, technical and environmental benefits. In this paper, the system model components are constructed from real manufactural data. Also, the optimal selection of installation capacity of distributed generations regarded to maximizing return on investment (ROI) rate and cost optimization regarded to reducing production, maintenance and environmental costs using Two-Layer Particle Swarm Optimization Algorithm has been presented in detail. The production amount of power sources is optimally dispatched to satisfy load demand then as a result, system is able to operate in island-mode. Results show that the optimization goals has been achieved in an actual Microgrid base, and this lead to suitable island-mode operation.

Keywords: Microgrid, Cost optimization, Two-Layer Particle Swarm Optimization Algorithm, Stand-alone Operation, ROI

ID-339

CFD Analysis of Supersonic Ejectors Operating with Mixture of Gases

M. Shafaee[a], M. tavakol[a], N. sharifi[b], R. riazi[a]

[a] Faculty of New Science and Technologies, University of Tehran, North Karegar Ave., Tehran, Iran
[b] Department of Aerospace Engineering, Amirkabir University of Technology, Tehran, Iran

Abstract

An ejector is a type of pump that uses Venturi-effect of a converging-diverging nozzle. It's very common in a variety of applications such as solar-driven refrigeration cycle, solar desalination systems and oil-gas industries. With an Optimal design, its energy consumption considerably decreases, and become economic. This paper mainly deals with the aspect of ejector functions which have received little attention so far. In this regard, the ejector performance is numerically studied under the condition of two different gas streams with variable mass fractions. With the convenience of numerical simulation, various conditions for two perfect gas streams of air and water vapor are investigated. Initially, the numerical solution is carried out for the case with steam as only flows in the ejector. After validation of initial case with experimental data, numerical solutions for specific case, such water vapor for motive stream and a mixture of air and steam in suction inlet, is carried out. By considering all feasible variation of mass fraction in the range of zero to one, the ejector performance is analyzed.

Results indicate that mass fraction of air has a significant impact on Entrainment Ratio (ER). It was also observed that higher pressure of motive fluid reduces the effect of air mass fraction variation on ejector entertainment ratio (ER). In other words, if designer is not limited to choose working pressure of motive fluid, the best choice for the driving pressure is the highest pressure available.

Furthermore, it stabilizes the performance of ejectors, and thereby, operational statues always remain close to optimal design condition.

ID-340

Optimal Sizing of Stand Alone Photovoltaic Systems

S. Kebaili[a], H.Benalla[b]

[a]Department of Electrical Engineering, Oum El Bouaghi University, Algeria
[b]Department of Electrotechnics, Constantine1 University, Algeria

Abstract

This paper presents an analytical method for technical-economic optimization of a standalone photovoltaic system. The loss of load probability concepts for the reliability and the total system cost for the economic criteria. The main objective of this study is to find the optimum PV generator area and useful battery storage capacity of a stand alone photovoltaic system. Mathematical equations have been formulated and LOLP curves have been constructed. A set of configuration meeting the desired LOLP are obtained. The configuration with the minimum cost gives the optimal one.

A case study has been presented to determine the optimal sizing of a stand alone photovoltaic system for eight sites located at Algeria and to analyze the impact of different parameters on the system size. This proposed analytical method is rational in terms of reliability and cost and simple to implement for the size optimization of a stand alone photovoltaic system.

ID-341

Design of a Guarded Hot Plate for High Temperature Measurements of the Fibrous Insulation Materials

S. Onbaşıoğlu,O. Doğu ,E. Dikeç

Istanbul Technical University
Mechanical Engineering Department Gumussuyu 34473 Istanbul

Abstract

To determine the thermal properties of a material, using the experimental data obtained by a standard set-up at moderate temperature values is not correct, if the material will be applied for high temperature conditions. Especially, for the fibrous materials the radiation heat transfer will contribute to the total effective conductivity. Since high temperature insulation is getting more and more important with its rapid development in some application fields, the measurement techniques should be developed and applied carefully. In this study, an experimental apparatus was designed and fabricated to measure the effective thermal conductivities at high temperature conditions. To evaluate the performance of insulation at high temperatures, a guarded hot plate device was designed and built to measure the effective thermal conductivities of insulation subject under large grads representative of typical domestic oven conditions for experimental analysis. A flat, electrically heated metering section surrounded on all lateral sides by a guard heater section controlled through differential thermocouples, supplied the planar heat source introduced over the hot face of the specimens. The heater assembly was sandwiched between two specimens for the heater; the temperature of up to 350°C. The oil-cooled plate was instrumented such that a well- defined, user-selectable temperature difference is established over the sample thickness. The power input in the hot plate with area A is then measured as soon as thermal equilibrium is reached. Using the measured sample thicknesses, temperatures and power inputs, the thermal conductivity can be calculated using the steady-state heat transfer equation. ASTM C177 and ISO 8302 standards have been followed for the design and building. Several fibrous insulation materials have been tested and compared to data taken from a reference apparatus. The results have been used in validation of the radiation model for fibrous insulation materials.This model includes Monte Carlo Ray Tracing Method (MCRT).

ID-342

Electrochemical Performance of Lead Acid Battery Using two Additives Surfactant with Different Concentrations in Sulfuric Acid Medium

BOUDIEB Naima[a,b], M. BOUNOUGHAZ[a,b]

[a]University M'Hamed Bougara -UMBB-Boumerdes; Laboratory of Fibrous Polymers Treatment and Forming, Faculty of Engineering Science, Avenue of Independence – Boumerdes-35000 – Algeria.

[b]Faculty of Sciences, Departement of Chemistry -UMBB- Boumerdes, Avenue of Independence –Boumedes- 35000 – Algeria

E-mail naima741963@yahoo.fr,

E-mail moussa_bounoughaz@yahoo.fr

Abstract

The aim of this study is to introduce the application of two additives (phosphonate surfactant (PS)) in lead-acid batteries in the sulfuric acid medium. The hydrogen and oxygen gas evolution potential and anodic layer characteristics were investigated employing cyclic and linear sweep voltammetric methods. The morphological changes of $PbSO_4$ layer that formed on the electrode surface were confirmed using scanning electron microscopy. Also potentiodynamic polarization curves, electrochemical impedance spectroscopy, and an equivalent circuit analysis were used to evaluate the corrosion behaviors of the Pb alloys and the positive plate in the presence of two additives.

The obtained results indicate that a decrease in the peak related to transition of PbO to Pb demonstrates that lower PbO has been formed underneath the lead sulfate membrane in the presence of low concentration of SP, indeed a decrease in the amount of formed $PbSO_4$ on electrode surface. The over-potential of hydrogen was shifted to negatives values, the oxygen evolution was inhibited in presence of PS and the growth of the anodic PbO_2 was inhibited. SEM imaging with the presence of PS showed reduction in the growth of the anodic $PbSO_4$ layer. Also, the results show that using the SP in a very low concentration can improve the electrochemical performance of lead acid batteries. Adding chemicals to the electrolyte of lead acid batteries can reduce the buildup of lead sulfate on the plate and improve the overall battery performance.

Keywords: Corrosion; Phosphonate Surfactant (PS); lead-antimony alloy; positive plate Electrochemical Impedance Spectroscopy (EIS), SEM, Electrochemical Techniques.

ID-343

Enhancement of Heat Transfer by the use of Metallic Foam in Both Liquid Single Phase and two-Phase Flow Regimes

B. Madani

Laboratory of Multiphase Transport and Porous Media, Faculty of Mechanical Engineering and Process Engineering, University of Sciences and Technology Houari Boumediene, BP 32 El Alia Algiers, Algeria

Email.bmadani@usthb.dz

Abstract

Open cells metallic foams are a kind of cellular material. Compared to other porous media, these materials are characterized by a high porosity (> 90 %). Note that, these materials have also other interesting properties: low density, high impact resistance and a high specific surface. All these properties make these materials a very promising solution to take into account when designing compact heat exchangers. The present work is an experimental characterization of fluid-wall heat transfer in the presence of open cells metallic foams. The flows analyzed here concern both the liquid single phase regime and the two-phase regime (phase change). The sample of foam tested in the present work is made from copper with 36 PPI as a grade and 97% as porosity. The working fluid is n- pentane. This is used for its low boiling point 36 °C at atmospheric conditions, and low latent heat of vaporization which is at atmospheric conditions 357 kJ/kg, six times low than that of water in the same conditions. The cross section of the test channel is rectangular and it is 10x1 [cm^2]. The heat flux varies from 0 to 25W/cm^2 for a flow rate ranging from 0 to 13m/s. The variables measured are: temperature using k-type thermocouples implanted in the channel wall and in the foam, pressure using piezoelectric sensors and exit quality using a balance. The results for the liquid single-phase conditions are compared to several configurations of heat and flow in channel: smooth channel, channel filled with fibrous porous media and channel filled with honey combs-type cellular material. Comparison of the present results with those given in the literature for a liquid single phase flow in smooth tube, gives a local heat transfer coefficient about one hundred times larger. For convective boiling regime, the heat transfer coefficient is multiplied by a factor equals to 2. For this last regime, an inversion point is observed where the thermal performance with metal foams becomes smaller than in the case of a smooth tube. The heat transfer enhancement observed in the present work is due essentially to the metallic foam morphology. In fact the structure of these materials allows combining three effects largely used in the thermal industries, but separately: pins effect (increasing the heat exchange surface), baffle effect (increasing both fluid mixture and its retention time) and destroying the thermal boundary layer (reduction of the thermal resistance in the wall level). Moreover for the boiling regime, the Thomé effect (the contact of a porous media with a solid wall is in favor of the nucleation).

Keywords: Metallic foam, heat transfer; boiling, experimental

ID-344

Nanostructured TiO_2 film Deposition by Supersonic Plasma Jet Source for Energetic Application

E. C. Dell'Orto, S. Caldirola, H. E. Roman, C. Riccardi

Dipartimento di Fisica, Università degli Studi di Milano-Bicocca, Piazza della Scienza 3, Italy
Elisa.dellorto@unimib.it

Abstract

Titanium dioxide (TiO_2) materials are widely used in a variety of applications in the environmental and energy fields, such as self-cleaning surfaces, sensors, hydrogen generation by water photo-electrolysis, and photo-electrochemical conversion (e.g. DSSC and thin film solar cells) [1-3]. The nano-structure of a TiO_2 material influences many of its properties, such as its photo-catalytic performance, and also its surface area, adsorption, reflectance, adhesion, and carrier transportation properties. For this reason in the last years the study of TiO_2 morphology and structure has been very attractive [4]. In particular columnar structures (e.g. nano-rods and nano-wire) have showed interesting features.

In this work we use Plasma Assisted Supersonic Jet Deposition (PA- SJD) to realize TiO_2 thin film deposition [5]. Nanostructured thin film growth by PA-SJD is based on the separation of the deposition process into two steps: the precursor dissociation in a reactive plasma environment and the nanoparticles nucleation and aggregation by means of a sonic jet (Fig. 1). Vaporizable and stable monomer could be employed as the source of the oxides, the semiconductors or even the metals. By changing deposition parameters it is possible to change film porosity and the hierarchical nanostructure. The extraction of a supersonic plasma jet allows to focus the precursor flow on the substrate and to control atoms kinetic energy and clusters size.

In this work Titanium isopropoxide ($Ti\{OCH(CH_3)_2\}_4$), commonly referred as TTIP, is used as organometallic precursor. The precursor is introduced into the plasma chamber when the Ar-O_2 plasma is stable at RF powers about 450 W. The dissociation of TTIP takes place inside the reactive plasma and it is driven mainly by oxidation reactions, however it is also favored by the presence of electrons and other energetic species leading to the production of TiO_x molecules. Oxidation products could be observed by quadrupole mass spectrometry measurements performed directly along supersonic jet and by the acquisition of emission spectra in the plasma chamber.

Films with thickness from few tens to few hundreds nanometers were performed. After deposition, TiO_2 samples are annealed at 500°C. Raman spectra collected after annealing show the anatase characteristic peaks. Metal oxide films images, obtained by SEM/TEM, show a tree-like structure (Fig. 2); film density shows a high porosity degree. Surface investigation performed by Atomic Force Microscopy (AFM) supplies information about surface roughness. By these data it is possible to relate films morphology to deposition parameters.

In addition, we have simulated a deposition process of TiO_2 particles in the supersonic jet, on a simple cubic lattice by a kinetic Monte Carlo code. Changing simulation parameters it possible to compare results with experimental data.

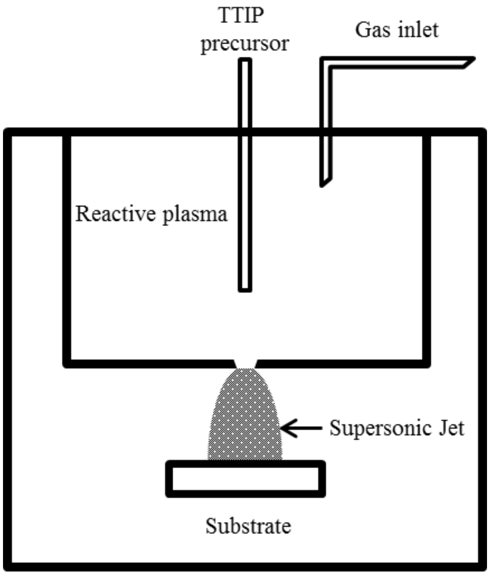

Figure 1. Experimental set-up.

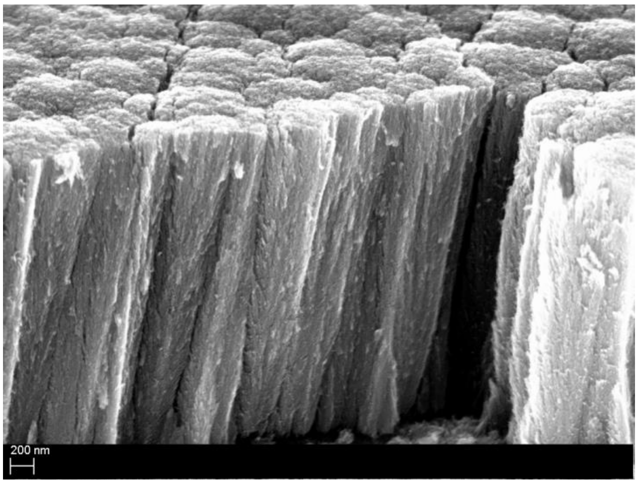

Figure 2. SEM images of TiO2 film.

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ID-345

Geothermal Anomalies of Northern Algeria

B.Haouchine F. Zohra, H. Abdelhamid

USTHB University, Geo-environment laboratory, Faculty of Earth Sciences, BP 32 El Alia Babezzouar, 16111 Algiers, Algeria

Abstract

The map of geothermal gradient was drawn as part of a research work developed to characterize and evaluate the geothermal potential of northern Algeria.

Established from the correction of 198 BHT (Bottom Hole Temperatures) measured during logging operations deep boreholes, this map shows essentially three areas with positive anomalies:

- The thermal anomaly of eastern Algeria, bounded by the gradient curve 4°C/100m and oriented SW-NE, is the largest anomaly where the high value of the gradient is due to the "Numidian Batholith " supposed by works of EURAFREP (Cormy and Demians, 1970) and those of ENEL-SONELGAZ (Baldi, 1984).

- In the center, at the bibanic area, the gradient reached 4.27°C/100m. This high value is mainly due to the large multi-kilometric deflexure staking the bibanic and sub-bibanic area with a direction of WE. This deflexure appears clearly on the satellite photo and it becomes a clearly fault at the depth and affects the entire sedimentary series and part of the crystalline basement whose proximity is evidenced by the strong positive gravimetric anomaly.

- With a gradient of 4.29°C/100m, the west thermal anomaly would result in a large measure to the high seismic activity in the region. Active sinistral faults with NE-SW direction and dextral faults EW affecting these sectors serve as upward drains to thermal waters.

Keywords: Geothermal gradient, BHT, DST, Northern Algeria.

ID-348

Energy Strategy in the Context of Sustainable Development: Case of Morocco, Algeria and Tunisia

Abstract

A problem of sustainable development has been clearly demonstrated in the Earth Summit in RIO (2012). Among the major battles to be fought in this century for the survival of the planet is to include energy efficiency as an international political priority, reduce emissions of greenhouse gases. Renewable energy, inexhaustible, clean, are needed in these conditions as a priority.

As part of its energy strategy, Morocco gives priority to the development of renewable energy and to the sustainable development.

The Moroccan Law on Renewable Energy aims to promote energy production from renewable sources, its marketing and its export by public or private entities.

The Law of Energy Efficiency aims to integrate energy efficiency techniques in a sustainable manner.

Morocco offers many investment opportunities in the sector of solar energy, thermal and photovoltaic energy with the launch of several programs. In addition, the government has developed a program of development of the Moroccan market for solar water heaters. Morocco is also involved in a wide wind program.

The Algerian energy strategy is decidedly towards sustainable development by integrating the promotion of renewable energy. The legislative and regulatory framework adopted in recent years testifies to this irreversible commitment.

Executive Decree n ° 13-218 of 18 June 2013 lays down the conditions for granting premiums for the costs of diversification of electricity production from renewable energies.

A national program for development of new and renewable energy (NPRE) in Algeria includes the realization of 67 projects, 27 solar power plants, 27 diesel hybrid power plants and TG, six solar thermal power plants and seven wind farms which allow at the horizon 2030 the production from renewable energies of 40% of the needs of Algeria in electricity.

Since twenty years, Tunisia has established the institutional and regulatory framework of energy management in general and has launched a national program in this area focused on the rational use of energy but also on promotion of renewable energy.

A system of energy management with the aim of supporting actions aimed at rationalizing of energy consumption, promoting renewable energy and alternative energy has been created by law n ° 2005-82 of August 15, 2005. Rates and premium amounts relating to the shares covered by this system are established by Decree N° 2005-2234 of 22 August 2005 amended by Decree 2009-362 of February 9, 2009.

Thus, for achievements in the field of wind energy, it is the installation of a wind farm in Sidi Daoud of 55 MW and installation of 12 small wind turbines to supply electricity to rural areas. In the field of heating of domestic water by solar thermal energy, it is the installation of 400 000 m2 of solar collectors for heating domestic water in residential and tertiary sectors. In the field of solar photovoltaic, it is the electrification of 12,500 rural households and 200 rural schools and the equipment of 200 wells by photovoltaic pumps

A Tunisian Solar Plan (TSP) with 40 projects was launched in December 2009.

ID-349

NO Reduction, By the Methane in Presence of O_2 Excess, Over Functionnalised Organized Mesoporous Aluminated Silica Al-MCM-41

K. Benabou, A.Belhakem, S..A. Ghomari

Laboratoire S.E.A.2M/U. Mostaganem B.P 1001, 27000 Mostaganem, ALGERIE
E-mail: ahmedbel39@hotmail.com

Abstract

The catalytic reduction of NO with CH_4 has been studied over functionalized Al-MCM-41 in the temperature range 353−673 K at atmospheric pressure in SCR reaction. The rate of NO reduction is at a maximum at a high CH4/NO stoichiometry (4/8) and at a minimum at a low (1/2) CH_4/NO ratio. Correspondingly, the activation energy for NO reduction decreases with increasing CH_4/NO ratio, and the reaction orders are −1.0 in NO and +1.5 in CH_4. Unlike NO, the rate of N_2O reduction is at a maximum at low CH_4 pressures, and the reaction orders are positive in N2O and negative in CH_4. In the presence of oxygen, NO is oxidized to NO_2, which is in turn reduced back to NO by CH_4. The NO/NO_2 oxidation/reduction cycle has the effect of delaying NO reduction to N_2 until all of the O_2 is consumed. The present work have been focused firstly on the impregnation of OMAS-type materials (AlMCM-41) with various amounts of Pt (0.5 - 4 wt %) and the obtained catalysts were tested for NOx reduction (250 ppm) by the methane in presence of oxygene excess (>950 ppm), in a flux of helium. Several parameters were examined: temperature was varied from 353K to 673K, rate of platinum exchanged, mass of catalysts, WHSV (space velocity) and different CH_4/NO ratio. For Pt($_x$)-catalysts, the NO_x maximum conversion depends mainly on the oxygen concentration and temperature. It observed for high oxygen concentrations and around 573K for, catalysts functionalized with a high platinum concentration Pt(2,5%)-AlMCM-41 catalyst, gave a good conversion of NO_x. In the absence of Pt, the catalytic activity remains weak, on the other hand and in the presence of Pt, high conversion of NO_x is obtained and it decreased strongly when the oxygen concentrations increase beyond certain limit. Theirs specifics catalytic behavior are ascribed to the presence of Pt ions dispersed in the materials canals. These catalysts are completely deactivated after steam ageing at 873K. the migration ability and the reduction of Pt ions into metal Pt particle, determined by XANES technique, induced the presence of octahedral aluminum, which causes by dealumination phenomenon, is thought to be responsible for the loss of activity.

Keywords: NO reduction, stream ageing, catalytic activity

ID-350

Supercapacitive Properties of Symmetry and the Asymmetry Two Electrode Coin Type Supercapacitor Cells Made from MWCNTS/Nickel Oxide Nanocomposite

A. S. Adekunle[a,b,c], B. B. Mamba[b], B. O. Agboola[d], O.S. Oluwatobi[e], K. I. Ozoemena[f], E. E. Ebenso[c]

[a]Department of Chemistry, Obafemi Awolowo University, Ile-Ife, Nigeria.
[b]Department of Applied Chemistry, University of Johannesburg, P.O. Box 17011, Doornfontein, 2028, South Africa.
[c]Department of Chemistry, Material Science Innovation & Modelling (MASIM) Focus Area, Faculty of Agriculture, Science and Technology, North-West University (Mafikeng Campus), Private Bag X2046, Mmabatho 2735, South Africa.
[d]Department of Petroleum Chemistry and Engineering, American University of Nigeria, Yola, Nigeria.
[e]Department of Chemistry, Cape-Peninsula University of Technology, P.O Box 652, Capetown 8000. Western Cape, South Africa.
[f]Energy & Processes Unit, Materials Science and Manufacturing, Council for Scientific and Industrial Research (CSIR), Pretoria 0001, South Africa.
E-mail: sadek2k@yahoo.com, aadekunle@oauife.edu.ng

Abstract

Studies have shown that carbon nanotubes-metal oxide (CNT/MO) nanocomposite modified electrodes exhibited huge capacitive current in some electrolytes [1]. Therefore, it becomes imperative to establish the charge storage properties of these materials as a potential source for energy generation. RuO2 is well known as a good metal oxide in supercapacitors because of its high specific capacitance values (740 F g−1) [3] even though its application is limited due to its high cost and toxicity. Transition metal oxides attached to CNTs have been studied recently and are expected to show improved capacitive behaviour due to their enhanced stability and high conductivity [4]. Thus, the hybrid of an electric double layer system and a Faradaic pseudocapacitive system could be a good candidate for a supercapacitor with high specific capacitance and energy density [5]. In this work, we established the supercapacitive behaviour of synthesised nickel oxides supported on MWCNT platform in acidic and neutral medium using two-electrode asymmetric and symmetric systems in a coin type supercapacitor cell. Our study was prompted by the paucity of literature on the supercapacitive properties of NiO modified electrode in acidic medium in comparison to alkaline medium.

Successful formation of the MWCNT-NiO nanocomposite was confirmed with techniques such as transmission electron microscopy (TEM), scanning electron microscopy (SEM), electron dispersive X-ray spectroscopy (EDX) and X-ray diffraction spectroscopy (XRD). The supercapacitance behaviour of both the symmetry and the asymmetry MWCNT-NiO based supercapacitor in 1 M H_2SO_4 and 1 M Na_2SO_4 electrolytes was evaluated using cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS) and galvanostatic constant current charge-discharge (CD) techniques. Our findings showed that the acid-functionalized MWCNTs significantly enhanced the supercapacitance of the synthesized nickel oxide in the media studied, as compared to other literature reports. There was a good correlation between the CV and the CD specific capacitance (SC) values for the asymmetry supercapacitor. Asymmetry supercapacitor (MWCNT-NiO|H2SO4|MWCNT) gave the highest SC value of 925.9 $mFcm^{-2}$ (53.9 Fg^{-1}) higher than those reported in literature. The electrodes demonstrated high stabilities with no significant changes in SC values over 1000 cycles.

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ID-351

Simulation of Photovoltaic Cells based on Thin Films made by SiGe with SILVACO©

Z. Ziani, S.Mostfa-kara, A.Benmansour, N-E. Chabane Sari

Adresse: Cité sidi lahcen Bt GN°24 Tlemcen Algeria

Email: z_zaki100@yahoo.fr

Abstract

Energy consumption is increasing. Conventional energies are decreasing continuously and non-conventional energy have many risks. Despite their characteristics and polluting exhaustible fossil fuels are overexploited. As energy is one of the engines of national development. Green political parties and scientists have gained momentum in developed societies; they try to promote renewable energy. The search is intensifying in the clean energy alternatives. Renewable energy in general and photovoltaics in particular appear in this context as an alternative for preserving both the comfort of humans and environmental quality. The work I have presented is part of the preparation of the diploma of magister and this is a modest contribution of research in the field of transformation of solar energy into electrical energy using photovoltaic cells SiGe base of heterostructures. We started our work by the simulation of a reference sample with a conventional structure Si/ Si/ Si, and as result we obtained a yield equal to (11.62%). Then we introduced a second sample in a $Si_{1-x}Ge_x$ graded layer, and changed the rate of Ge x from 0 to 0.3, the yield decreases with the variation of Ge. This decrease is due to the structure used, where the value of the potential barrier increases with promotionnellement change in the rate of Ge. The study of this phenomenon showed that this structure can be used as a light sensor or temperature. Later we exchanged the issuer of our solar cell with a structure of type $Si_{0.29}Ge_{0.71}/Si_{1-x}Ge_x/Si$, then we noticed a proportional increase in yield with the rate of Ge introduced into the structure, until 'to a value equal to 11% of Ge in Si, corresponding to a yield equal to 12.85% and a decrease thereof. We also showed that the photocurrent increases with the rate x Ge.

The study of the influence of the rate of Ge on the open circuit voltage has shown us that as x increases the voltage decreases.

Finally we replaced the silicon germanium substrate by while keeping the same structure before; The simulation results have shown that the yield decreases with the increase of Ge.

In conclusion it appears in our work that the right structure for the realization of a solar cell based layers is gradual: $Si_{0.71}Ge_{0.29}/Si_{1-x}Ge_x/Si$. Moreover, the introduction of a thin SiGe buffer in a photovoltaic cell does not improve performance too as we had hoped.

As perspective, we would like to expand this work by using solar cells based on other structures and other high performance materials (CdTe, ingas ...) to improve the performance of them and especially to reduce the price / yield. The photovoltaic cell technology is a huge area of research. Every small contribution will, no doubt a plus for future energy needs.

ID-352

Energy Efficient Lighting Lamp with Carbon Nanotube Electron Beam (C-Beam) Technique

Kyu Chang Park[1], Jung Su Kang[1] ,Kyo Jun Song[2]

[1]Department of information Display, Kyung Hee University, Dongdaemoon-ku, Seoul 130-701, Korea)
[2]NB Engineering, Pureunsolmunwagwan 117, Dongdaemoon-ku, Seoul 130-701, Korea
Contact: kyupark@khu.ac.kr

Abstract

Energy efficient lighting technique is very important for sustainable world and lower carbon emission. For EU, lighting sources consume around 15% of total electricity. To replace current low efficient light bulbs with high efficiency one, such as LED-lighting, their many hurdles still. High cost and lower lighting quality is key issues for LED based lighting devices. Here we propose novel lighting sources with carbon nanotube electron beam (C-beam). The lighting sources are based on classical cathode-ray tube (CRT) and carbon nanotechnology. High efficiency C-beam can be fabricated with carbon nanotechnology and lighting bulbs with CRT technologies. With combine reliable classic technique with cutting edge nanotechnology can make novel lighting source. The C-beam based lighting sources are called as “C-Lighting”. The brightness of the C-lighting shows more than 30,000 cd/m^2 with lower driving power less than 5 W. The performance of C-beams based lamp appeared to the high performance CNTs grown with resist-assisted patterning(RAP) process. The unique growth technique show enhanced electron emission and long-time stable operation. The C-lighting bulbs shows very low fabrication cost and LED compatible lighting performance. More detail of energy efficient C-Lighting structure, fabrication process, materials and performance will be presented.

ID-353

Study of the Effect of Fast Neutrons on the Thermal and Structural Properties of PVA/HPC Blends

Mimouna M. Abutalib[1], Nabawia A. Abdel-Zaher[2]

[1]College of Science (Girls Branch), King Abdulaziz University, Jeddah, Saudi Arabia, lolyhamada@gmail.com
[2] Textile Department, National Institute of Standards, Giza, Egypt,
nabawia@yahoo.com

Abstract

Polymers and polymeric composites have steadily reflected their importance in our daily life. Blending poly(vinyl alcohol) (PVA) with a potentially useful natural biopolymers such as hydroxypropyl cellulose (HPC) seems to be an interesting way of preparing a polymeric blends. In the present work, blends of PVA/HPC of different compositions were prepared to be used as bioequivalent materials. Thermal analyses [differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA)], and X-ray diffraction (XRD) were employed to characterize and reveal the miscibility map and the structural properties of such blend system.The effect of fast neutron irradiation of fluence 10^7 n/cm^2 was also studied.

The obtained results of the thermal analyses showed variations in the glass transition temperature (T_g) indicating the miscibility of the blend systems. Moreover, the changes in the melting temperature (T_m), shape and area were attributed to the different degrees of crystallinity and the existence of polymer-polymer interactions between PVA and HPC molecules. The X-ray diffraction (XRD) analysis showed broadening and sharpening of peaks at different HPC concentrations with PVA. This indicated changes in the crystallinity/amorphosity ratio, and also suggested that the miscibility between the amorphous components of homo-polymers PVA and HPC is possible.

Keywords: Poly(vinyl alcohol)/Hhydroxypropyl cellulose; Differential scanning calorimetry; Thermogravimetric analysis; X-Ray Diffraction; Fast neutron irradiation

ID-354

Nuclear Reactor Reload Optimization Using Quantum Delta-Potential-Well-Based Particle Swarm Optimization Algorithm

Andressa Nicolau, Roberto Schirru

Federal University of Rio de Janeiro - UFRJ, Nuclear Energy Program - PEN, Coppe

Brazil

Abstract

Nuclear Reactor Reload Optimization Problem (NRROP) is a prominent problem in Nuclear Engineering that is associated to the nuclear reactor fuel reloading operation. The optimization of the nuclear core of Pressurized Water Reactor (PWR) involves multiple objectives concerning economics, safety, energy efficiency and reactor physics calculations. Its principal characteristics are high-dimensionality, large number of feasible solutions, disconnected feasible regions in the search space as well as high computational cost of the evaluation function and lack of derivative information. The fuel reloading operation of a PWR core is a process that occurs whenever the burn up of the fuel assemblies in the nucleus reaches a certain value that it is not possible to maintain the reactor critical producing energy at nominal power. Thus, the NRROP consist on determining the position of the fuel assemblies in the nucleus of the reactor in an optimized way, in order to gain more production with less fuel minimizing the benefit cost relationship of the fuel assemblies cost per maximum burn up of the fuel assemblies and also satisfying symmetry and safety restrictions. In other words, NRROP consists in finding a pattern of burned-up and fresh fuel assemblies that maximize the number of full operational days. In this way NRROP is a NP-Complete problem whose difficulty grows exponentially with the number of the fuel assemblies in the reactor core. In the case of the Brazilian Nuclear Power Plant Angra 1, for example, composed by 121 fuel assemblies and gives rise to approximately 8.09 x 10200 (121!) loading patterns. However, due to 1/8 core symmetries and also to rules of the fuel assemblies placement in the core, this number falls to approximately 1025 loading patterns. This number is extremely high to solve this problem by enumeration because it would take approximately 5.8 x 1019 years to test all these combinations with the Reactor Physics codes and today's computers, making it unfeasible to check all these combinations to find the best. Due the importance and the difficult of solving the NRROP, it has been a standout problem, in the sense of challenge to develop new algorithms in order to find near optimal solutions with the least number of possible evaluations. The main goal of this research e is to show the performance of Quantum Delta-Potential-Well-based Particle Swarm Optimization Algorithm (QDPSO) with Random Key method in to solve the 7th cycle of operation of the Nuclear Power Plant PWR Angra 1. The results found with this approach were compared to previous results in the literature. Results demonstrate that it is possible to reduce the computational cost using QDPSO besides increasing the quality of the solutions on the long run.

ID-356

Highly Hydroxide-Conducting Solid Membrane Electrolytes Containing Ammonium-Modified Nano-Particles for Direct Alcohol Fuel Cells

Guan-Ming Liaw, Shingjiang Jessie Lue*

Department of Chemical and Materials Engineering, Chang Gung University, Kwei-shan, Taoyuan, Taiwan 333
E-mail: Jessie@mail.cgu.edu.tw

Abstract
This study investigates the performance of alkaline alcohol fuel cells (AAFCs) employing hydroxide conducting nano-composite membrane electrolytes. These membranes consisted of quaternized polyvinyl alcohol (Q-PVA) and quaternized chitosan nano-particles (Q-chitosan). The polymer free volumes and the ion-exchange capacities of the composites were significantly modified at the presence of nano-fillers. The increased free volume in the polymer matrix substantially promoted hydroxide ion transport, while suppressing the fuel cross-over. The Q-chitosannano-filler provided ionic hopping paths and the fuel cell performance using these Q-PVA/Q-chitosan composites was better than that of pristine Q-PVA film. The cell performance (in terms of maximum power density and open-circuit voltage) was monitored for AAFCs at various operating conditions. The nano-filler load, KOH doping concentration, methanol and KOH concentrations, and operating temperature effects on the cell performance were correlated with the electrolyte characteristics. We achieve higher performance than most literature data at comparable operating conditions for AAFCs.

Keywords: Nano-electrolytes, alkaline fuel cell, hydroxide-selective, cell performance.

ID-357

Direct Decomposition of Methane to Cox Free Hydrogen over Ni Loaded Mesoporous SBA-15 Catalysts

ZahiraYaakob[a,b,*], ManojPudukudy[a,b], SitiMasrindaTasirin[a]

[a]Fuel Cell Institute, Universiti Kebangsaan Malaysia, UKM Bangi, 43600, Selangor, Malaysia[b]Department of Chemical and Process Engineering, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, UKM, Bangi, 43600, Selangor, Malaysia[c]Solar Energy Research Institute, Universiti Kebangsaan Malaysia, UKM Bangi, 43600, Selangor, Malaysia

*Email: zahirayaakob65@gmail.com, Tel.: +60 389216422; fax: +60 389216148.

Abstract

Due to the scarceness of fossil fuel based energy and the concern of increased global warming, the production of renewable hydrogen from natural sources has attracted a major attention in the modern world. The direct thermo catalytic decomposition of methane into hydrogen and value added carbon nanomaterials is of much higher interest in the energy research due to the non-emission of greenhouse gases such as carbon oxides. In the present article, we report on the synthesis, characterisation and catalytic activity of a novel Ni loaded mesoporous SBA-15 catalyst system for the direct thermal decomposition of methane to COx free hydrogen and open tip carbon nanotubes. The active phase of nickel in the fresh catalyst was found to be NiO with high crystallinity by the X-ray diffraction analysis. The mesoporous texture of SBA-15 support with the uniform pore size of 5 nm was clearly shown in the transmission electron microscopy (TEM) images with the fine dispersion of NiO nanoparticles in the hexagonal pores of SBA-15 support. The reactions were carried out in a vertical tubular up flow cracking reactor made up of stainless steel at a reaction temperature of 700°C 0.15 MPa pressure and a methane flow rate of 250 ml/minute. A maximum hydrogen yield of 57 % was reached at 30 minute duration of reaction and after that the yield of hydrogen slightly decreased with increasing the reaction time. After 300 minutes duration of reaction, the catalyst was not deactivated and the yield of hydrogen (39%) was quietly comparable with that of initial activity. The analysis of the as-deposited carbon was carried out by XRD, TEM, TGA and field emission scanning electron microscopy (FESEM). The high intensity of the diffraction peak at the 2θ value of 26.1° was attributed to the formation of highly crystallized carbon nanotubes with high graphitization degree. The SEM images indicated the bulk formation of uniform open tip carbon nanotubes which are relatively very rare to synthesize by conventional methods and catalysts. The TEM results indicated that the open tip carbon nanotubes are multiwalled.

ID-358

Renewable Energy Sources Targets - Potential Role of Geothermal Energy in Kosovo

Xhevat Berisha

Faculty of Mechanical Engineering Prishtina, Kosovo, Albania

Abstract

This paper focuses on geothermal energy as a renewable energy source that could be utilized further in making the country greener. The paper addresses the important problem that Kosovo is facing in responding to climate change and energy sustainability; more specifically, the country's struggles towards meeting the renewable energy source and energy efficiency requirements of the "EU 20 20 by 2020" policy. The paper provides background information on the current energy supply, demand, and sources in the country and the document also presents the country's current level of applying alternative energy sources. An analysis is provided on how to approach the aforementioned targets through investments in geothermal energy. Economic and environmental implications of investing in geothermal energy projects are elaborated.

ID-359

Effect of Zinc Acetate Precursor Concentration in Structural Properties of Tin Doped and Undoped Zinc Oxide Thin Layers

Razika TALA-IGHIL[1,2], Bilel LARAB[2], Samir BACHIR[2], Aicha IRATNI[2], Fayçal BENSOUICI[2], Mahdia TOUBANE[2] ,Amel SLIMANI[2]

[1] Institute of Electrical & Electronic Engineering, Université M'hamed Bougara Boumerdes, Rue de l'indépendance, Boumerdes 35000, ALGERIA

[2] Unité de Recherche des Matériaux, des Procédés et Environnement, Université M'hamed Bougara Boumerdes, Rue de l'indépendance, Boumerdes 35000, ALGERIA

Abstract

Zinc oxide material is widely used in all photo electronic devices especially photovoltaics, in both organic and non organic solar cells.

The present work focus on the structural properties study of tin doped zinc oxide ZnO:Sn and undoped zinc oxide ZnO deposited by spray pyrolysis technique.

The sprayed solution is deeply studied by zinc acetate concentration variation. Two values have been taken 0.4 mol/l and 0.5 mol/l. Doping is obtained by zinc $SnCl_4$ addition to the solution.

The structural properties were determined by X-ray diffraction method.

It has been remarked a high cristallinity for tin doped zinc oxide layers is remarked compared to undoped ones in the case of 0.4mol/l zinc acetate precursor concentration, while for 0.5 mol/l zinc acetate concentration the inverse occurs between doped and undoped layers.

ID-361

Create UWB Filters with Coaxial Cables

Abdelkader Benkaddour[1], Nasreddine Ben Ahmed[2], Nadia Benabdallah[2] and Fethi Tarik Bendimerad [2]

1 University Tahar Moulay of Saîda Algeria, 2 University of telemcen Algeria

Abstract

Ultrawideband (UWB) communications offers great promise for voice, video, and high-data-rate transmissions, although key components will be needed for such systems. One of those components is the band pass filter. Although traditional band pass filters are designed and fabricated in planar form, it is also possible to create a UWB version using coaxial cables and coupled structures. The design approach is straightforward and the filter design can be readily analyzed by means of commercial electromagnetic (EM) simulation software.

ID-362

Solar Swimming Pool Heating Assisted by Geothermal Energy

N. Beithou

Mechanical and Industrial Engineering Department, Applied Science University-Amman Jordan
Nabil@asu.edu.jo

Abstract

The heating of different swimming pools used in residential buildings is a main task that consumes a lot of electrical energy. The consumption of electrical energy leads to many problems, starting by the cost and not ended by polluting the atmosphere accompanied with all bad results of using fossil fuels. This paper deals with offering a solution for swimming pool heating by natural means. Two vertical holes are drilled under the swimming pool to reach the geothermal water, the cold water will drop down to the geothermal hole and the hot water will rise naturally to the swimming pool. This natural heating is generally not enough to heat the swimming pool, to make this process efficient its assisted by solar energy heat exchanger that accelerate the heat exchange between the swimming pool water and the geothermal water. To analyze this problem a model was constructed and tested for different temperatures. It has been found that the heating of the swimming pools is feasible and the temperature of the swimming pool water will rise to the suitable comfortable temperatures. The system was tested by only geothermal heating and solar assisted geothermal heating. A relatively long waiting time was observed in the device without solar assistance due to the preheating of the initial swimming pool water. This time is demolished in the case of solar assisted geothermal heating.

Keywords: Solar energy, Renewable alternatives, Geothermal, Swimming Pool, Natural heating.

ID-363

The Fragility of Turkish Economy from the Perspective of Oil Dependency

Eren Yıldız[1], Gözde Gürgün[2] and Merve Karacaer[2]

[1]Department of Bankingand Finance, YildirimBeyazitUniversity, Turkey, Email: erenyildiz_86@yahoo.com
Phone:00905309602486
[2]Department of Bankingand Finance, YildirimBeyazitUniversity, Turkey

Abstract

In an emerging economy, energy is a crucial input. In an oil dependent country, like Turkey, the volatility of oil price might affect more than thought. In the study, we examined the impact of oil price changes in Turkish macroeconomy. A VAR model is built with the quarterly data between the second quarter of 2003 to second quarter of 2013. The seasonally adjusted variables are Brent Oil Price, GDP, gross fixed capital formation, interest rate, USA GDP and inflation. We believe that the analysis has shown the fragility of Turkish economy to Oil Price volatility with its significant results in the relationship between Oil Price and main macroeconomic indicators. That study shows the incredible need of sustainable energy to make a country's economy stable.

ID-364

Electrocatalytic Oxidation of Formic Acid on Controlled Shape Copper Modified Pt Nanoparticles Electrode: Morphology Effect

Gumaa A. El-Nagar[1], Ahmad M. Mohammad[1,2], Mohamed S. El-Deab[1,2],
Bahgat E. El-Anadouli[1,*]

[1]Chemistry Department, Faculty of Science, Cairo University, Cairo 12613, Egypt
[2]Department of Chemical Engineering, Faculty of Engineering, The British University in Egypt, Cairo 11837, Egypt
elnagar086@yahoo.com, ammohammad@cu.edu.eg, msaada68@yahoo.com,

Abstract

Direct liquid fuel cell is a clean, highly efficient, easy-operation energy conversion technology that has attracted much attention during the past decades. Among these Fuel cells, direct formic acid fuel cells (DFAFCs) where formic acid oxidation is a vital anodic reaction; have attracted much attention as alternative power sources for portable applications due to their unique properties. In this regard, improving the catalytic activity of the anode catalyst is an important issue in direct formic acid fuel cell (DFAFC) development and commercialization. In the present work, the catalytic activity of shape-controlled Cu nanostructured modified Pt nanoparticles electrode (Cu/Pt/GC) formic acid oxidation (FAO) was investigated. The results show that the addition of Cu to Pt increases the catalytic activity towards FAO. In addition, the shape of prepared Cu-Pt nanostructured plays an important role on improving the reactivity of FAO. The Cu modified Pt nanoparticles electrodes were characterized by Scanning electron microscope (SEM), Energy dispersive spectroscopy (EDs) and X-ray diffraction (XRD). Compared to Pt/GC, the Cu/Pt/GC electrode has superior electrocatalytic activity and stability for the oxidation of formic acid. Cu nanostructured believed to enhance FAO via catalyzed CO oxidation at low potential (Bi-Functional effect).

Keywords: Formic acid oxidation; Bifunctional effect; Morphology Control; Direct formic acid Fuel Cells.

ID-365

Impact of Energy Storage Technologies on Multi Carrier Energy Networks

Mahmoud-Reza Haghifam, Samaneh Pazouki

Department of Electrical Engineering Islamic Azad University (IAU), South Tehran Branch Tehran, Iran

e-mail: haghifam.mr@gmail.com

Abstract

Smart grid technologies such as Combined Heat and Power (CHP) facilitates integration of different energy infrastructures. Efficiency and reliability enhancement as well as operation and emission reduction are considered as prominent characteristics of combining different networks. In this paper, effects of different storages on multi carrier energy networks and operation costs are presented. An energy hub including electricity and gas networks is modeled for integration of the storages (electric, gas and heat) to supply electricity and heat demands.

ID-367

Measurement and Modelling of Air Pollution in Bejaia (Algeria)

Alkama R[1]., Benaissa F[2].

1. Electrical Engineering Laboratory, Technology Faculty, Bejaia university, 06000 Béjaia, Algeria. Tel/fax : 213 34215105, e-mail : rezak_alkama@yahoo.fr

2. Ecology and Environment Departement, Bejaia university, 06000 Béjaia, Algeria
e-mail : benaissa_fatima@ymail.com

Abstract

The present study was designed to investigate the levels of air pollutants in the environment of Bejaia (Algeria). We have used an opacimeter and a three-gas detector (IBRID MX6) to measure the rates of opacity, CO, SO_2 and NO. Measures were made in two sites: a tunnel and a square road with heavy traffic in the middle of the town. In order to find possible relationships between atmospheric pollutants and the sources, we applied the statistic methods of correlation-regression.

For the automobile pollution measurement, we used an enclosure of 0.80 m^3 to collect exhausts directly on the outlet side of vehicle tailpipe. We studied the exhaust pollutants according to the vehicle age (1980 – 2012). Measurements related to a sample of 176 vehicles using gasoline or diesel oil fuel.

We have counted the number of vehicles passing through Daouadji square road and calculated the total pollution rejected. The comparison with the air pollution measured in situ confirmed that urban pollution is primarily from automobile sources.

In Kherrata tunnel (5700m) we installed pollutant sensors and a wash system operating by remote control in order to count the number of vehicles crossing the tunnel witch were classified according to the type (bus, lorry, car), fuel (diesel, essence) and direction (descendant, climbing). To estimate the pollutant concentration, we use a mathematical model of pollution dispersion: the box model. We find that the number of vehicles is related significantly (R=0.78) and linearly to increase of atmospheric pollutants in the tunnel. With the help of box model, we find a significant correlation (R=0.827) between the pollutants measured and the concentrations calculated. Sometimes serious pollution episodes in urban city are not directly caused by sudden increases in pollutants emissions but results from unfavourable meteorological conditions. So a study was carried out to investigate the effects of meteorological conditions on atmospheric pollutant concentrations in the city centre. Using measured pollutant concentrations during 2011 and Box Jenking method, we established a forecasting model for CO, NO and SO_2 during the following three months. Results are comparable with measured data during the same period.

Key Words: Urban pollution, tunnel, automobile exhausts, pollution model.

ID-368

Design Methodology for Helical form Energy Piles that Considers Load Characteristics of Coastal Area

Seung Rae Lee*, Gyu Hyun Go, Seok Yoon

Seung Rae Lee, Dept. of Civil and Environmental Engineering, KAIST, Daejeon, Korea. KAIST (Tel.:042-350-3617, E-mail: srlee@kaist.ac.kr
Gyu Hyun Go, Dept. of Civil and Environmental Engineering, KAIST, Daejeon, Korea.KAIST (Tel.:042-350-5657, E-mail: gogyu@kaist.ac.kr
Seok Yoon, Dept. of Civil and Environmental Engineering, KAIST, Daejeon, Korea. KAIST (Tel.:042-350-3657, E-mail: busybeeyoon@kaist.ac.kr

Abstract

This paper presents a design methodology for helical form energy piles that considers load characteristics ofcoastal area. In the load characteristics of coastal area, heating loads are dominant because local residents ofcoastal area tend to minimize their use of electricity for cooling during summer season due to the aid of sea breeze. Because of this imbalance between heating and cooling loads, the ground temperature steadily decreases over a long term period, which causes a sharp drop in heat efficiency of energy pile system.According to the results of this study, the helical form energy pile systems combined with hybrid energy such as solar or windcan alleviatethe imbalance of loads, and decrease the total heat exchanger length for energy piles.Besides, the imbalance of loads can be reduced by increasing the separation distance between piles.Furthermore, the groundwater advection attenuates thermal interference between piles as well as a long term ground thermal resistance, which contributes to the economical design of energy piles.Thus, this study suggests the optimum design concept for helical form energy piles which can consider various geotechnical conditions.

Keywords: Optimum energy pile design;helical form heat exchanger;hybrid system;groundwater advection.

ID-369

Elimination of Lower Order Harmonic in Cascaded Multilevel Inverter Using Particle Swarm Optimization

Baharuddin Ismail[1], Syed Idris Syed Hassan[1], Rizalafande Che Ismail[2]

[1]School of Electrical System Engineering, University Malaysia Perlis
[2]School of Electrical System Engineering, University Malaysia Perlis UniMAP Pauh Putra Campus
02600 Arau, Perlis, Malaysia
baha@unimap.edu.my, syedidris@unimap.edu.my, rizalafande@unimap.edu.my

Abstract

In renewable energy (RE) power generation (solar), some kind of energy conversion process has to take place. This is because the output voltage of RE sources is captured in direct current(DC) form, while the electrical transmission system and the load are based on alternating current (AC). In this circumstances, an inverter system is required. The main purpose of the inverter is to convert the DC voltage to AC , i.e. to construct an AC waveform from DC sources by chopping the latter using power electronics switches. An inverter is classified as a current source (CSI) or voltage source inverter (VSI). For VSI is categorized as a two-level inverter or a multilevel inverter. Despite its growing importance, one of the major concerns of the inverter is the presence of a significant amount of unwanted harmonics in its output voltage. A harmonic is known to exhibit several detrimental effects on electrical and mechanical components. When connected to the electrical grid, the harmonics, particularly the lower order ones, are very undesirable as they cause a number of complicated problems at the distribution system. This paper deals with an elimination of lower order harmonic in a multilevel inverters by using particle swarm optimization (PSO). The goal of harmonic elimination pulse width modulation (HEPWM) technique is to eliminate the lower order harmonic and at the same time satisfied the fundamental component. The PSO algorithm is applied to a multilevel inverter for solving the nonlinear equation for the different modulation index (m_a). The required switching angles in eliminating lower order are computed efficiently by PSO algorithm. The performance of the proposed method for a multilevel cascaded H-bridge inverter was evaluated based on simulation studies. Lower order nontriplen harmonics up to 7^{th} are eliminated for seven-level inverter output voltage waveform and up to 11^{th} are eliminated for nine-level inverter output voltage waveform.

ID-370

The Developing of Passive Sampler with Modified Carbon Nanotube (CNT) for measurement of Ozone Concentration in Ambient Air

Andaç AKDEMIR[1], Ümmükülsüm Özel AKDEMİR[2]

1: Ondokuz Mayıs University, Department of Environmental Engineering, 55200 Turkey

2: Giresun University, Department of Civil Engineering, 28200 Turkey

Abstract

UV photometric method, which is commonly referred to as tropospheric ozone measurements are performed.More economical than the passive samplers, ozone measurements are used for a long time.As a result of widespread use of nano-materials in the environmental engineering, carbon nano tubes (CNT) have been used as a filter material and as the sensor.

In this study, the passive samplers absorbs solutions used in the single-walled carbon nanotube (SWCNT) as a result of saturation of the CNT s to investigate the effects of ozone measurements. In this context; a commercial passive samplers, continuous measurement device, and CNT addition of ozone concentrations for passive samplers were statistically compared.

As a result of research, When the SWCNT was added, It was adsorbed more than ambient ozone by diffusion. But, this adsorbtion capacity was stabile by the addition of SWCNT after saturation level. Indeed, The correlation between The Commercial Passive Sampler with 0 and 1 mg addition of SWCNT was found about %18-19. The reasons for the decrease in correlation have point pollutants (especially NO_x, HC_x), meteorological values, and exposure time (1 and 2 weeks).

In conclusion, The addition of nano-material will be exemplary in the development of passive samplers gave initial findings. Other pollutants in the ambient air and more comprehensive studies that investigated the effects of passive samplers with high accuracy of the results is expected.

Keywords: SWCNT, Passive Sampler, Ozone, Nano Material

ID-371

Multi-Scale Modeling of Hydrogen Energy Storage by Adsorption on New Graphene Related Materials

Mahamadou Seydou[1], Moussa Dicko[2], Farida Darkrim Lamari[2], François Maurel[1] and Dominique Levesque[3]

[1] Université Paris Diderot, Sorbonne Paris Cité, ITODYS, UMR 7086 CNRS, 15 rue J.-A. de Baïf, 75205 Paris cedex 13, France

[2] Université Paris 13, Sorbonne Paris Cité, LSPM, UPR 3407 CNRS, 99, Av. J.-B. Clément, 93430 Villetaneuse, France

[3] Université Paris 11, LPT, UMR 8627 CNRS, Bâtiment 210, 91405 Orsay Cedex France

Abstract

Graphene planes functionalized by hydrogen or fluor atoms can constitute the characteristic adsorptive surfaces of new porous materials. Structure and symmetry of the atom arrangements in graphane and fluoro-graphene have been estimated from experiments and ab-initio computations. These data allow to determine the molecular interactions between gas molecules and the functionalized graphene materials by ab-initio calculations or to describe them by approximate effective atom-atom potentials. In this work on the basis of such interactions and potentials, we calculate by Monte-Carlo simulations the adsorption properties of hydrogen on graphane and fluoro-graphene. Comparison of simulation results shows that the two sets of molecular interactions data are in good agreement. The adsorption is obtained up to high pressure and temperature 293 and 77 K. The hydrogen total adsorption on fluoro-graphene is 40 % higher than that on graphane. The total weight percent of hydrogen storage at 77K on fluoro-graphene seems around 9 %.

ID-372

CFD Modeling of Enhanced Heat Transfer in Mono-Sized Spherical Packed Bed

Mohammad Nazififard

Energy Research Institute, University of Kashan, Kashan, Iran
*Corresponding author: nazifi@kashanu.ac.ir

Abstract

Heat transfer plays a very important role in the design of nuclear fusion reactors. The sphere-packed pipe (SPP) is a sort of mono-sized spherical packed bed which is consists of metal spheres inside a pipe. Recently SPP has been proposed as a heat transfer booster for the high Prandtl (Pr) number fluid such as fist wall of Fusion Reactors. In this study a SPP filled with mono-sized spheres is numerically simulated to assess flow characteristics. Unstructured meshes are applied to discretize the flow domain. The shear stress transport (SST) *k*–*ω* models are used for turbulence simulation. In order to validate the numerical model, Reynolds number (Re) and thermal boundary condition were chosen to match *Re* of the available experimental data. The results show that the heat transfer performance of the SPPs is on average eight times greater than that of the straight pipe. However a modified correlation is required which considers the SPP packing structure and wall effect to determine the accurate pressure drop.

ID-373

μSR Reveals H_2 Storage Mechanism in Fullerides

Riccò M. [1,*], Gaboardi M. [1], Pontiroli D. [2,1], Magnani G. [1], Aramini M.[1], Milanese C.[3] and Cavallari C.[1,4]

[1] Dipartimento di Fisica e Scienze della Terra, Università di Parma, Via G. Usberti 7/a, 43124 Parma (Italy)

[2] Laboratorio di Micro e Submicro Tecnologie abilitanti dell'Emilia Romagna (MIST.E-R), via P. Gobetti 101, 40129 Bologna (Italy)

[3] Pavia Hydrogen Lab, CSGI & Dipartimento di Chimica, Università di Pavia, Viale Taramelli, 16, 27100 Pavia (Italy)

[4] Institut Laue Langevin, BP156, 6, rue Jules Horowitz - 38042 Grenoble Cedex, France

[*] *Mauro.Ricco@fis.unipr.it , Tel. +39 0521 905217*

Abstract

When positive muons (μ^+) are implanted in insulating materials, they capture electrons to form muonium (Mu), a light isotope of H. This process makes muon spin resonance technique (μSR) [1] suitable for studying H interaction with matter, for example in hydrogen-storage materials.

Among carbon-based materials, metal intercalated fullerides are rather promising for hydrogen storage: in particular, recently we have shown that sodium and lithium intercalated fullerides $Na_{10}C_{60}$ and $Li_{12}C_{60}$ can reversibly absorb up to 3.5 and 5 wt % H_2 respectively [2,3], while Teprovich et al. found that Li_6C_{60} can absorb up to 5 wt % [4], at thermodynamic conditions much milder than what observed in pure C_{60}. However, the hydrogenation mechanism in these systems is not trivial and still not well understood [5].

In C_{60} based materials, implanted muons can stay as free unbound particles (diamagnetic muons), or they can bind to an electron and form Mu. As expected from a free H atom, muonium reacts with C_{60} to form adduct radicals. On the contrary, in alkali intercalated fullerides, Mu is observed inside C_{60} (endohedral muonium) and radical formation is usually prevented, due to the ionic character of these materials [6].

In this study we performed a μSR investigation of Li_6C_{60} and $Na_{10}C_{60}$, either as-prepared or after hydrogenation, on the EMU beamline, at the ISIS Rutherford Appleton Laboratory. Interestingly, we found that in these compounds the formation of muonium is not inhibited, thanks to the presence of the intercalated partly ionized alkali clusters [7]. Muonium was found to react with C_{60} to form adduct radicals, appearing as a missing fraction in the muon spin signal. This phenomenon is dependent on temperature and is invariably enhanced on cooling for all the investigated samples. Such findings clearly indicate that in these systems C_{60} hydrogenation is already feasible at cryogenic temperatures, with efficiency even larger than at high T, while the high T needed for hydrogen storage in fullerides is only required to overcome the alkali metals mediated H_2 dissociation barrier.

This finding suggests that the hydrogen molecule dissociation is the process to be enhanced in these materials. This was achieved by co-intercalating transition metals in the fullerides interstices in form of nanoparticles. Preliminary results show a sizeable improvement of the hydrogen absorption parameters [8].

ID-374

Alternatives to Lithium in Ion Batteries Exploiting Carbon Nanomaterials

Pontiroli D. [1,2,*], Gaboardi M. [2], Magnani G. [2], Aramini M. [2,3], Milanese C. [4], Christian J. [5], Sharma N. [5] and Riccò M. [1]

[1] Laboratorio di Micro e Submicro Tecnologie abilitanti dell'Emilia Romagna (MIST.E-R), via P. Gobetti 101, 40129 Bologna (Italy)
[2] Dipartimento di Fisica e Scienze della Terra, Università di Parma, Via G. Usberti 7/a, 43124 Parma (Italy)
[3] Laboratory of Electronic Structures, Department of Physics, University of Helsinki, Gustav Hallstrominkatu 2/b, 00014 Helsinki (Finland)
[4] Pavia Hydrogen Lab, CSGI & Dipartimento di Chimica, Università di Pavia, Viale Taramelli, 16, 27100 Pavia (Italy)
[5] Dalton Building, University of New South Wales, Kensington, 2052, Sydney (Australia)
[*] Daniele.Pontiroli@fis.unipr.it , Tel. +39 0521 905231

Abstract

Nowadays, rechargeable lithium-ion batteries represent the state-of-the-art for the power supply in technological devices [1]. However, the wide-scale implementation of this technology to large scale storage, for example in the renewable energy grids or in the automotive field, put some questions, especially on the raw materials provision, due to the limited Li mineral reserves, which would drive up the prices. The investigation of alternatives to lithium is hence highly desirable, although it requires the identification of new materials suitable as components for new batteries, which possibly display even better performance of the current commercial systems.

In this framework, carbon nanomaterials, such as fullerenes and graphenes, seem to be promising candidates. In fact, recently we have shown that solid C_{60} behaves as a good host material for the insertion of small metal ions, which can in some cases easily diffuse among the molecular interstices already at low temperatures. In the case of lithium, we found that the Li_4C_{60}compound behavesa "super-ionic" conductor, showing a Li^+ ion conductivity of 10^{-2} S/cm at room temperature, anunusually highvalue observed only in liquid electrolytes [2]. But a similar behavior was also observed by intercalating C_{60} with magnesium, leading to the isostructural compound Mg_2C_{60}, showing a Mg^{2+} ion conductivity of 10^{-4} S/cm at room temperature [3]. This behavior is made possible thanks to the unusual fullerene polymerizationobserved in these compounds, allowing the presence of three-dimensional pathwaysalong with metal ions can diffuse. Hence, Mg intercalated fullerenes appear promising candidates for solid state electrolytesin novel Mg ion batteries, which so far facedseveral stability problems due to the chemical reactivity of Mg [4].

On the other hand, it is well known that chemically produced graphene is quite promising for the development of new high-capacity Li ion batteries, in virtue of its high porosity, electronic and mechanical properties [5]. Recently, we found that anodes based on graphene can alsosupport the insertion of Na^+ ions with high capacity and stability upon cycling, thus allowing the development of novel Na ion batteries [6], whose research is still at an early stage. In fact,Na cannot be intercalated in graphite, due to the mismatch between Na^+ion dimensions and the graphite interstices[7]. Na ion batteries are expected to be good candidates for large scale grid storage applications, thanks to the wide availability and low cost of Na [8].

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ID-375

Theoretical Investigation of 6,8 He Halo Nuclei by Using Microscopic Optical Potentials

Wedad R. Alharbi[a], Awad A. Ibraheem[b], M. El-Azab Farid[c]

[a]Physics Department, Faculty of Science for Girls, King Abdulaziz University, Jeddah, Saudi Arabia
Physics Department, Al-Azhar University, Assiut Branch, Assiut 71524, Egypt and
[b]Physics Department, King Khalid University, Abha, Saudi Arabia
[c]Physics Department, Assiut University, Assiut 71516, Egypt
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Abstract

Recently measured data for elastic scattering angular distributions of 6,8He projectiles on a 65Cu target at three energies above the Coulomb barrier (19.9, 22.6 and 30.6 MeV) have been investigated in the framework of the optical model potential. The real parts are microscopically calculated with the Reid M3Y effective nucleon-nucleon interaction by using the double folding approach. Results comparable to the experimental data were obtained using two different forms of the imaginary part. The total reaction cross sections were successfully reproduced using the extracted potentials

ID-376

Crystallization and Thermoelectric Power of Tl_2GaInS_4 Layered Compound

S. R. Alharbi

Physics Department, Faculty of Sciences for Girls, King Abdulaziz University, KSA
srfalharbi@kau.edu.sa

Abstract

The investigation covers a temperature range from 193 to 600K. Thermoelectric power of single crystals Tl_2GaInS_4 prepared by a special modified Bridgman technique, showed that the samples under investigation have a positive TEP in all temperature ranges, indicating p-type conductivity for Tl_2GaInS_4 crystals. The ratio of electron and hole mobilities is μ_n/μ_p = 1.82. The effective mass of holes $m_p^*$is found to be $1.37x10^{-33}$kg while for electrons m_n^* = $3.206x10^{-39}$kg. The diffusion coefficient for both carriers (holes and electrons) is evaluated to be 358.3cm2/s and 425.338cm2/s respectively. The relaxation time for both majority and minority carriers were estimated to be τ_p =$1.189x10^{-17}$s and τ_n=$2.294x10^{-23}$s. Also the diffusion length for holes and electrons were found to be L_p=$6.528x10^{-8}$cm and L_n=$9.877x10^{-11}$cm respectively. In addition to these pronounced parameters, the efficiency of the thermoelectric element (figure of merit) was evaluated, which leads to better application in the field of energy conversation technique.

[S. R. Alharbi **Crystallization and Thermoelectric power of Tl_2GaInS_4 layered compound** *Life Sci J* 2013;10(X):X-X] (ISSN:1097-8135). http://www.lifesciencesite.com.

Keywords: Tl_2GaInS_4, thermoelectric power, effective mass, diffusion coefficient, relaxation time, type of conductivity.

ID-377

Effect of Uranium Gain and Loss on the Groundwater Dating Using Gamma Ray Spectrometry

Eman M. Ibrahim

Nuclear Materials Authority (NMA), P.O. Box 530, El-Maadi, Cairo, Egypt.

Abstract

Several radionuclides of the ^{238}U decay series (^{234}U, ^{214}Pb, ^{214}Bi), ^{235}U and ^{232}Th have been measured through gamma spectrometry in four dug wells in two successive years of Wadi (valley) Naseib, southwestern Sinai, Egypt, in order to study the effect of uranium gain or loss on dating. A non-destructive, gamma-spectrometric method for uranium age-dating is presented which is applicable to material of any physical form and geometrical shape. It relies on measuring the daughter/parent activity ratio $^{214}Bi/^{234}U$ by low-background, high-resolution gamma-spectrometry using intrinsic efficiency calibration. The method does not require the use of any reference materials nor the use of efficiency calibrated geometry.

The well noticed thing is that the collected waters are varied either in time or in place. The results of age dating showed that the young dates (614-1782 y) in the whole wells are noticed just after the flashflood with uranium gains. The dates after one year (2011) with decreasing the uranium content in the water are ranging between 11239 and 47830 y. The last dates are nearly coincide with the last wet period in Egypt.

ID-378

Economic Operation of Renewable Energy Resources and Energy Storages on a Smart Home

Mahmoud-Reza Haghifam, Samaneh Pazouki

Department of Electrical Engineering Islamic Azad University, South Tehran Branch
Tehran, Iran
e-mail: haghifam.mr@gmail.com

Abstract

Due to growing energy demands, electrical power system has been faced by new challenges in recent years. Technical and economic problems are taken into account as the significant troubles. In this paper, the effects of distributed energy resources such as renewable energy resources and energy storages as the prominent complement of the renewable fluctuations are evaluated on a Smart Home. GAMS software is used to solve the proposed Linear Programming (LP) model in different scenarios. Simulation results demonstrate how much wind, energy storage and demand response programs effect and improve the operation of smart homes.

Keywords: Smart home, wind, storage, demand response, operation costs

ID-379

Optimization of an Active Solar Still for Sear Water Desalination

Hamadou Osman Ali[1], Abdellatif Khamlichi[1]

[1]Telecommunications Systems Laboratory, Faculty of Sciences
Avenue de Sebta, Mhannech II 93002 - Tetouan – Morocco

e-mail : arhiba@hotmail.com, khamlichi7@yahoo.es

Abstract

Sea water desalination can be realized by means of a distillation process in which solar radiation is employed as a heat energy source to evaporate water. Solar distillation following this technique can provide low cost and sustainable fresh water for remote dry areas for which supply of water by transportation is too expensive.

Solar sea water desalination can be made by a solar still in which saline water is circulated and put in contact with a heat source to obtain distilled water by evaporation/condensation phase changes. The conventional slope passive solar still admits the configuration of a box like structure that can be made of ordinary materials. The box is enclosed with a glass cover so that the solar radiation passes through it and supplies heat to sea water with limited back reflection. To increase the portion of absorbed solar radiation, the surface of the basin liner is painted in black. Heat losses are to be considered in order to improve productivity. These occur in this system due to partial reflection at the glass cover and also to absorption of solar radiation by the glass cover and water or transmission by conduction through the basin liner.

The heat absorbed by the basin liner is transferred to the saline water by convection. The evaporative heat transfer between the water surface and the glass cover produces the distillate as the evaporated water undergoes film type condensation at the inner surface of the glass cover. This results from the inclination of the glass cover, cohesion between condensed water molecules and gravity effect. The condensed water trickles then down to a trough which guides it into a container. It was found that a lower water depth increases efficiency [1].

Extensive research work has been dedicated to improve the productivity of passive solar stills [2]. Active stills were introduced to provide additional energy supply by using various kinds of concentrators [3]. With more energy supplied to the system the distillate productivity increases.

In this work, an active solar still configuration using additional heat supply which is provided by a parabolic solar collector is considered. This heat source takes action under the basin liner such that the sea water temperature can increase to reach an optimal value for the purpose of evaporation. The collector temperature at the inlet of the still can be adjusted through regulation of the volume flow rate of the heat transfer fluid circulating in the parabolic collector. Use is made of an analytic modelling of the system where the input variables comprise heat transfer fluid flow and temperature as well as sea water flow. Optimisation of the distilled water flow was then performed.

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ID-380

Radioactivity Measurements and Radiation Dose Assessments in Soil of Al-Qassim Region, Saudi Arabia

J. H. Al-Zahrani[1] , A.El-Taher[2,3]

[1] Physics Department, Faculty of Science for Girls, King Abdulaziz University, KSA

[2] Physics Department, Faculty of Science, Al-Azher University, Assiut 71452, Egypt

[3] Physics Department, Faculty of Science, Al-Qassim University, Buraydah 51452, KSA

e-mail: jalzhrani@kau.edu.sa

Abstract

The activity concentration and the gamma absorbed dose rates of the terrestrial naturally occurring radionuclides (^{226}Ra, ^{232}Th and ^{40}K) were determined in soil samples collected from seven different locations of Qassim region in Saudi Arabia were performed using a NaI(Tl) gamma-ray spectrometer. The typical concentrations of ^{226}Ra ^{232}Th and ^{40}K were found in surface soil samples ranged from 1.4 Bq/kg (Al Asyah) to 35.3 Bq/kg (Al Badaea), from 2.5 Bq/kg (Al Maznib) to 39 Bq/kg (Al Badaea) and from 212 Bq/kg (Al Maznib) to 915 Bq/kg (Al Badaea) Bqkg^{-1},respectively. The mean radium equivalent (Ra_{eq}) and outdoor radiation hazard index (H_{ex}) for the area under study were determined as 68.1 Bq/kg and 0.18 respectively. The total absorbed dose rate due to three primordial radionuclides lies in the range of 18.6 – 55.5 nGyh^{-1} with a mean of 35.2 nGyh^{-1}, which yields total annual effective dose of 0.37 mSvy^{-1}. Excess lifetime cancer risk was calculated as 0.20 x 10^{-3}.When life expectancy was taken as 70 years, the lifetime outdoor gamma radiation was calculated as 3.02 mSv which yielded a mean lifetime cancer risk of 0.09 x 10^{-3} which is below the World average (0.29 x 10^{-3}).The measured values are comparable with other global radioactivity measurements and are found to be save for public and environment .The baseline data of this type will almost certainly be of importance in making estimations of populations exposure.

Keywords: Soil- Gamma dose- Radioactivity - Lifetime cancer risk – Al-Qassim - Saudi Arabia

ID-381

Effect of Neutron Irradiation on Electrical Properties of Gap-Leds

Nazir A. Naz[1,b], M. Asif Khurished, Akbar Ali[1,a]

(1) Department of applied Physics, Federal Urdu University of Arts, Science and Technology Islamabad, Pakistan
[a]aarandhawa@yahoo.com, [b]Nazir_Phys@yahoo.com,

Abstract

GaP-LEDs were irradiated with different doses of neutrons from Am^{241}-Be^{9} source. Response of current and capacitance to applied voltage before and after irradiation was studied.The effect of irradiation on shallow level concentration was also noticed. Interaction of neutrons with GaP-LEDs was found to increase the shallow level concenration exponentionally.

Keywords: Semiconductor, MOCVD, Electrical characterization

ID-382

An Investigation of 4He+12C and 4He+16O Reactions Using the Cluster Model

Amal Alghamdi, Awad Ibraheem, Mohammad El-Azab

King Abdulaziz University, Saudi Arabia. E-mail: ahg246@yahoo.com

Abstract

The -target semimicroscopic single folding potentials have been derived by folding a composite (repul-sive and attractive) effective - interaction with the -cluster distribution density in the target nuclei. The obtained potentials are considered as the real part of the nuclear optical model potentials, while the imaginary parts are phe- nomenologicaly expressed using the Woods–Saxon form. Nine sets of measured experimental data of the 4He+12C and 4He+16O elastic rainbow scattering over the energy range 80–240 MeV are analyzed using the obtained potentials. The data are successfully reproduced using the extracted potentials. The resulted reaction cross sections are also investigated and compared with the available corresponding data.

ID-383

Metal Foam as Flow Field for High Temperature PEM Fuel Cell

Ying-JuiHsueh[1], Sheng-Wei Lee[2], Chung-Jen Tseng[1*]

[1]Department of Mechanical Engineering, National Central University, Jhongli, Taiwan
[2]Institute of Materials Science and Engineering, National Central University, Jhongli, Taiwan
*E-mail: cjtseng@ncu.edu.tw

Abstract

In this study, we applied a recently developed metal foam flow field design to high temperature (HT) PEM fuel cell, and compared its performance with a HT PEM fuel cell with conventional graphite serpentine flow channel. The membrane electrode assembly used is Advent TPS® from Advent Technologies Inc. Effects of several operating parameters are investigated.

Operated at 180 °C with anode stoichiometry of 1.2 and cathode stoichiometry of 3, and both unhumidified, cell current density increases from 295 mA/cm^{2}at 0.6 V for the conventional graphite cell to 362 mA/cm^2 for the metal foam cell, an increase of 23 percent.The current density enhancement increases to 31 percent when the operation temperature is raised to 200 °C. An AC impedance analysis shows that mass transfer resistance of the metal foam cell is much lower than that of the conventional graphite cell. This is because the metal foam used in this study has a high porosity of approximately 90 persent, and therefore hashigh gas permeability that improvesreactant tranport inside the cell.Preheating the reactant gases to different temperaturesand the degree of humidification of the reactant gases have negligible effects on cell performance.

We also conducted a 100-hr continuous operation test. Operated at fixed load of 400 mA/cm^2, the output voltage of both cells oscillate within 5 % of mean value. No obvious degradation has been observed. We are currently extending the long term operation test.

ID-385

Preparation and Characterization of Activated Carbons Prepared from Textile Waste Activated by Phosphoric Acid: Adsorption of Clofibric Acid on the Prepared Adsorbents

N. Boudrahem, F. Aissani-Benissad, F. Boudrahem, D. Makloufi, D. Abbas

Laboratoire de Génie de l'Environnement (LGE), Faculté de Technologie,
Université A. MIRA-Bejaia 06000, Algérie, tel. 00 (213) 7 7512 99 25
e-mail: benissadfarida@yahoo.fr

Abstract

Due to rapid urbanization, improved standards of living, and increased world population, the demand for pharmaceutical compounds such as clofibric acid is increasing everyday [1]. The most important issue of concern about the presence of pharmaceutically active compounds in the aquatic environment is the ecotoxicological effect that they may cause. Although it is unlikely that these pollutants would be found at concentrations high enough to induce acute effects, growing evidence suggests that they may be present at concentrations able to cause chronic effects or even lethal effects [2]. For this reason, the removal of these compounds from waste water is necessary.

In this work, the adsorption of clofibric acid on the adsorbents prepared from textile waste was examined. Cotton cloth was employed as a precursor for the preparation of activated carbon by phosphoric acid activation. Raw materials non impregnated (0%) and impregnated (25, 50 and 75%) with different impregnation ratios (mass of H_3PO_4/mass of precursor) were pyrolysed at 600 °C under N_2 gas during 1 h. The products were characterized by scanning electron microscopy, Fourier transform infrared spectroscopy and adsorption of N_2 at 77 K. The BET analysis showed 609 m^2/g and 65 % for area surface and microporosity, respectively for non impregnated material and a maximum surface area of 1150 m^2/g and 99% of microporosity when 50 % impregnation ratio was used. The optimization of the operating parameters, namely the temperature, the pH, the initial clofibric acid concentration was performed. The activated carbon prepared from cotton with 50% impregnation ratio, was effective for removal of clofibric acid (CA) and the maximal adsorption capacity was 83 mg/g at 20 °C, pH 3.0 (pH_{pzc} = 3.33). The kinetic follows the pseudo-second-order model and isotherms obtained at different temperatures follow perfectly the Freundlich model.

Key words: Cotton, Cloths, Activated carbon, Phosphoric acid, Clofibric acid, Adsorption

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ID-386

Electro/Fe^{3+}/Peroxydisulfate Process for Biodegradability Enhancement of Tetracycline Solution

I.Yahiaoui[*1], F. Aissani-Benissad[1], N. Boudjerda[1] and Y. Lahrassi[1]

Laboratoire de Génie de l'Environnement (LGE), Faculté de Technologie, Université de Bejaia 06000, Algérie.
e-mail :yahiaoui.idris@yahoo.fr
tel. 00 (213)34215704

Abstract

The removal of tetracycline (TC) by electro/Fe^{3+}/peroxydisulfate process is reported in this study. The effect of current density, peroxydisulfate (PDS) concentration, Fe^{3+} concentration, and initial tetracycline concentration were investigated. The results indicated that the removal efficiency of teracycline increased with an increase of current density which can be related to the increasing production of oxidizing $SO^{\bullet}_4{}^{-}$ radicals. Concerning the initial tetracycline concentration effect, it was observed that the removal efficiency declined with increasing the tetracycline concentration. This effect is attributed to the competitive consumption of oxidizing $SO^{\bullet}_4{}^{-}$ radicals between TC antibiotic and generated intermediate compounds. The tetracycline degradation efficiency was improved significantly when the PDS and Fe^{3+} concentrations were increased from 1 to 10 mM and 1 to 2 mM respectively. It was found that the increases in PDS and Fe^{3+} concentrations to 20 mM and to 4 mM respectively, did not improve the degradation efficiency.

The optimal operating conditions were: 2 mM catalyst (Fe^{3+}) concentration, 40 mA cm^{-2} applied current density, 0.06 mM tetracycline concentration, 50 mM Na_2SO_4, 10 mM peroxydisulfate (PDS) concentration, pH = 3, T = 30°C and ω= 360 rpm. These conditions led to a total degradation of TC within only 40 min of reaction time and 98 % of its mineralization yield after 3 h electrolysis.

The biodegradability of the solution after electro/Fe^{3+}/peroxydisulfate pre-treatment was examined and the results showed that BOD_5/COD ratio increased substantially from 0.00 initially (before the solution pretreatment) to 0.40, 0.46 and 0.83 after 4 h, 5 h and 6h of electrolysis respectively, namely above the limit of biodegradability (0.4) confirming the feasibility of the combination of electro/Fe^{3+}/peroxydisulfate and a biological treatment.

Keywords: Antibiotics, tetracycline, Electrochemical oxidation, Sulfate radicals, Ferric iron, Peroxydisulfate and biological treatment.

ID-388

Performance Analysis of Downdraft Biomass Gasifier-Engine-Generator Plant using Different Biomass Feedstocks

Prokash C. Roy[a,*], Amitava Datta[b], Niladri Chakraborty[b]

[a]Department of Mechanical Engineering, Jadavpur University, Kolkata 700032, INDIA.
[b]Department of Power Engineering, Jadavpur University, Salt Lake Campus,
Kolkata 700098, INDIA.
e-mail: prokash.roy@gmail.com

Abstract

Performance analysis of a downdraft biomass gasification system for distributed power generation using different biomass feedstocks has been carried out using finite rate kinetic modeling of the reduction zone of the downdraft biomass gasifier [1] and single zone thermodynamic model of the producer gas engine. Both models are validated against the experimental results. Comparison of the gasifier performance using different biomass feedstocks have been done based on the char reduction at the reduction zone i.e. at the critical char bed length. Feed rate and equivalence ratio has been selected based on the desirable producer gas production rate for a specific engine installation. In the present paper, a single-zone producer gas engine has been developed based on the gas-mixture model considering all the gas species and coupled with gasification. Producer gas engine model has been validated against experimental results. Engine operating parameters such as spark timing and burning duration has been optimized to achieve maximum engine performance and minimum fuel consumption. Finally performance of the plant (plant efficiency, specific fuel consumption) and cost of fuel for per unit electrical energy have been evaluated and discussed for different biomass feed stocks such as Eucalyptus wood (EW), Rice Straw (RS) and Bamboo wood (BW).

Keywords: Distributed power generation, downdraft biomass gasifier, gasifier model, producer gas engine model, performance analysis.

ID-389

A CFD Study on the Natural Ventilation Performance of Iranian Wind Catcher System in Residential Buildings

Mohammad Nazififard

Energy Research Institute,University of Kashan, Kashan, Iran
*Corresponding author: nazifi@kashanu.ac.ir

Abstract

The purpose of the paper is to study the aerodynamics of Iranian wind catcher system by means of computational fluid mechanics (CFD). Badgir (Wind catchers) are one of traditional natural ventilation systems attached to residential buildings in order to ventilate the indoor air. The common type of wind catcher is four-sided one which is capable to catch wind in all directions. A series of 3Dimentional steady RANS simulations for a typical wind catcher are presented.Sensitivity analyses are performed to find out the effect of different settings of CFD on results. The CFD simulations are validated with available experimental data. The influence of different computational parameters is explored in this paper, including the mesh resolution, the size of the computational domain and the turbulence model.

ID-390

Thermoeconomic Assessment of a Geothermal Powered Hydrogen Production System

Ceyhun Yilmaz, Mehmet Kanoglu*, Aysegul Abusoglu

Department of Mechanical Engineering, University of Gaziantep, 27310 Gaziantep, Turkey
e-mail: kanoglu@gantep.edu.tr

Abstract

Hydrogen, as an energy carrier, is subject of a lot of research work and some consider it as the energy of the future. If hydrogen is to become the energy of the future, it must be produced using renewable energy sources and the technical and economic problems on its production, storage, transportation, and use should be solved. There are various methods used in hydrogen production and these methods may require both electricity and heat inputs.

In this study, we consider hydrogen production by an electrolysis process using electrical energy from a geothermal power plant. The power plant is selected to be a combined flash/binary system and an alkaline electrolysis process is selected for hydrogen production. We study energy and exergy analyses and exergy based cost formation of hydrogen production by a alkaline water electrolysis process powered by combined flash and binary geothermal power plant. The exergetic cost formation process is developed applying specific exergy cost method (SPECO) to geothermal based hydrogen production via alkaline water electrolysis. We determine exergy destructions and their costs in detail as avoidable and unavoidable exergy destructions. The results of the energy, exergy and exergoeconomic analyses can be used to for improve the process flows, and to reduce product costs.

Keywords: Geothermal energy, hydrogen, hydrogen production, exergoeconomics, SPECO.

ID-391

Enhancing the Electro Catalytic Activity of Manganese Ferrite through Cerium Substitution for Alkaline Water Electrolysis

T.Pandiarajan and S. Ravichandran, Senior Scientist
Central Electrochemical Research Institute, Karaikudi-630006, Tamil Nadu, India.

***E-mail**: pandiaraj211@yahoo.co.in
Mobile: +91-8344248406

Abstract:
Alkaline water electrolysis (AWE) is the simplest way of producing hydrogen, an attractive fuel for the future. In view of cost-effectiveness and durability, non-noble metal oxides are the promising catalysts for AWE. Here, we studied the effect of Ce substitution on the OER activity of manganese ferrite and their catalytic performance at the solid-state water electrolysis. Ce substituted $MnFe_2O_4$ ($0 \leq x \leq 0.8$) was synthesized by a combustion method. Characterization techniques such as SEM, XRD, and EDAX were used to analyse the surface morphology and the chemical composition of $Ce_xMnFe_{(2-x)}O_4$. Substitution of Cein the cubic lattice of $MnFe_2O_4$ increases the conductivity of $Ce_xMnFe_{(2-x)}O_4$, which results in the negative shift in the OER onset potential. Among all catalysts investigated, $Ce_{0.2}MnFe_{1.8}O_4$ was found to be more active for OER in terms of current and stability. Therefore, we fabricated a membrane electrode assembly (MEA) for alkaline water electrolysis by coating 3 mg cm^{-2} $Ce_{0.2}MnFe_{1.8}O_4$ on the anode, which exhibits a current density of 300mA/cm^2 at 1.80V. Our results indicate that the OER activity of the $MnFe_2O_4$ increases with cerium substitution, and this spinel ferrite based MEA's demonstrate a lifetime of 100 hours and above on constant electrolysis in deionised water.

ID-394

A Comprehensive State of The Art of Conventional Maximum Power Point Tracking Techniques for Photovoltaic System

M. Seyedmahmoudian*, A. Maung Than Oo, A. Mohammadi, A. Stojcevski
School of Engineering, Faculty of Science, Engineering & Built Environment, Deakin University, Waurn Ponds, 3216, Victoria, AUSTRALIA. E-mail: mseyedma@deakin.edu.au

Abstract

Due to the increasing world energy demand, renewable energy systems have been significantly applied in the power generation sector. Among the renewable energy options, photovoltaic (PV) system is one of the most popular resources which has been experiencing a huge attention during recent decades. The remarkable advantages, such as static and movement free characteristics, low maintenance costs, and longevity are the primary factors for the popularity of solar generation in the late years. Nevertheless, the low PV conversion efficiency in one side and high PV material cost in the other side have made PV generation comparably expensive system. Consequently, a capable maximum power point tracking (MPPT) is all important to elicit the maximum energy from the production of PV systems. Different researches have been conducted to design a fast, simple and robust MPPT technique under uniform conditions. However, due to the series and parallel connection of PV modules and according to the use of bypass diodes, in the structure of PV modules, conventional techniques are unable to track a true maximum power point (MPP). Recently, several studies have been undertaken to modify these conventional methods and enable them to track the global MPP under rapidly changing environments and partial shading conditions. This report concentrates on the state of the art of these methods and their evolution to apply under partial shading conditions. The recent developments and modifications are analyzed through a comparison based on design complexity, cost, speed and the ability to track the MPP under rapid environmental variations and partial shading conditions.

ID-395

Cosmo-Rs Predictions, Hydrogen Bond Basicity Values and Experimental Evaluation of Amino Acid-Based Ionic Liquids (AAILS) for Lignocellulosic Biomass Dissolution

Nawshad Muhammad
Aınterdisciplinary Research Center in Biomedical Materials, Comsats Institute of Information Technology, Lahore, Pakistan. E-mail: nawshadchemist@yahoo.com

Abstract.

In this study amino acid-based ionic liquids (AAILs) with two different cations i.e. 1-ethyl-3-methylimidazolium (Emim) and Tetrabutyphosphonium (P4444) were investigated by COSMO-RS predictor, hydrogen bond basicity (*β*) of kamlet taft parameters and further compared with experimental values of its bamboo dissolution. COSMO-RS was used for calculating sigma profile and activity coefficients(γ_i)of amino acid-based ionic liquids. The trends in sigma profile and activity coefficients (γi) for AAILs were compared with hydrogen bond basicity (*β*) values and in addition the effect of structure moiety of ionic liquids was also discussed. The trend of COSMO-RS prediction for anions was noted similar to the hydrogen bond basicity (*β*) values of AAILs with exception of serinate anion. Similarly,the trend predicted by COSMO-RS and hydrogen bond basicity (*β*) values was also found same while changing the cations of AAILs. However in case of experimental results, the trend predicted by COSMO-RS and the hydrogen bond basicity (*β*) values were not correlating with efficiency of AAILs for bamboo dissolution. The AAILs with Tetrabutyphosphonium (P4444)cation were able to dissolve the bamboo as change in crystalinity of cellulose was identified by XRD analysis after dissolution and regeneration of bamboo. Scanning Electron microscopy also showed homogenous structure for regenerated materials.

ID-396

Study of New Configuration Photovoltaic PumpingSystem

Mehdi Ouada*,Mohamed Salah Meridjet

Electromechanical Department Badji Mokhtar University Annaba,Algeria
E-mail: ouadamehdi@gmail.com,meridsa@yahoo.fr

Abstract

Solar photovoltaic pumping system is one of most important of renewable energy applications especially in rural areas, In this paper, we present simple method of modeling and control of photovoltaic pumping system based BLDC centrifugal pump controlled by new improved incremental conductance in order to optimize the price and operation of pumping system this MPPT algorithm have many advantages like can be eliminate proportional integral controller. While the system is in a modeling and simulation using different toolbox of Matlab/Simulink, simulation results show that we can improve the operation system using simple and effective techniques.

ID-397

Global Change and Human Health

Dr.Fereshteh Farzianpour[1], Eng .Shayan Hosseini[2], Eng.Shadi Hosseini[3]

1. Dept. of Health Management &Economics, School of Public Health. Tehran University of Medical Sciences.
2. Dept. of Electrical Power Engineering, Science & Research branch of Islamic Azad University, Tehran, Iran
3. Dept of Management, University of Tehran Kish International Camp use, Iran

Abstract

The term **global change** encompasses several interconnected phenomena such as climate change; stratospheric ozone attenuation; species extinction and reduced biodiversity; serious forms of widespread environmental pollution; macro- and micro changes in the ecosystem, including some that have led to emergence or reemergence of dangerous pathogens. These phenomena are mostly associated with industrial processes and increased pressure of people on fragile ecosystems. All are interconnected and several are synergistic-some processes to reinforce others.

Underlying all forms of global change, indeed part of it, is a population explosion. In little more than the length of an average lifetime, the population has quadrupled and it is not clear whether our numbers have already reached or even exceeded the earth's carrying capacity; however, we have reached the limits for comfortable human existence. Indeed, life for all but a very small minority would be of greatly diminished quality and long-term sustainability would be at best a precarious possibility. Not only are numbers increasing at an unprecedented rate, people are moving around in the world on a scale never seen before, and this too is part of global change.

Every health-related component of global change merits discussion; I also mention some of the complex interconnections among them in this brief account and readers are also urged to consult the sources I cite.

Keywords: Environmental Pollution, Human Health, Changing World, Climate Change, Environmental sustainability

ID-398

Hydrogen Storage in Alkali-Cluster Intercalated Fullerides

GaboardiM. [1)*], Aramini M.[1)], PontiroliD.[1,2)], Magnani G.[1)], Riccò M.[1)],Milanese C.[3)] andMauron P.[4)]

[1)]Department of Physics and Earth Sciences, University of Parma, Via G. Usberti 7/a, 43124 Parma (Italy)

[2)] Laboratorio di Micro e Submicro Tecnologie abilitanti dell'Emilia Romagna (MIST.E-R), via P. Gobetti 101, 40129 Bologna (Italy).

[3)] Pavia Hydrogen Lab, CSGI & Dipartimento di Chimica, Università di Pavia, Viale Taramelli, 16, 27100 Pavia (Italy)

[4)] Empa. Swiss Federal Laboratories for Materials Science and Technology, Division "Hydrogen and Energy", Überlandstrasse 129, 8600 Dübendorf (Switzerland).

e-mail: *mattiagianandrea.gaboardi@fis.unipr.it , *Tel. +39 0521 905209*

Abstract

In the wide panorama of hydrogen storage materials, carbon based nanostructures are ratherattractive,because of the low weight and cost of carbon. In particular, metal decoratedfullerenes had been firstly proposed, due to their theoretically high values of adsorbed hydrogen at with favorable binding energy [1,2], although their solid-state stability had never been confirmed. Alkali cluster intercalated fullerides have been recently investigated with renewed interest,appearing as a novel class of materials for hydrogen storage applications, thanks to their proved capability to reversibly uptake high amounts of hydrogen via a complex chemisorption mechanism.

In this work the synthesis, the structural investigation and the hydrogen storage properties of Li_xC_{60} and Na_xC_{60} will be presented, for x varying between 6 and 12. The synthesis was carried out by means of solid-state reaction between $C_{60}$and stoichiometric amounts of a suitable metal precursor. Hydrogen storage properties were studied by means of the pressure-composition-Temperature (PCT) isotherms measurements. The structural properties were investigated thanks to *in-situ* neutron scattering and the analysis of the Pair Distribution Function (PDF) obtained from high-energy synchrotron diffraction. The mechanism of hydrogenation was unveiled by means of the Muon Spin Relaxation spectroscopy (μSR).These systems were proved to reversibly absorb up to 5 mass% H_2 at moderate temperature and pressure [3–5].

Recently, we also identified some strategies to further improve the absorption in the samples. On the one hand, we succeeded to add Pt andPdnanoparticles to Li fullerides, whose known catalytic activity towards hydrogen dissociation allows to increase of 20% the absorption performances [6]. On the other hand, we also studied the H_2 absorption propertiesof the mixed alkali $Na_xLi_{6-x}C_{60}$phases, in order to find the best compromise between absorbed hydrogen and kinetics.

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ID-399

Energy Access and Usage in Peri-Urban Small Industries in Yangon, Myanmar

Aung PhonnKyaw, Cherry MyoLwin, S. Neupane, A. Salam, and S. Kumar*
Energy field of study Asian Institute of Technology
KlongLuang, Pathumthani 12120, Thailand
e-mail: kumar@ait.ac.th; Fax: + 66 2 524 5439; Tel.: + 66 2 524 5410

Abstract

For small industries, access to reliable and modern energy source is vital. To know the status of energy access in industries, a survey was conducted in ShwePyiTharand East Dagon Townships, two peri-urban areas of Yangon city. The research studies the energy access status of peri-urban township and to understand the impacts of modern energy access on the small industries. Thiswas done by conducting informal interviews using random sampling of 50 small industries - teashops and restaurants (over 25%), computer and copying shop (over 10%), electronic shops (about 15%), etc. The observations and results show the following:

- 94% of the small enterprises were runby self-investments and the rest through loans. 63% of small industries were run by men.
- 54% of industries earnan average monthly income of about 200,000 kyat, 26% over 400,000 kyat, 13% about 19 million kyat, and 7% with 50,000 kyat (1 US$ = approximately 950 Kyat, June 2014). On an average, an industry spends about 5% of the total income on energy.
- In ShwePyiThar Township,
  - about 2% of the surveyed industries did not have access to electricity and they use diesel generators. Blackouts and brown-outs are common, while the power outage period is between 30 minutes to 5 hours per day. In case of power outage, they use diesel and battery (about 22% and 15% respectively).
  - The fuel used in restaurants and teashops are as follows: LPG 17.39%, firewood 6.52% and charcoal 17.39%.
- In terms of electricity pricing,
  - In East Dagon Township township, most residents/industries have settled illegally, and so cannot apply for electricity connection from local electricity authority. They receive electricity from neighboring private generators, and the electricity price depends on the equipment type used. Users pay 350 kyat for lighting (two lamps), TV and video player, and 100 kyat for only lighting (one lamp ony) at night time.
  - In ShwePyiThar Township, small industries pay their electricity consumption based on their consumption, mostly using residential meters. For residential meters, minimum electricity price was 35 kyat for consumption between 1 kWh to 100 kWh. For 3 phase meters, the minimum electricity price is 75 kyat for consumption between 1 kWh to 500 kWh.
  - Therefore, electricity price for industries in East Dagon Township based on supply from neighboring generators was at least 10 times higher than electricity price from government electrical power authority in ShwePyiThar Township.
- The importance of energy (electricity) can be gauged as providing increased services and products, e.g increased sales in printing and copying shops (27%), extended working hours in restaurants, salon and grocery shops and stores (27%), time saving in salon and tailor shops (15%),etc. Distribution lines of electricity are weak in stability and reliability, resulting in many blackouts and brownouts. However there is no significant effect due to of lackof electricity in small teahouses where charcoal is the main source of fuel.

ID-401

Life Cycle Extensions of Geothermal Turbines by Multi Composite Technology

Ioana Csaki[1], Aurelian Buzăianu[2], Petra Moţoiu[3], Gabriela Popescu[2], Kolbrun Ragnarstottir[4], Sæmundur Guðlaugsson[5], Daniel Guðmundsson[6]

[1] University "POLITEHNICA" of Bucharest, Romania; [2] S.C. METAV-R&D S.A Bucharest, Romania.

[3] *TEHNOID COM Ltd.*

[4] *Innovation Center Iceland-ICI*

[5] *Orka Náttúrunnar*

[6] *Vélvík ehf.*

Abstract

Nowadays in Energy research area a few number of countries are involved in geothermal evaluation, exploitation and progress of new geothermal development projects. In order to provide a stable power supply without increasing CO_2 on global environment problem, high reliability and high maintainability are required as a basic condition for the geothermal turbines and energetic components [1]. Concurrently effective improvement of efficiency and upgrading of geothermal system turbines are also very important and fundamental economical factor. Geothermal energy is prone to play a significant role in moving the Europe and other regions of the world toward a cleaner and more sustainable energy system [2]. In order to increase the reliability of geothermal steam turbines, it is important to assess the materials life under geothermal environment condition. Turbine corrosion damage, particularly for blades, has been long recognized as a leading cause of reduced availability in the geothermal power plant, heat pumps and non-conventional energetic systems. Advanced life-cycle of rotor steam-turbine [3] for optimisation thermal spray process deposition by multicomposite systems are required to ensure the mechanical integrity of turbines. Some of the specific article objectives are related to the: design and synthesis of new complex powder mixtures (NiCr/NiCoCr with different addition of ZrO_2 stabilized with Y that can be used to obtain protective layers, with improved wear, thermal shock and abrasion resistance. The subject of present work is the development of a knowledge-base platform for optimisation of multi-composite technology and thermal spray processes deposition, in terms of accuracy, surface finishing, productivity and cost performance in upgrading and life geothermal cycle turbine extension in superheated geothermal steam condition.

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ID-402

Ambient Temperature and Relative Humidity Dependence of PV Module Efficiency

Rezak Alkama, Kahina ouali, Mohand Arkoub

Laboratoire de Génie Electrique, Université de Béjaia, Algerie
rezak_alkama@yahoo.fr, kahina.ouali@yahoo.fr, arkoub_m@yahoo.fr

Abstract
The solar radiation data is one of the most important indicators for photovoltaic (PV) power generation application. The measurement array presented in this paper is performed at the University of Bejaia in Algeria. It is used to evaluate the performance of photovoltaic modules and systems. In order to study ambient temperature and relative humidity dependence of PV module efficiency, we established a database of more than 100,000 points obtained by recording every eight minutes of solar radiation and meteorological parameters (sunshine hours, ambient temperature, air pressure, relative humidity and rainfall). The measurement of the voltage and the current are made through transducers and data logger but also directly with voltmeter and ammeter. Software developed under Lab View environment permit to configure the system and to read and save the data. The current delivered by solar panels is proportional to the illumination. The calculated correlation factor is 0.956. The voltage varies less with the illumination.We have studied the evolution of sun radiation, voltage and current, each time on midday, during November 2012. For the presented data, correlation coefficient is .93 for the current witch vary linearly with sun radiation. It is .67 for the voltage, the variation is logarithmic. There is negative correlation (-0.3285) between efficiency and ambient temperature and positive correlation with relative humidity (.2334).When humidity increases near the module area, module temperature decreases and the efficiency may be better.

Keywords: Solar radiation; ambient temperature; relative humidity,module efficiency

ID-403

Genetic Algorithm Optimization for the Average Position Analysis of a Welding Robot through a Metal Spar

Dj. Bellala[1], L. Ourlis[2], H. Smadi[3]

[1, 2, 3] Control Engineering and Manufacturing Laboratory, University of Batna, 05000 Algeria
bellala_djamel@yahoo.co.uk, ourlisl@gmail.com, h.smadi@hotmail.fr

Abstract
At present, some industrial applications need to be updated using new techniques developed by recent researches, especially those based on heuristic approaches like genetic algorithms. This paper discusses the optimal locations of a welding robot along a metal spar while performing sheet steel casing assembly using average position analysis. This optimization aims to carry out the welding operation using the minimum possible displacements along the metal spar. In order to work out efficiently this optimization problem, a genetic algorithm capable of finding the global minimum of a nonlinear quadratic function of two variables is used. Besides this heuristic approach of optimization, a problem modelling is carried out using a mathematical technique known as average position analysis. A detailed overview about the space evolution of this quadratic function is obtained via a three dimensional representation of that function, finally the generalisation of the obtained result over the total length of the metal spar is made.

Keywords: optimization, welding robot, metal spar, average position analysis, genetic algorithm, quadratic function.

ID-404

Hydrogen Production from Dimethyl Ether, Methanol and Dimeyhoxymethane over Bifunctional Cuo-Zno/Γ-Al_2O_3 Catalyst

S.D. Badmaev[1,2], A.A. Pechenkin[1,2], V.D. Belyaev[1,2], V.A. Sobyanin[1,2]

[1]Boreskov Institute of Catalysis, Pr. Akademika Lavrentieva, 5, Novosibirsk, 630090, Russia

[2]Novosibirsk State University, Pirogova St. 2, Novosibirsk, 630090, Russia

(*) corresponding author: sukhe@catalysis.ru, tel: +73833269747

Abstract

Fuel cells are considered as an alternative environmentally sound source of electric power. The most of fuel cells are fed by pure hydrogen or hydrogen-rich gas mixtures produced by catalytic conversion of hydrocarbons. Dimethyl ether (DME), methanol and dimethoxymethane (DMM) are synthetic materials and can be easily and selectively converted to hydrogen-rich gas at relatively low temperature (250-350^{o}C) compared to other fuels such as natural gas, gasoline and LPG. Overall DME, methanol, and DMM steam reforming (SR) are expressed by equations:

$$CH_3OCH_3 + 3H_2O = 6H_2 + 2CO_2$$

$$CH_3OH + H_2O = CO_2 + 3H_2$$

$$CH_3OCH_2OCH_3 + 4H_2O = 8H_2 + 3CO_2$$

Besides, during these reactions, a reverse WGS reaction may proceed to produce carbon monoxide:

$$CO_2 + H_2 = CO + H_2O$$

It is well known that Cu-containing catalysts are effective for methanol SR. It is generally assumed that DME SR and DMM SR proceed via consecutive two-step reaction mechanism: the first step is hydration of DME/DMM to methanol/formaldehyde over acidic catalyst; the second step is steam reforming of the produced methanol/formaldehyde to hydrogen-rich gas.

The main idea of this work is to realize a concept of multifuel processor which provides reforming of all three type fuels (DME, methanol, DMM) over the same catalysts under similar reaction conditions. Obviously, the active and selective catalyst for this purpose should contain acidic centers for DME/DMM hydration and copper centers for methanol/formadehyde steam reforming, i.e. the catalyst should be bifunctional. The present work reports on the performance of bifunctional CuO-ZnO/γ-Al_2O_3 catalyst in DME SR, methanol SR, DMM SR to hydrogen-rich gas to be used for fuel cell feeding. The catalyst was characterized by XRD, HR TEM, EDX and FTIR spectroscopy. It was found that the catalyst provided the hydrogen production rate ~15 L $H_2/(g_{cat} \cdot h)$ at complete conversion of dimethyl ether, methanol and dimethoxymethane to hydrogen-rich gas with low CO content in the temperature interval of 300–370°C. Thus, bifunctional catalyst demonstrates high promises for the realization of multifuel processor concept. It enables the production of hydrogen-rich gas from more than one fuel (DME, methanol and DMM) under similar reaction conditions. Moreover, the produced hydrogen-rich gas can be used for direct feeding HT PEM FC and, after CO removal by CO PROX with the same catalyst, LT PEM FC.

This work was supported the Council for Grants of the President of the Russian Federation for Support of Young Scientists of Russia (MK_2199.2013.3).

ID-405

Restoration Of Mangrove Forests Through Innovative Breakwater Systems For Shoreline Protection: An Evaluation Of Rehabilitation Project At Carey Island, Malaysia, Malaysia

Shervin Motamedi[a], Roslan Hashim[a,b]

[a] Department of Civil Engineering, Faculty of Engineering, University of Malaya, 50603, Kuala Lumpur, Malaysia

[b] Institute of Ocean and Earth Sciences, University of Malaya, 50603, Kuala Lumpur, Malaysia

shervin@um.edu.my

Objective: In this paper, we reviewed a history of coastal protection methods in Malaysia during the last 60 years. We also presented a case study of an innovative mangrove restoration and rehabilitation project on Carey Island, Malaysia. The main objective of this paper is to investigate the conductivity of the site for re-establishment of planted mangroves at the site.

Methods: We conducted a long-term evaluation of a mangrove restoration project at the Carey Island, Malaysia. The site is severely affected by erosion and mangrove loss due to sea level rise. We performed 3 classes of test at the site. Firstly, we examined the sedimentological features of the site according to the We used sieving and hydrometer methods to obtain the particle size distribution of the soil samples. The tests were performed in accordance with the Standard Test Method for Particle-Size Analysis of Soils (ASTM D 422). Further, the bathymetric data was collected using a TOPCON Total Station. The Temporary Bench Mark (TBM) was located at 2°49′28″N, 101°20′25″E. Further, surface profiling was conducted in accordance with TBM along axis S5 in Figure 5 from 0 to 60 m of the existing dyke with the interval of 5 m. Finally, we We assessed the pH value for each of the 36 water samples using a multiprobe apparatus according to the Standard Test Methods for pH of Water (ASTM D 1293). Sample salinity was assessed using an Atago Hand-Held Refractometer in accordance with Standard Methods for the Examination of Water and Wastewater (American Water Pollution Control Federation). The nutrient concentrations were measured via ICP (the 861-Advanced Compact; Australia/Switzerland) in accordance with ASTM Water Testing Standards in the "Inorganic Constituents in Water" series.

Results and Discussion: Four years into the construction of the breakwater stretches, the geotechnical characterization and bathymetric data collected from the vicinity of the project suggests an enhancement in site condition. The sedimentologic data attests that the amount of silt and clay content rose up to 76.14% (on average) and only about 23.86% of fine sand. Besides, the bathymetric data show an increase in seabed level four years into the rehabilitation project. Thus, we draw the conclusion that according to the increasing trend in the seabed elevation, the cross-section profile of the beach has been leveled-up. Based on the hydrogeochemical assessment, the site will be a potential ground for establishing mangroves. Based on our findings, it is worthwhile to put efforts on conducting mangrove rehabilitation project at the site

Keywords: Mangrove, Coastal protection, coastal restoration, wetlands, coastal rehabilitation, ecological engineering

ID-406

Entering the Bio Based Economy - Verification of Demand on Education in the Field of Green Economy

Zuzana Palkova

Slovak University of Agriculture in Nitra, Technical faculty, Department of Electrical Engineering, Automation and Informatics, Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic

e-mail: Zuzana.Palkova@uniag.sk

Abstract:

So far worldwide economy was oil-based. Oil and other examples of fossil energy were used for fuel, for heating, for the production of a wide range of products like plastics, medicines, food additives, etc. This oil-based economy has many consequences - global warming due to a growing production of carbon dioxide, limited quantities of oil, worldwide, dependency on unstable countries and/or governments.

These consequences have led to a search for alternatives for oil in many sectors:

- renewable energy, like wind and solar energy,
- bio-fuel, like bio-diesel, bio-gases,
- production of raw materials for further processing, like fibers, dyes, medicines, food
- additives, alternatives for plastics, etc.

From this point of view, global climate changes, the greenhouse gas emissions and reduced sources of traditional fossil fuels are one of the most serious environmental problems of present time. This fact was the starting point for Directive 2009/28/EC, which defined two objectives in the area of RES, the mandatory 20% share of RES in gross final energy consumption in the European Community and the mandatory 10% share of RES in transport, which all Member States must achieve by 2020. In 2011 was the share of renewable energy sources in total energy production in the European Union 13%.

The article presents general state in the Green Economy and a way how to increase the attractiveness and accessibility of vocational education and training for employees in green economy in the European countries – Netherlands, Slovakia, Hungary, Finland, Denmark and Germany.

ID-407

Molasses Based Activated Carbons As CO_2 Sorbents

J. Młodzik, K.Glonek, U. Narkiewicz, A. W. Morawski, R.J. Wróbel, B. Michalkiewicz

The West Pomeranian University of Technology in Szczecin, Institute of Chemical and Environment Engineering, ul. Pulaskiego 10, 70-322 Szczecin, Poland, Tel: +48 9144 94730, jmlodzik@zut.edu.pl,kglonel @zut.edu.pl, urszula.narkiewicz@zut.edu.pl, amor@zut.edu.pl, rafal.wrobel@zut.edu.pl, beata.michalkiewicz@zut.edu.pl

Abstract

The aim of this study was to examine adsorption of CO_2 on activated carbons contained TiO_2 produced from molasses. According to our knowledge in this work for the first time such hybrid materials - activated carbons – TiO_2 were described.

Dense liquid – molasses (Mb), has been mixed with grounded KOH, to obtain homogenic mixture. Mass of dry molasses has been calculated, as well as mass of TiO_2, and dry KOH. Mass ratios of starting materials were: AC1 Mb: KOH 1:1, Mb: TiO_2 1:0; ACT1 Mb: KOH 1:0, Mb: TiO_2 1:0.08; ACT2 Mb: KOH 1:0, Mb: TiO_2 1:0.16; ACT3 Mb: KOH 1:1, Mb: TiO_2 1:0.08; ACT4 Mb: KOH 1:1, Mb: TiO_2 1:0.32.

The mixture has been left for 3 hours and dry at 473K for 19 hours. Pyrolisis has been performed simultaneously with chemical activation (1023K, 1h). Then materials have been grounded. Powder has been washed with water to neutral pH. Then all materials have been swamped with HCl in concentration of 0.1 mol/dm^3 for 19 hours, and washed with water again to neutral pH. EDX test proved, that washing these materials do not wash TiO_2 away and not contained K.

Adsorption of CO_2 was measured at 313K by volumetric method. Specified surface area (S_{BET}) of produced materials was calculated with BET equation, according to isotherms of adsorption and desorption of liquid nitrogen in 77K. The total pore volume (V_T), was estimated from N_2 adsorption data as volume of liquid N_2 at p/p_0 equal to 0.99. Micropore volume (V_M) though, was calculated by DFT method, for pores smaller than 2 nm in diameter.

The values of S_{BET} were as follows: AC1: 1985, ACT1: 523, ACT2: 298, ACT3: 1728, ACT4: 385 [m^2/g],

The total pore volume were equal: AC1: 0.942, ACT1: 0.245, ACT2: 0.156, ACT3: 1.762, ACT4: 0.450 [cm^3/g].

The micropore volume were as follows, relatively: 0.714, 0.186, 0.109, 0.600, 0.101 [cm^3/g]

The results of CO_2 adsorption proved the influence of these parameters on adsorbing capacity. Results at 1 bar were: AC1: 2.46; ACT1: 1.68; ACT2: 1.15; ACT3: 1.93; ACT4: 0.47 mmol/g.

Series of tests confirmed, that molasses is very efficient carbon source. Sorbents based on molasses are very effective, and it is plausible to obtain micropore structure, using simple producing process. Addition of TiO_2, even in small amounts decreases adsorbing abilities, as well, as specific surface area. Addition of TiO_2 also blocks micropore forming. Produced sorbents without KOH, but with TiO_2 proved importance of potassium hydroxide, as activation agent. These materials were noticeable worst sorbents. The most promising material seams to be ACT3, which can be used as photocatalist, because of highly developed adsorbing abilities and TiO_2 content.

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ID-408

Impact of Reductants in Dss-Crystal Violet Photogalvanic Solar Cell Systemsfor Solar Energy Conversion and Storage

ChhaganLal

Department of Chemistry MahilaP GMahavidyalaya, Kamla Nehru Nagar, Jodhpur-342001, Rajasthan (India)
E-mail: chemistcbaloch@rediffmail.com,cbjnvu@gmail.co

Abstract

Phtogalvanic effect was studied containing crystal violet as photosensitizer in different reductants (Ascorbic acid, Oxalic acid &EDTA)systems . A water filter was used inH-cell between the diffusion length. In different systems the photopotential and photocurrent were observed 835.0,828.0,754.0mV and 165.0,200.0,230.0µ are respectively. The conversion efficiency of the systems wasobserved 0.36%, 0.50%, 0.72% and fill factor was determined as 0.40, 0.48, and 0.48.The effects of different parameters on the electrical outputof the cell and current-voltage (i-V) characteristics of thecell were studied. A mechanism was also proposed for thegeneration of photocurrent in photogalvanic cell

Keywords: Conversion efficiency, fill factor, performance of the cell, photopotential and photocurrent.

ID-409

Photoelectrochemical Behavior of Bimetallic Cu-Ni and Monometallic Doped Tio_2 for Hydrogen Production

N. M. Mohamed[a], R. Bashiri[b *], C. F.Kait[a], S.Sufian[b], S.Kakooei[c]

[a] Fundamental and Applied Sciences Dept., Universiti Teknologi PETRONAS, 31750 Tronoh, Perak, Malaysia

[b] Chemical Engineering Dept., Universiti Teknologi PETRONAS, 31750 Tronoh, Perak, Malaysia

[c] Mechanical Engineering Dept, Universiti Teknologi PETRONAS, 31750 Tronoh, Perak, Malaysia

Abstract

Development of solar energy conversion devices using modified photocatalysts have been researched intensely with the objective of replacing fossil fuel with renewable source of energy. This paper reports the physical properties and photoelectrochemical behaviour of nanostructured bimetallic (Cu-Ni), monometallic (Ni, and Cu) doped TiO_2 and pure TiO_2 photocatalysts. The photocatalysts were synthesized by sol-gel method followed by hydrothermal with total metal loading of 10 mol%. The physical properties of powder photocatalyst form were investigated using thermogravimetric analysis (TGA), X-ray diffraction (XRD), Brunauer–Emmett–Teller (BET), field-emission scanning electron microscopy (FESEM), high resolution transmission electron microscopy (HRTEM), X-ray photoelectron spectroscopy (XPS), and diffuse reflectance UV-Vis spectroscopy (DR-UV-Vis). XRD analysis showed the presence of anatase (101) with crystal size between 9 to 14 nm as the most photocatalytic active phase of TiO_2 compared with other phases which also confirmed by TEM data.The chemical state of elements in the synthesized photocatalyst are Ti^{4+} (TiO_2), Ni^{2+}(NiO_2) and two different oxidation state of Cu^{+} (CuO), Cu^{2+} (Cu_2O) obtained from XPS data. DR-UV-Vis results displayed that the Cu-Ni doped TiO_2 has more absorbance in the visible region compared to other prepared photocatalysts.The best performance of the photocatalytic reaction for water splitting hydrogen production in the batch system was exhibited by Cu-Ni doped TiO_2 as compared to other photocatalysts, believed to be due to the synergetic effect of two metals as charge carriers trapping which reduces the electron–hole recombination and increases the photoconversion efficiency. The photoelectrochemical studies of screen printed thin film photocatalyst were conducted with three electrode configuration system under solar simulator with AM 1.5 G filter. The Cu-Ni doped TiO_2 thin film with optimum thickness of 24 μm and sintered at 400^{o}C, demonstrated high photoconversion efficiency, η of 3.5% and maximum current density of j_p=3.85 mA/Cm^2 at external bias of 0.4 V vs. Ag/AgCl in the optimum 10 v/v% of glycerol in KOH 1M solution.

Keyword: Photoelectrochemical, Ni-Cu/Tio_2, Sol-Gel, Thin Film, Photoconversion Efficiency

ID-411

The Interactions between Agricultural Commodity and Oil Prices: Evidence from Cointegration and Causality Analysis

A. Kapusuzoglu[a], M. Karacaer[a]

[a] Department of Banking and Finance, Yildirim Beyazit University, Turkey, Phone: +90-312-466 74 08
E-mail: akapusuzoglu@ybu.edu.tr,

Abstract

The purpose of this study is to investigate the short and long term relationships between the world oil prices (Europe Brent Spot Price and West Texas Intermediate Spot Price) and the agricultural commodity prices (wheat, corn and soybeans), which have a key importance for energy markets. Corn and soybeans are especially used in the production of ethanol and biofuel. In addition to this, the fluctuations in the prices of corn and soybeans push farmers to enhance production and this situation may cause a potential increase in wheat prices. Furthermore, the situation of an increase on the demand of biofuels may push energy prices up as well as environmental concerns. Upon these information, the analysis is based upon totally 1450 data set covering the monthly period of 1990.01-2013.12 and performed by using Eviews 7.0 econometric software. The data on oil prices have been collected from the US Energy Information Administration (EIA) and agricultural commodity price indexes have been collected from International Monetary Fund (IMF) database. Within the framework of this study, firstly the natural logarithms of the variables are taken and unit root tests (Augmented Dickey Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS)) are used to investigate the suitability of each variable for the analysis. Relevant variables of the series are non-stationary in level, however when their first differences are taken they become stationary, with other words it is observed that the series do not contain unit root. As a result of the fact that series are stationary at the same level, in order to investigate the long-term relationship between each agricultural commodity and world oil prices the Johansen co-integration test is used. Before performing the relevant test, VAR models are employed in order to determine the lag lengths, and by determining the number of lags in accordance with the Akaike Information (AIC), Schwarz Information (SC) and Hannan-Quinn (HQ), the relevant test is performed. According to the Johansen co-integration tests results, there is no long-run relationship between each agricultural commodity and world oil prices at the 5% significance level. On the other hand, according to the results of Granger causality tests, there is a unidirectional causality relationship from Europe Brent and West Texas Intermediate oil prices to Wheat at the 1% and 5% significance level respectively, to Corn at the 1% and 1% significance level respectively and to Soybeans at the 1% and 5% significance level respectively. No causality relationship from agricultural commodities to oil prices has been observed. Considering the findings, it can be expressed that investors trading on global basis can predict agricultural commodity prices by watching the changes/fluctuations on oil prices; policy and decision makers in the direction of energy markets and policies should design agricultural commodity policies; the increase in agricultural commodity prices could be an indicator of poverty in countries, therefore, investments should be done to develop agriculture and in this process the government should give subsidy.

ID-412

Catalytic Activity of Mechanochemically Prepared Strontium-Doped Nanostructural Lanthanum Manganite used as cathode in solid oxide fuel cells (SOFCs)

A. Maghsoudipour, H. Tamaddon

Ceramic Department, Materials & Energy Research Center(MERC), Alborz, Iran,
Tel: +2636204131
E-mail: a-maghsoudi@merc.ac.ir

Abstract

The fuel cells (FC) are distinguished as generating of distributed energy and are electrochemical devices of low environmental impact. In the current work, the catalytic activity of mechanochemically prepared strontium-doped lanthanum manganite- cathode in solid oxide fuel cells (SOFCs)- has been investigated. The nanocrystalline $La_{0.8}Sr_{0.2}MnO_3$ (LSM) was prepared by varying the milling time of planetary mill during the mechanochemical method. X-ray diffraction confirmed the formation of perovskite LSM e cathode powder from sintered pellets at 1200^oC for 4 hours in air. The gas chromatography (GC) test was used in order to study the catalytic activity of porous LSM cathode material in methane gas conversion and oxygen reduction. The volume percent, size and distribution of porosities were utilized via secondary electron microscopy (SEM) imaging. The results confirmed that by increasing grinding time as an important factor in LSM mechanochemical synthesis, the catalytic characteristics as well as pore distribution could be modified.

ID-413

Effect of sulfur dioxide on the PILC based catalyst for the marine SCR

S.Sung[a], M. K. Kim[a], M. Y. Kim[a], S. H. Kim[a]

[a]Environment Research Department, Advanced Technology Institute, Hyundai Heavy Industry (HHI), 1000, Bangeojinsunhwan-doro, Dong-gu, Ulsan 682-792, Korea, Tel.: +82-52-203-4904
E-mail: sksung@hhi.co.kr

Abstract

The Urea-SCR system is the most efficient deNOx technology for reducing diesel NOx emissions, but it is not a new technology. This system has widely applied to various marine vessels to meet the most stringent NOx regulation, IMO Tier Ⅲ. Vanadium-based catalysts using TiO_2 as a support material are commonly employed in marine SCR system. The sulfur content in the diesel fuel is one of major parameters to determine the catalyst type as well as the reactor size.

In the present study, the effect of sulfur dioxide as the main deactivation component on the deNOx activity has been investigated using Ti-PILC based catalyst. The catalyst samples were prepared by cutting a V_2O_5/WO_3-Ti-PILC extruded catalyst. The laboratory-scale reactor system was used to verify the deNOx performance of the Ti-PILC based catalyst. The feed gas simulated diesel exhaust contained 1,000 ppm NO, 1,000 ppm NH_3, 13% O_2, 5% H_2O, 6% CO_2 and N_2 balance. The concentration of SO_2 was varied from 0 to 1,000 ppm. Catalytic activity was measured between 250 and 450℃. The gas hourly space velocity (GHSV) was kept constant at 20,000 h^{-1} during the course of the reaction.

Generally, the deNOx performance of Vanadium-based catalyst was deactivated by SO_2 in the whole temperature region below 450℃. However, the effect of SO_2 on the deNOx activity over the Ti-PILC based catalyst was negligible. That is, around 3% of the NOx conversion decreased in the presence of 1,000 ppm of SO_2 at the low temperature of 250℃. After the deNOx activity test, catalyst sample was characterized by BET and NH_3-TPD. It was found that the surface area and amount of ammonia adsorption slightly decreased by sulfate. Accordingly, further tests of the full-scale SCR system will be conducted in our test shop to confirm the deNOx performance in the real diesel exhaust gas including sulfur dioxide, PM, lubricant oil and SO_3.

ID-414

Efficient Models of Partially Shaded PV Modules for System Design

L. Exel[a], F. Felgner[a], G. Frey[a]

[a]Chair of Automation, Department of Mechatronics Engineering, Saarland University, D-66123 Saarbrücken Germany
E-mail: georg.frey@aut.uni-saarland.de

Abstract

The power output of a photovoltaic plant depends on the characteristics of the individual solar cells, their total surface area, solar irradiance, and the maximum peak point (MPP) tracking algorithm. If the individual cells of a photovoltaic panel (PP) –built out of up to 60 or more cells– are subject to non-uniform irradiation due to partial shading effects, the electric panel layout –especially the usage of bypass diodes–, strongly affects the power output. As a consequence, to determine the correct output power of a PP, each cell has to be simulated individually, based on appropriate models like the single-diode model. These models describe the non-linear voltage-current characteristic in an implicit form. Therefore, the model of a typical PP with 60 cells ends up in a system with 60 nonlinear equations. Although there exist proper solvers, the computation is expensive and too time-consuming to use such models for long-term simulations.

The paper will present a method how the simulation effort can be reduced dramatically with little or even no loss in simulation accuracy under typical shading conditions. Thereby, the proposed PP models are:

1) suitable for long-term simulation (e.g. year-round simulation studies);
2) deployable in lager energy system models, adding only marginal computational costs.

The approach exploits two characteristics of a PP. First, if identical cells work under equal conditions, they can be modeled as one cell with only one equation. This situation is typical of non-shaded panels. That means, if N cells are connected in series, some parameters of the equation for one cell are scaled by the factor N. Second, if several cells are connected in series, the voltage-current characteristic of the connected cells is mainly affected by the cell with the lowest irradiation. The idea of the presented approach is to describe each strand of a PP by only three, two or one cell(s) whose respective parameters are scaled by a factor n_i, (with $\sum n_i = N$). These parameters are dynamically determined by a pure algebraic clustering algorithm during simulation runtime. The algorithm also determines effective average irradiation values based on the given irradiation condition. The paper will focus on the modeling approach and the clustering algorithm as well as the implementation in Modelica/Dymola. Several simulation results will be presented which show the accuracy of the approach. First simulation results are given in Fig. 1 right, which shows the voltage-power curve under specific conditions (Fig.1 left). Compared with the exact model, that models each cell individually, the computation time could be reduced by 93% (3-cell model) or even 97% (one-cell model) without much loss in accuracy (less than 3% in MPP).

ID-415

Enhancing the Biological Phosphorus Removal Efficiency By Chemical Treatment: Preservation Of Receiving Waters

N. Nedjah[a], O. Hamdaoui[b], N. Laskri[c].

[a] Preparatory School of Sciences and Technology (EPST Annaba), Algeria

[b] BadjiMokhtar University / Faculty of Engineering Sciences / Laboratory of Environmental Engineering, Annaba-Algeria

[c] Preparatory School of Sciences and Technology (EPST Annaba), Algeria.

E-mail : nedjah23nawel@gmail.com

Abstract

Municipal wastewater contains various wastes, and usually consists of approximately 99.94% and 0.06% liquid solids. However, if this wastewater is not treated or is poorly collected, it can affect public health and the environment as well. The excessive intake of nitrogen and phosphate loads, in the natural environment, from wastewater represents a danger of pollution in the aquatic environment. Found in wastewater, phosphorus can pass through the sewage system without being properly treated; it will therefore be rejected in rivers, causing the undesirable growth of algae and other pests that can contribute to the eutrophication of the receiving aquatic environment. The objective of the treatment carried out in this study, that aims to find out a solution to this pollution issue, is the reduction of phosphorus discharges into the environment. The findings demonstrate a 53% of biological phosphorus removal efficiency .This efficiency increases to 70% when adding a chemical treatment with ferric chloride. Such treatment proved to be effective in preserving receiving environments such as rivers, lakes, seas, and groundwater from nutrients specifically phosphorus and therefore preventing the degradation of these waters quality.

Key words: Wastewater, Environment, Nitrogen, Phosphorus, Biological Treatment, Chemical Treatment**.**

ID-416

The Effects of Temperature and Organic Wastes' Concentration on Anaerobic Digestion Performance: Production of biogas

N. LASKRI[*a], O. HAMDAOUI[b], N. NEDJAH[c]

[a] Preparatory School of Sciences and Technology Annaba, Algeria

[b] Badji Mokhtar University / Faculty of Engineering Sciences / Laboratory of Environmental Engineering,

[c] Preparatory School of Sciences and Technology Annaba, Algeria.

E-mail: laskri_n@yahoo.fr

Abstract

Anaerobic digestion is a treatment process of organic pollution concentrated, particularly of sludge say biological. This technique is subject to a strong resurgence of interest, the main advantage of this process is a significant reduction of the organic matter with as a consequence, the production of biogas, in particular very rich in CH_4.

Our study focused on the influence of the temperature and the concentration of the substrate of digestion on the production in biogas from the rumen of Camel chosen as residue of digestion.

We have worked with three temperatures of digestion to know: 24°C, 30°C and 37°C. The three temperatures are in the field mesophilic. We found that as the temperature of the middle of digestion increases the more production of biogas is favoured.

The second parameter of study is the concentration of the substrate in dry materials, we found similarly that the production in biogas is best for high concentrations, only, the time stays in the digester for the substrates loads is very high and can reach more than 150 days of digestion.

Keyword: Anaerobic Digestion, Biogas, Digester, Organic Waste, Time of Stays

ID-417

Enhancement of Upconversion Luminescence of $NaYF_4:Yb^{3+}/Er^{3+}$ Nanocrystals through Plasmonic Ag Nanoparticles

H.Ko[a,d*], G. Y. Lee[a,c], H. S. Jang[b], I. K. Han[a,d], D-H. Ko[a,d]

[a] *Center for Opto-Electronic Convergence, Korea Institute of Science and Technology, Hwarangno 14-gil 5, Seongbuk-gu, Seoul, 136-791, Republic of Korea*

[b] Center for Materials Architecturing, Korea Institute of Science and Technology, Hwarangno 14-gil 5, Seongbuk-gu, Seoul, 136-791, Republic of Korea

[c] *Quantum Material Research Laboratory, Yonsei University, Seodaemun-gu, Seoul 120-749, South Korea*

[d] Nanomaterials Science and Engineering, Korea University of Science and Technology, 217 Gajeong-ro Yuseong-gu, Daejeon, 305-333, Republic of Korea

E-mail: kohd94@kist.re.kr

Abstract

Upconversion luminescence (UCL) emitting photons of higher energies through absorbing photons of lower energies, has attracted great interests. [1-3]. Particularly, the UC can be excited by using an incoherent light source, thereby which can provide opportunity to realize optoelectronic devices such as solar cells, lasers, displays, etc. Hexagonal phase $NaYF_4$ co-doped with trivalent Yb^{3+} and Er^{3+} is widely used as an upconverter, however, most of the UC materials still suffer from quite low quantum efficiency. To improve the low efficiency of the UC materials, many previous works have exploited the plasmonic nanostructures, as an alternative strategy to boost the luminescence efficiency of the UC materials. Nevertheless, most of the previous works did not demonstrate large enhancement in the UCL by the plasmonic nanostructures.

In this study, we experimentally demonstrate that the UCL of β-$NaYF_4:Yb^{3+}/Er^{3+}$ nanocrystals can be extremely enhanced on a metal-dielectric-metal (MDM) structure with Ag nanoparticles (NPs). The randomly distributed Ag NPs were generated by well-known thermal annealing method, allowing straightforward fabrication and a cost-effective process. In comparison to the UC nanocrystals on a glass substrate, the plasmonic nanostructure with the MDM structure induced about 500-fold enhancement in the UCL. From the numerical simulation and experimental analysis, it is believed that it results from the local field enhancement and a change in the transition rates, as well as large scattering of the excitation wavelength, due to the localized surface plasmon resonance of Ag NPs. Furthermore, we discuss how the incorporation of nanocrystals with the plasmonic structure influences the efficiency of a solar cell.

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ID-418

Reduced Graphene Oxide/Pt-CeO_2 Nanocomposite for the Electrooxidation of Formic Acid and Formaldehyde

B. Habibi[a], N. Delnavaz[a]

[a]Electroanalytical Chemistry Laboratory, Department of Chemistry, Faculty of Sciences, Azarbaijan Shahid Madani University, Tabriz, Iran Tel: +98-412-432-7541

E-mail: b.habibi@azaruniv.edu

Abstract:

In fact, the choice of a suitable supporting material is an imperative factor that may affect the recital of supported metals electrocatalysts owing to their interactions and surface reactivities [1-3]. On the other hand, the physicochemical characteristics and surface chemistry of substrate can influence the properties of supported catalysts [4, 5]. The supports can promote the formation of highly distributed catalyst nanoparticles with small size and narrow size distribution. Reduced graphene oxide (RGO) is of special interest due to their outstanding properties, such as excellent thermal conductivity, large surface to volume ratio, good chemical stability. Recently RGO is used as supports in the fuel cells [6]. Also, cerium oxide (CeO_2) is widely used as a support for many oxidation catalysts and the industrial applications of CeO_2 as a catalyst support are due to its high oxygen transport and storage capacities [7]. Therefore, can be expected if the Pt-CeO_2 nanoparticles are supported on the RGO surface, the electrocatalytic performance and utilization efficiency could be further improved. In this work, for the first time by combining the advantages of reduced graphene oxide and cerium oxide the reduced graphene oxide/Pt-CeO_2 nanocomposite (RGO/Pt-CeO_2) was designed via a simple, fast and repeatable procedure. The formation, morphology and the electrochemical properties of the obtained nanocatalyst were investigated by scanning electron microscopy (SEM), transmission electron microscope (TEM), X-Ray diffraction (XRD) energy-dispersive, X-ray spectroscopy and cyclic voltammetry (CV). After physicochemical characterizations of RGO/Pt-CeO_2 nanocomposite, its electrocatalytic activity toward the formic acid and formaldehyde oxidation in 0.1 M H_2SO_4 solution was evaluated by cyclic voltammometric and chronoamperometric measurements and the obtained results were compared with those obtained on the Pt-CeO_2 nanoparticles modified carbon-ceramic electrode (Pt-CeO_2/CCE). It was found that RGO/Pt-CeO_2/CCE was catalytically more active than Pt-CeO_2/CCE and had satisfactory stability and reproducibility when stored in ambient conditions or continues cycling. The effect of some experimental factors was studied and optimum conditions were suggested. Then, the long-term stability of modified electrode has also been studied.

Keywords: Pt Nanoparticles, Ceo_2, Reduced Graphene Oxide, Carbon-Ceramic, Formic Acid, Formaldehyde

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ID-419

Synthesis and Characterization of Palladium Nanoparticles on Carbon Black Nanostructure Electrocatalyst for Formic Acid Fuel Cells

B. Habibi[a], So. Mohammadyari[a]

Electroanalytical Chemistry Laboratory, Department of Chemistry, Faculty of Sciences, Azarbaijan Shahid Madani University, Tabriz, Iran, Tel: +984124327541

E-mail: b.habibi@azaruniv.edu

Abstract

Direct formic acid fuel cell (DFAFC) as a clean power source is non-toxic, not flammable and has easy fuel storage and transport, so it can be a suitable power source for portable electronics and microelectromechanical systems [1, 2]. It has been widely accepted that formic acid is oxidized to CO_2 via a dual path mechanism, involving a reactive intermediate (main path, dehydrogenation) and adsorbed CO, as a poisoning species (parallel path, dehydration). Numerous studies have shown that the palladium (Pd) based catalysts accomplish higher activity for formic acid oxidation than platinum (Pt) and palladium nanoparticles (PdNPs) are a favorable catalyst in DFAFC due to low cost, high catalytic activity and stronger resistance to CO poisoning intermediates [3, 4]. Usually, to improve the electrocatalytic activity, the PdNPs are supported on various conductive carbon materials and these supports increase the availability of catalyst surface area and mass transfer of reactants [5, 6]. The reported results have shown that the catalytic activity of the PdNPs electrocatalyst depends on support and its properties. In this work, PdNPs are deposited on carbon black nanostructure (CBNS) by a new reagentless process. The structure and composition of prepared catalyst (PdNPs/CBNS) were investigated by scanning electron microscopy (SEM), transmission electron microscope (TEM) X-ray diffraction (XRD), and energy dispersive X-ray spectroscopy (EDX) analyses. The PdNPs/CBNS composite modified carbon ceramic electrode (PdNPs/CBNS/CCE) was employed as an electrocatalyst toward formic acid electrooxidation and cyclic voltammetry and chronoamperometry techniques were used for the study of its electrocatalytic activity. It was found that PdNPs/CBNS/CCE was catalytically more active than PdNPs decorated on CCE (PdNPs/CCE), without any support. The effect of some parameters such as the mass of PdNPs in electrocatalyst on the CCE, concentration of formic acid, scan rates and etc. on the electrooxidation of formic acid was studied and optimized. On the other hand, the obtained PdNPs/CBNS/CCE electrocatalyst has satisfactory stability and reproducibility for electrooxidation of formic acid when stored in ambient conditions and improve of catalytic activity in continues cycling make it more attractive for DFAFC applications.

Keywords: Formic Acid, Fuel Cell, Pd Nanoparticles, Carbon Black Nanostructure, Carbon-Ceramic

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ID-420

Single Wall Carbon Nanotubes-Palladium Nanocomposite Modified Carbon-Ceramic Electrode for the Electro-Oxidation of Methanol and Ethanol

B. Habibi, S. Mohammadyari

Electroanalytical Chemistry Laboratory, Department of Chemistry, Faculty of Sciences, Azarbaijan Shahid Madani University, Tabriz, Iran, Tel: +984124327541

Email: b.habibi@azaruniv.edu

Abstract

Among various alternative energy sources, direct alcohol fuel cells (DAFCs) are attractive power sources for portable devices and vehicles due to their high power density, low operation temperature and environmental friendly materials [1]. Low molecular weight alcohols such as methanol and ethanol have high energy density and easy transfer properties. A large number of investigations have been conducted on the electrochemical oxidations of methanol and ethanol [2]. With the development of nanotechnology, nanostructures offered new opportunities for searching and designing effective nanoelectrocatalysts. Among the exploited nanocatalysts, Pt-based catalysts have been considered as the best electrocatalyst in the low-temperature fuel cells. However, the disadvantages of Pt narrowed its use. In recent years, Pd-based catalysts were found to be a good candidate of non-Pt catalysts, and they have been found to possess prominent electrocatalytic properties towards alcohol and formic acid [3, 4]. In order to improve catalytic activity and minimize the overall cost of fuel cell, Pd nanoparticles are deposited on several materials such as carbon supports. Supported electrocatalyst is a practical means to achieve high utilization of expensive noble metals and to maintain good lifetime. Carbon supports can improve electrocatalytic activity of Pd nanoparticles and enhance the electron transfer between electroactive species and electrodes [5]. Among carbon supports, single wall carbon nanotubes (SWCNTs) have attracted enormous attention owing to their unique electronic and mechanical properties [6]. In this study, SWCNTs supported Pd nanoparticles electrocatalyst (PdNPs/SWCNTs) is prepared by a new reagentless process. The X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscope (TEM) and energy dispersive X-ray spectroscopy (EDX) analyses were performed to characterize the nanostructures and composition of prepared catalyst. Sol-gel derived carbon ceramic electrode (CCE) modified electrocatalyst (PdNPs/SWCNTs/CCE) was used for oxidation of methanol and ethanol in alkaline media. Electrochemical methods including cyclic voltammetry, chronoamperometry were used to study the electrochemical properties of obtained catalyst. The effect of some experimental factors such as fuel concentration, potential scan rate, the upper limit of potential scanning region and long-term stability of prepared modified electrode was investigated. It was found that PdNPs/SWCNTs/CCE was catalytically more active than Pd nanoparticles decorated on CCE (PdNPs/CCE) without any supports and has eligible stability for electrooxidation of methanol and ethanol when stored in ambient condition. In addition, continuous cycling make obtained modified electrode more active for alcohol fuel cells.

Keywords: Alcohol Fuel Cells, Pd Nanoparticle, Swcnts, Carbon-Ceramic

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ID-421

Sand Effect on Photovoltaic Array Efficiency in Algerian Desert

S. Semaoui [a], A. Hadj Arab [a] , H. Zeraia [a], E. Kouadri Boudjelthia [a], S. Bacha [b]

[a] Centre de Développement des Energies Renouvelables, CDER, BP 62 Route de l'Observatoire Bouzaréah, 16340 Algiers, Algeria.

[b] Grenoble Electrical Engineering Laboratory, G2Elab, Saint Martin d'Hères, Grenoble, 38000, France.

Abstract

The Algerian energy strategy recommends an increase of renewable energies contribution. The objective is to reach a renewable energies contribution for electricity production of 5% by year 2015 and 40% by year 2030, through photovoltaic, solar thermal and wind generators. In this sense, the insertion of a PV system has an impact on development, economy and environment on desert regions. However, the southern Algerian regions are generally characterized by frequent sandstorms. This natural phenomenon causes the dust accumulation on photovoltaic panels. Consequently, this may reduce the efficiency of photovoltaic array. The objective of this research is to study the effects of the dirt accumulation on the performance of a photovoltaic array in a desert region of Algeria (for example in Ghardaia site, 32°29'N, 3°40'E, 450 m). The experiments have been conducted on the effect of the dust particle accumulation on the photovoltaic modules. The tests were performed with the PVPM2540C in natural conditions to determine the current/voltage characteristics and see the resulting efficiency. It was found in this study, that the dust accumulation on the photovoltaic array surface for a period of several months can significantly reduce the photovoltaic generation efficiency with an average power loss of about 4.38%.

ID-422

Measurement of Pollutant Emission from Cars Powered with LPG, Gasoline And Diesel in Algeria

M. Boughedaoui [a,b], S. Chikhi [a,b], R. Kerbachi [b], R. Joumard [c]

[a]Department of Industrial Chemistry, Faculty of Technology, University of Blida 1, Route de Soumaa, Blida 09000, Algeria. Email: boughedaoui@lste-enp.dz

[b]Environmental Science and Technology Laboratory, National Polytechnic School of Algiers, Algiers 16200, Algeria

[c]Transport and Environment Laboratory, Ifsttar, Bron, France

Abstract

On-board measurements of unit emissions of CO, HC, NOx and CO2 were conducted on 17 private cars powered by different types of fuels including gasoline, dual gasoline-LPG, gasoline, and diesel. The tests performed revealed the effect of LPG injection technology on unit emissions and made it possible to compare the measured emissions to the European Artemis emission model. A sequential multipoint injection LPG kit with no catalyst installed was found to be the most efficient pollutant reduction device for all of the pollutants, with the exception of the NOx. Specific test results for a sub-group of LPG vehicles revealed that LPG-fueled engines with no catalyst cannot compete with catalyzed gasoline and diesel engines. Vehicle age does not appear to be a determining parameter with regard to vehicle pollutant emissions. A fuel switch to LPG offers many advantages as far as pollutant emissions are concerned, due to LPG's intrinsic characteristics. However, these advantages are being rapidly offset by the strong development of both gasoline and diesel engine technologies and catalyst converters. The LPG's performance on a chassis dynamometer under real driving conditions was better than expected. The enforcement of pollutant emission standards in developing countries is an important step towards introducing clean technology and reducing vehicle emissions.

Keywords: Unit Emission, Pollutant, Vehicle, On-Board Measurement, LPG, Gasoline, Diesel.

ID-423

The Method of Determining Certain Parameters of Energy Absorption in Materials under Complex Dynamical Excitations

M. Bocian[a], K. Jamroziak[b] M. Kulisiewicz[a], S.Piesiak[c]

[a]Departament of Mechanics, Materials Science and Engineering, Wroclaw University of Technology, Smoluchowskiego 25, 50-370 Wroclaw, Poland
[b]General Tadeusz Kosciuszko Military Academy of Land Forces, Czajkowskiego 109, 51-150 Wroclaw, Poland
[c]The Lower Silesian University of Entrepreneurship and Technology, Skalników 6b, 59-101 Polkowice, Poland
mirosław.bocian@pwr.edu.pl, krzysztof.jamroziak@wso.wroc.pl, maciej.kulisiewicz@pwr.edu.pl, s.piesiak@dwspit.pl

Abstract

The phenomenon of energy dissipation in deformable materials is important, among others, in the design and creation of modern ballistic shields. In such cases, the primary purpose of the material is to dissipate the impact energy, as quickly as possible. This diffusion is carried out in conditions of a large range of material deformation and large range of speed deformation of the material. This situation is frequently the case of dynamic loads of various machine elements constructed out of modern and lightweight composite materials.

In case of large deformation ranges, the linear Hooke's law, even in the range of reversible deformation (elastic deformation), very inaccurately describes the relationship between load and deformation, not only for loads slowly growing (so-called quasi-static), but above all, in case of quick dynamical loads (e.g. impact loads or load generating cyclic fatigue phenomena).

Such materials are characterized by a high tendency to dissipate energy as opposed to a metallic material - mainly steel, for which the dissipation of energy in civil engineering applications generally is omitted or at most is described by a single damping parameter associated with the viscous Kelvin linear model.

Considering a determination of the life-time of dissipate-elastic machine elements made of the modern materials, the size of dissipated energy is very important. This implies the need to develop some identification methods for more accurate models, and thus more complex in this highly nonlinear models.

This paper presents a method to identify the dissipative properties of such materials, for which there is a clear hysteresis loop under quasi-static loads, that is under such loads which cause the deformations with a constant and low as possible velocity.

As it is known, this situation exists, for example, in the so-called common tests of static tensile and then compression of specific samples of the tested material. However, for low values of the speed, a resistance force related to the rate is negligible. Thus, in this conditions it is not possible to determine the forces as specific functions of the deformation velocity.

Hence the need to develop such methods of identification, which use the system responses to cyclic loading with high frequency. The results of such methods may be useful inter alia, in the field of effective and modern energy-consumption shields (ballistic shields) construction.

In this study, it was assumed that the forces S of the material response depends nonlinearly on the deformation x and deformation rate v as follows:

$$S(x,v) = c_1 x + c_3 x_3 + h(x)\,\mathrm{sgn}(v) + kv \tag{1}$$

where c_1, c_3, k – are the positive constants, while $h(x)$ - the dry friction coefficient which depends on the level of deformation x in the way:

$$h(x) = h_0 \cos\left(\frac{x\pi}{2A}\right) \tag{2}$$

where A is the range of deformation change ($-A < x <+ A$).

For such a model, there was formulated so-called energy balance equation. Based on this equation, a suitable method of determining the parameters k, h_0 was created. The parameters allow a precise calculation of energy absorption in the complex dynamic loads conditions. The method has been tested experimentally with the use of a computer simulation technique.

ID-424

CO Preferential Oxidation and Methanation Reactions: Catalyst Performance And Reactor Design for CO Removal in A Hydrogen-Rich Stream

D.I. Potemkin[a,b], M.M. Zyryanova[a,b], P.V. Snytnikov[a,b], V.A. Kirillov[a,b] and V.A. Sobyanin[a,b]

[a] Boreskov Institute of Catalysis, pr. Ak. Lavrentieva 5, 630090, Novosibirsk, Russia
[b] Novosibirsk State University, Pirogova st. 2, 630090, Novosibirsk, Russia, Tel: +7-383-3269747
E-mail: potema@catalysis.ru

Abstract

CO preferential oxidation (PrOx) and preferential methanation (PrMeth) are important reactions for CO removal from H_2-rich reformate for low temperature polymer electrolyte membrane fuel cells feeding applications. Despite the existing advantages and disadvantages, both processes provide CO-cleanup to 10 ppm.

The report presents the results of a systematic study of the catalysts and reactors in PrOx and PrMeth processes obtained during the last decade.

Advantages and disadvantages of CuO-CeO_2 oxide catalysts and supported bimetallic Pt-Co and Au-Cu catalysts for PrOx and Ni-, Co-, Fe- and Ru-based systems for PrMeth are discussed. Finally copper-ceria catalysts and nickel-ceria are recommended as the most promising catalysts for the PrOx and PrMeth reactions, respectively. The composition and structure of these catalytic systems were optimized. Copper dispersion and copper-ceria interaction for the CuO-CeO_2 and nickel-ceria interaction and chlorine additives for Ni/CeO_2 are the key factors providing excellent catalyst performance.

Both PrOx and PrMeth are high exothermic reactions characterized by narrow temperature operational window. Thus the precise temperature control is required. Micro- and milli-channel reactors with high mass- and heat-transfer rates were designed for the processes.

Fig. 1a exemplifies the typical temperature dependencies of CO outlet concentration at CO PrOx over 5 wt.% CuO/CeO_2 in the microchannel reactor at various WHSV values. An assembly comprised of 26 micro-channel reactors demonstrated efficient operation with realistic reformate stream (containing CO_2 and H_2O) supplied at space velocities sufficient for feeding a ~100 W_e portable LT PEM FC. The outlet CO concentration attained 10±2 ppm at 100% O_2 conversion and selectivity 33.3% [1].

The temperature dependencies of CO outlet concentration at CO PrMeth, presented in Fig. 1b, illustrate the excellent performance of 10 wt.% Ni/CeO_2 catalyst and its ability to clean up H_2-rich gas from CO to below 10 ppm in a wide temperature interval. The millichannel reactor with structured 10 wt.% Ni/CeO_2 catalyst connected with CO water gas shift reactor provided deep CO removal from a gas stream fed to a 3 kWe LT PEMFC [2].

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ID-425

Nanostructured Co-B Catalysts for Hydrogen Generation

D. Richardson, F. M.F. Rhen

Department of Physics and Energy, Materials and Surface Science Institute, University of Limerick, Ireland

Phone +353 61 234824

E-mail: david.richardson@ul.ie, fernando.rhen@ul.ie

Abstract

The viability of hydrogen technology as a future alternative to non-renewable energy sources requires low cost fuel cells, safe and cheap storage media and efficient methods for hydrogen production. Here, we focus on the study of nanostructured Co-B alloys as catalysts for hydrogen generation from sodium borohydride. Sodium borohydride is an efficient storage media as it is possible to controllably release pure hydrogen with an effective catalyst according to the reaction (eq. 1)

$$NaBH_4 + 2H_2O \xrightarrow{catalyst} NaBO_2 + 4H_2 \qquad (1)$$

We have prepared nanostructured Co-B catalysts via electroless deposition on a porous polycarbonate membrane as it is a simple and cheap method. Amorphous Co-B deposits are obtained forming nanotubes, which are connected together by a thin film at both ends as shown in Fig.1. We investigated different Co-B nanostructures to maximise hydrogen release. A solution of 0.25 M $NaBH_4$ with a pH 12 adjusted with 0.025 M NaOH was used as the hydrogen source. The bath temperature was maintained at 25 °C throughout the experiments. The bath was placed in a sonicator to ensure complete release of hydrogen bubbles from the catalyst surface and the hydrogen volume was recorded using a water displacement method.

The nanostructures remain in the polycarbonate membrane during the experiments, which allows for easy recovery of the catalyst. The mass of the samples also remains constant during testing giving excellent recyclability characteristics. We have found that Co-B nanostructures with low deposition times of 1 minute have the highest hydrogen production rate of up to 8185 ml min^{-1} m^{-2} of membrane. This is due to the fact that the nanotubes are fully formed, have a large pore diameter of 250 nm and a large catalytic surface area. A maximum hydrogen release rate per unit mass of 2685 ml min^{-1} g^{-1} of Co-B catalyst is obtained at a catalyst deposition time of 30 seconds, corresponding to a nanostructure of Co-B islands distributed throughout the supporting template. As deposition continues the nanotube pore diameter decreases which results in a reduction in the hydrogen generation rate as shown in Fig. 1. At deposition times greater than ten minutes, the nanotubes are end-closed and the rate reaches a minimum of 3600 ml min^{-1} m^{-2}.

We have observed that end-open Co-B nanotubes with a large pore diameter display the best hydrogen production rates per unit area and per unit mass due to the increased catalytic surface area and large pore diameter for solution replenishment within the nanotube pores. The nanotubes are held in the membrane template during hydrogen generation and as recovery from the deposition bath is simple they have excellent recyclability characteristics. Therefore, these Co-B nanostructures are ideal candidates as high surface area catalysts for releasing hydrogen stored in sodium borohydride.

ID-426

Design of High Sensitive Optical Sensor for Seawater Salinity

Ahlam Harhouz[a], Abdesselam Hocini[a,b]

[a]Electronics Department, University of, M'sila, PO.Box.166, Ichebilia road
M'sila, Algeria
[b]Laboratoire Micro-systèmes et Instrumentation (LMI), Université Constantine 1
Constantine, Algeria.
E-mail : harhouz7ahlam@gmail.com, hocini74@yahoo.fr

Abstract

Monitoring of water quality is a major factor in protecting public health, besides high-quality freshwater is also a key input in agriculture and many industrial processes. Salinity (S) is among the most fundamental parameters for oceanic, marine environment monitoring, seasonal climate prediction, mariculture, and solar engineering, which is essential to climate models, therefore, measurement of such parameters for chemical oceanography has become increasingly attracted to optics sensors community. Salinity sensors play an important role in manufacturing process control and protection of ecosystems.

Among the optical sensing mechanism, there is one to detect the effective refractive index of the resonator that is changed due to analytes binding on it. In order to enhance the sensitivity of detection, one of the most straightforward ways to detect the sensing signal is the resonant wavelength detection/shift and intensity variation. On the other hand, Photonic Crystals (PhCs) structure provided a good solution to enable extremist small ring resonator with ultra low bending loss owing to the excellent light confinement.

Sensors based on photonic crystal (PhC) waveguides incorporating with microcavities have high sensitivity easy extension to sensor arrays, various choices of materials, and capability of parallel measurement. With an appropriate design of the cavity size and the position of microcavities to the PhC waveguide by Difference Time Domain (FDTD) calculation and simulation, high sensitivity sensors can be accomplished.

In this work, a novel Optical sensor for seawater salinity proposed. It is formed by two waveguides and one microcavity in a PhC with a triangular lattice of air holes. The sensing principle is based on the shift of resonance wavelength, which occurs due to change in refractive index (RI) of the sensor when the PhC's air holes are full of seawater. The RI seawater is from n=1.33300 to n=1.34031 corresponds to the change in salinity from S= 0% to 40% (g/l) over the temperature 20°C. The sensor is formed by enlarging the dimension of holes localized at each side of waveguide in order to achieve further improvement in sensitivity. The properties of the sensor are simulated using the finite-difference time-domain (FDTD) algorithm.

ID-427

Synchronization and Protection of Grid Connected PV System

M. Ahmad

Former Professor Department of Electrical Engineering
Aligarh Muslim University, Aligarh 202002, India
E-mail: mukhtar@ieee.org

Abstract

In isolated PV system the main consideration is to extract maximum power from the PV array. However, when the PV plant is connected to the grid , special attention has to be paid to reliability of the system, power quality , and synchronization and protection. The grid tied inverters require sensors to sense the presence of grid ,synchronize and inject a current in phase with the grid voltage. Sensors also required to monitor the grid and disconnect the array in case of frequency or voltage oscillations The PV system must also have THD of less than 5% before it is connected to grid.. Power electronic converters with intelligent control for single phase PV system is designed and presented in this paper.

The control objective for 1-phase PV system based on fuzzy logic will be presented.

ID-428

Management of Municipal Solid Waste in Sanatory Landfill of Mostaganem District (Western Algeria)

I.S. Abdelli[a], M. Asnoune[a], F. Arab[b], F. Abdelmalek[a], A. Addou[a]

[a]Laboratoire des Sciences et Techniques de l'Environnement et de la Valorisation (STEVA), Université de Mostaganem, 27000 Mostaganem, Algeria, Tel : +213 554587761

[b]Centre d'enfouissement technique (Landfill); Sour, 27210, Mostaganem, Algeria

E-mail : a.addou@univ-mosta.dz

Abstract

The management of waste has long been a natural action by people and is becoming now a major preoccupation for developing countries. The management of solid waste in Mostaganem district was limited to collection and transporting to open dumpsites. By the end of 2010, the situation has changed since there exists now a Sanatory Landfill (S.L) which allows a better management. The objective of our work is to determine the main elements related to MSW (Waste production, physical composition, physicochemical and bacteriological parameters, ways and means to collect) which enable to help local collectivities (municipality, decision-makers, political actors and private sector) to decide on how to improve and exploit the S.L. This help is by tentative propositions of valorization ways applying the principle of 3R-VE (reducing waste at the source, reusing and recycling, valorization and elimination) and also by optimizing the collection as well as using sorting centers and transfer docks. The study is on the qualitative and quantitative evaluation of MSW collected since 2011 from the S.L of Mostaganem city and six nearby municipalities.

The quantities of waste increase annually by 18% with a ratio of 0.4 kg/inhab/day for 2013. The organic matter represents the major fraction with more than 60% and the recycled part is of the order of 32%. The identification of micro-organisms has been performed in order to know the risks taken by the staff. The determination of physicochemical parameters of MSW has enabled a financial study by valorization channels (composting, recycling and reusing).

Keywords : Municipal Solid Waste ; Sanatory Landfill ; Characterization ; Valorization ; Mostaganem; Western Algeria

ID-429

Gliding Arc Post-discharge Treatment of Alizarin Red B

M. Mehal[a], F. Abdelmalek[a*], M R Ghezzar[a], J-L. Brisset[b], A. Addou[a]

[a]STEVA laboratory, University of Mostaganem, Algeria
[b]University of Rouen, France, Tel : +213 552193107
E-mail: f.abdelmalek@univ-mosta.dz

Abstract

Environmental pollution by organic dyes set serious ecological problems, which are increased by the fact that most of them are difficult to degrade by traditional techniques. In the presented process, hydroxyl radicals $^{\bullet}OH$ are generated by an electric discharge in humid air by means of a gliding arc discharge. These reactive species are strong oxidising agents and thus able to degrade organic pollutants. The degradation of the organic compounds was followed for different treatment times by Chemical Oxygen Demand (COD) measurements and by spectrophotometry at the absorption peaks of the solutes in the UV-visible spectral range .

This study focuses on the plasma treatment of Alizarin Red S (ARS) which is divided in three types:

(i) Direct exposure to the discharge: the evolution of the treatment of the dye solution under plasma treatment in batch mode was followed for various exposure times and analyzed immediately after sampling.

(ii) Indirect treatment by post-discharge: the sample solutions were exposed to the discharge in the same conditions as for direct exposure experiments before being abandoned outside the reactor for various post-discharge times before the analyses were performed

(iii) Indirect treatment by plasma-activated water (PAW): the solution is prepared by dissolving the dye in the PAW generated after plasma treatment of distilled water.

We underline the economical advantage of the plasmachemical degradation without extra energy or reagent input. This feature is of major importance in industrial application for economy reasons since the glidarc treatment then requires only few minutes exposure to reach pollutant abatement.

Keywords: Gliding Arc Discharge, Degradation, OH°, Post-Discharge, Alizarin Red B.

ID-430

The Prediction of Proximate Parameters of Biomass Pellets Using Near Infrared Spectroscopy

G.D. Gillespie, D. J. Farrelly, C. D. Everard, K. P. McDonnell

University College Dublin, School of Biosystems Engineering, Agriculture and Food Science Centre, Belfield, Dublin 4, Ireland, Tel: +353 (0)1 716 7458

E-mail: gary.gillespie@ucdconnect.ie

Abstract

With a multitude of biomass varities in use with a diverse range of characteristics, the need for rapid determination of proximate parameters is demanded by the pelleting industry. The most important parameter of biomass pellets is their calorific value, which is strongly influenced by the moisture content (MC) and ash content (AC) of the feedstock. Near infrared (NIR) spectroscopy is a non-invasive sensing technology which has the potential to be a useful technique in the biomass-to-energy conversion process. The objective of this study was to use NIR spectroscopy combined with chemometric techniques to determine the MC, AC, gross calorific value (GCV) and net calorific value (NCV) of cylindrical biomass pellets. The pellets were produced from a diverse set of feedstocks including pine wood, wheat straw, *Miscanthus* and energy grass (Szarvasi). The principal component analysis model was used to determine clustering of the samples. As expected, it showed a negative correlation of GCV and AC and of NCV and MC. Partial least squares (PLS) regression models predicted the MC, AC, GCV and NCV with root mean square errors of cross validation of 1.035% (R^2 = 0.85), 0.316% (R^2 = 0.85), 0.240 MJ kg^{-1} (R^2 = 0.86) and 0.382 MJ kg^{-1} (R^2 = 0.86), respectively. The model for MC was based on O-H and C-H interactions, i.e between water and organic matter. The AC model were based on interactions in primarily C-H bonds. Both claorific value models were spanned by combinations of O-H and C-H stretching. Prior knowledge of pellet MC, AC, GCV and NCV will allow control of conversion technologies such as gasification or combustion.

The results for this work were for a multiple biomass variety sample set, results demonstrate that NIR spectroscopy has the potential for rapid prediction of proximate parameters of biomass pellets. This would facilitate the optimisation of biomass conversion technologies.

ID-431

Modeling the Air Channel Ventilation in Ansys CFX of A Romanesque Church

A. Sedláková, L. Ťažký

Faculty of Civil Engineering, Technical University of Košice, Vysokoškolská 4, Košice 042 00, Slovakia,
Tel: +421-602 4165
E-mail: anna.sedlakova@tuke.sk

Abstract

Moisture is a major source of damage in historic solid masonry. Rising damp is a well-known phenomenon around the world and occurs when groundwater flows into the base of a construction and is allowed to rise through the pore structure. From practical experience it is known that many factors may play a role regarding permeability problems in masonry. The amount of possible causes of moisture problems in historic masonry underlines the complexity of this phenomenon. Evaporation is an important factor in rising damp. The surface of an affected wall contains moisture that has risen from the ground and this moisture is then subject to evaporation. The factors controlling evaporation include: temperature, humidity, air movement and surface. The church in Gemerský Jablonec is the oldest in the micro region Medveš, which is a valuable monument of the Romanesque architecture. The church is a protected cultural monument and a historic value should be particularly sensitive to any remediation done. To improve the technical condition of the church minor structural modification is required. We designed the cross-sections dimensions of ventilated air channel in 10 variants. We designed the church and terrain in the first simulation to get the properties of the wind on the surface church. In the second model we used obtained values of pressure in monitored points, what represented the location of the inlets on the wall in the first model. The air channel around the church Gemerský Jablonec is simulated in many different variants. Results obtained from the numerical simulation in the software ANSYS CFX showed cross-section 500 x 400 mm as the best for this church.

Keywords: Moisture, Air Channel, Reconstruction, Ventilation

ID-432

Solution of Ground Floor for Energy Efficient Buildings – Economic Evaluation

A. Sedláková, P. Majdlen, L. Ťažký

Faculty of Civil Engineering, Technical University of Košice, Vysokoškolská 4, Košice 042 00, Slovakia,
Tel: +421 602-4165, Tel: anna.sedlakova@tuke.sk

Abstract

Do you think that passive houses are inventions of recent years? It is not exactly true. Even if they use more advanced technology, some of the basic principles goes back hundreds years. History of passive houses have their roots in the 19th century, where the first building was not a building, but research ship of polar explorer Fridtjof Nansen called Fram in 1883. Walls and sandwich construction deck had thickness of 400 mm, which fulfill the function of thermal insulation layer of felt and linoleum fulfill the function of a vapour barrier. Glass treated windows were triple and worked there controlled ventilation with electric ventilators.

The building, which is directly on the ground is in direct interaction with the subsoil and its thermal state. An amount of heat primarily destined for creation of thermal comfort in the interior escapes from foundational construction and floor on the ground to the cooler sub grade. The outgoing heat represents heat losses, which unfavorably affect the overall energetic effectiveness of the building. The heat losses represent approximately 15 to 20 % of the overall heat losses of the building. This number is clear antecedent of need of isolation and minimize of heat flow from the building to the sub grade.

Keywords: Lower Structure, Foundations, Basement

ID-433

Silver Supply Risk Analysis for Photovoltaic Industry

W. Li, T. Adachi

Akita University, School of Engineering and Resource Science, Tegataji17ryu, 16-1, Suzuki heights11, 010-0851, Japan,
Tel: 08055736447
Email: gentlelwh@163.com

Abstract

Raw material availability can restrict the application of renewable energy. Silver is an essential raw material and also among the most expensive raw materials of photovoltaic (PV) solar cells. The objective of this research is to evaluate quantitatively the silver supply restriction for PV sector until 2050. After forecasting of PV industry development and modeling of primary silver supply from mining site, silver demand for PV installation is estimated. According to population logistic modeling and GDP trend, total electricity installed capacity is also estimated as 15,421GW until 2050. The amount generation by PV is predicted under some different scenario. Concretely, we assume four scenarios as high, medium, low and policy (4+) which represent 40%, 20%, 10% of total capacity respectively, and sum capacity of China, Japan, USA, EU policy based on PV installation policy in each countries. Taking technology factors, specifically improvement of generation efficiency of PV and substitution into account, silver demand for PV sector can be calculated under each scenario. In addition, a supply model is applied for silver mining production by using Logistic Curve. Through comparisons and combinations, it is predicted that silver supply risk for PV sector is very high unless substitution of materials in the future. Around 30% of silver is going to be consumed by PV production in 2050, which will take share of silver supply for other sectors and make the supply-demand unbalance. Silver as a raw material can be high risk and may restrict PV supply based on the present technology. It is necessary to advance more technological innovation which does not depend on high risk materials in this sector, and conduct more accurate and comprehensive evaluation method to check the availability of raw material risk. In addition, silver supply risk was assessed in five dimensions including resource potential, price volatility, recycling ratio, by production ratio and concentration ratio. After separately modeling, all the five indicators was aggregated into a radar chart which shows the risk degree from 1-5 divided by risk free, relaxed, moderate, risky, and very risky. The result shows, in general, silver supply risk increased during year 2000-2008, after 2008, risk was mitigated. The bottleneck of silver supply is by production ratio, and price volatility is considered to be more sensitive than other indicators. Risk shown by five indicators are within moderate and risky, considering time-series trends, the silver supply risk tend to be moderate in the near future.

ID-434

Comparative Study Between Solar Cells Produced by Two Methods

N. Moudir[a,c], N. Moulaï-Mostefa[b,c], Y. Boukennous[a], I. Bozetine[a], F. Tayour[a]

[a] Research Center in Semiconductors Technology for Energy (CRTSE) 02 Bd, Frantz FANON, BP 140, Algiers

[b] LME, Medea university, Ain D'Heb, 26001 Medea, Algéria

[c] LAFPC, Blida University, Route de Soumaa, 09000 Blida, Algeria

Email: moudir2001@yahoo.fr

Abstract

An approach for preparing silver powders, based on chemical precipitation in various mediums is studied and compared. The powder will find application to the conductive paste for solar cells metallization using screen-printing technology.

Synthesis of silver powders using silver nitrate as a starting material, hydrazine, and formaldehyde us reducing agent in basic aqueous medium (sodium hydroxide and ammonium hydroxide). Other silver powders were synthesized in glycolic mediums (Ethylen glycol, Di Ethylen Glycol and Propylen Glycol).

The physical properties of so prepared powders were characterized by X-ray Diffraction (DRX), Scanning Electron Microscopy (SEM), and laser granulometry.

XRD patterns suggest that the powders illustrate a good cristalinity. SEM micrograph shows the uniformity size distributed of synthesized silver powder and laser granulometry provides micrometric powders.

All synthesized powders were used to prepare conductive silver paste for the metallization of solar cell. The I(V) characterization of the cells shows that efficiency depends on the morphological properties of the powders.

Keywords: Chemical Reduction, Silver Powder, Conductive Paste, Metallization, Solar Cell Efficiency

ID-435

A Method for Building a Simple and Applicable Power Inverter

M. Abdelati[a], G.Frey[b]

[a] Electrical Engineering Department, IUG, Gaza, Palestine, Tel: +970 59 99 47 635
[b] Chair of Automation, Saarland University, Saarbrücken, Germany
Email: muhammet@iugaza.edu

Abstract

In the last few years, people in the Gaza strip started to rely on power inverters as part of a backup power system due to frequent failure of the mains utility. The simplest backup system consists of a battery, a battery charger, and an inverter. At least one house out of four in the Gaza strip is equipped with such a system. The inverters' market is shared by few local and plenty foreign manufactures. Although imported inverters are either cheaper than or functionally superior to locally made ones, the majority of people prefer to utilize the local inverters. This is due to not only encouragement reasons, but also the ease of maintenance. Foreign inverters use to be manufactured with high-tech and state-of-the-art components which do not fit with available resources and expertise. Moreover, due to current political situations, most import and export transactions are neither insured nor time predictable. In this work, design of a viable single phase inverter is addressed. It is low-cost and has an integrated battery charger making it a challenging competitor to present choices. The device functions are controlled by PIC16F877 microcontroller and the proposed design is experimentally demonstrated and evaluated for various loads.

Keywords: Power electronics, Inverter, Battery charger, PIC16F877.

ID-436

Carbon Dioxide Conversion Of Biogas Over The Polymetallic Supported Catalysts With Producing Syngas

Y. Y. Nurmakanov[1], V.S. Yemelyanova[2], S.S. Itkulova[1], G.D. Zakumbaeva, N.N. Nurgaliyev[1]

[1] D.V. Sokolsky Institute of Organic Catalysis and Electrochemistry, 142, Kunaev str., Almaty, Kazakhstan;
[2] Research Institute of New Chemical Technologies and Materials
Fax: +7–727–2915722; e-mail: s.itkulova@ioce.kz, y.nurmakanov@ioce.kz

Abstract

Carbon dioxide and methane are the main two green house gases that considerably contribute to the global warming. Dry reforming of methane (DRM) has received great attention due to its environmental benefits from utilizing greenhouse gases and producing highly valuable synthesis gas (H_2 + CO) as a feedstock. The syngas produced through DRM process (eq. 1) has a H_2/CO ratio of ~1, which is more compatible for many downstream processes such as hydroformylation, carbonylation, and Fischer–Tropsch synthesis.

$$CH_4 + CO_2 \rightarrow 2CO + 2H_2 \qquad \text{(eq. 1)}$$

Biogas commonly produced from biomass anaerobic digestion has a composition varied depending on the type of biomass and typically includes 55-70% of CH_4 and 27-44% of CO_2. Also some impurities such as H_2, H_2S, CO, and traces of NH_3 may be formed. The major drawback of this reaction is the deactivation of catalysts as a result of carbon deposition. According the stoichiometry of the reaction (eq.1), CH_4 + CO_2 ratio is 1/1. The excess of methane would cause significant carbon deposition, resulting in the rapid deactivation of a catalyst. For this reason, additional oxidant to eliminate carbon should be added to biogas. Either carbon dioxide or steam, or both CO_2+H_2O may be introduced into initial feed in order to avoid the carbon deposition.

In this work, carbon dioxide conversion of biogas has been studied using the polymetallic supported catalysts. Model biogas corresponding to biogas produced by anaerobic fermentation of horse manure has been used. Some amount of carbon dioxide and steam has been added to adjust the composition of biogas: CH_4:CO_2:CO:H_2:H_20=1:1:0.01:0.01:0.1. The processes of dry and steam reforming of biogas were carried out in a laboratory flow quartz reactor supplied with programmed heating and a controlled feeding velocity and operated at atmospheric pressure. The gas hourly space velocity (GHSV) was 1000 hr^{-1}. The temperature was varied from 300 to 800°C.

Conversion of methane and carbon dioxide are increased with temperature growth. At 800°C, conversion of CH_4 and CO_2 reach 98.2 and 100% respectively. Adding 10 vol.% of steam leads to complete (100%) conversion of both reactants at insignificant decreasing temperature - 795°C. Syngas is a main reaction product. Under these conditions, the H_2/CO ratio is 0.9 and 1.2 at dry reforming and steam reforming of methane respectively. The catalyst performs the high stability in the biogas conversion.

ID-437

Catalytic Steam Conversion of APG for Onsite Power Generation: from Laboratory to Pilot Scale Reformer

P.V. Snytnikov[a,b,c], M.M. Zyryanova[a,b,c], D.I. Potemkin[a,b,c], Yu.I. Amosov[a,b,c], V.D. Belyaev[a,b,c], V.V. Kireenkov[a,b,c], N.A. Kuzin[a,b,c], A.B. Shigarov[a,b,c], A. Malakhov[d] V.A. Kirillov[a,b,c] and V.A. Sobyanin[a,b,c]

[a] Boreskov Institute of Catalysis, Pr. Ak. Lavrentieva 5, 630090, Novosibirsk, Russia, Tel: +7-383-3269471

[b] Novosibirsk State University, Pirogova st. 2, 630090, Novosibirsk, Russia

[c] UNICAT Ltd, Pr. Lavrentieva, 5, 630090, Novosibirsk, Russia

[4]Novorocs Technologies LLC, 771 Elmgrove Rd, Rochester, NY 14624, USA

E-mail: pvsnyt@catalysis.ru

Abstract

Associated petroleum gas (APG) is a high-caloric gas of variable composition. Typical APG composition is as follows (% vol.): 50–70 CH_4, 5–10 C_2H_6, 5–15 LPG, 1–10 N_2, 1–10 CO_2. Utilization of APG in an economically viable and environmentally sustainable manner is one of the key challenges facing the gas-and-oil producing industry.

This report is focused on development of a catalytic reformer for recovery of APG / flare gas from oil and shale oil reservoirs (e.g. Bakken Formation, North Dakota), where gas flaring is an environmental problem, but also a potential source of revenues. It is generally accepted that flaring is primarily an economic problem, with oilfield operators reluctant to spend on infrastructure required to compress and transport APG for further processing into its individual components. On the other hand, while APG is flared at well sites, fuel such as diesel is brought in at high cost to provide for onsite power needs. The proposed technology addresses these issues by converting APG into conventional natural gas that can be used for onsite power generation. The result is elimination of greenhouse gas emissions from flaring and displacement of diesel fuel for onsite power by clean burning natural gas produced directly at the wellhead.

Direct use of APG as a mono-fuel for power generation (in gas-piston engines or gas turbines) is limited by low methane content, unstable gas composition, high coking and knocking risks that decreases the service life and causes engine damage. The knock resistance of gaseous fuels is often evaluated by the methane number. In order to increase methane content and, consequently, methane number of the gas mixture, APG heavy hydrocarbon components C_nH_{2n+2} (n>1) can be converted to methane and CO_2.

Widely used adiabatic pre-reforming proceeds at a temperature of 400-550°C and provides complete conversion of higher hydrocarbons into a mixture of methane, carbon oxides and hydrogen. To prevent catalyst coking, the process is usually performed at H_2O/C molar ratio 2.5-4. In contrast to this conditions, the process of steam reforming of APG to methane-rich gas is better to perform at lower temperatures (not exceeding 300-320°C) and at lower H_2O/C ratios (less than 1) in order to favor thermodynamically highest methane and minimum hydrogen yield. When fed to real gas-piston engine, this methane-rich gas mixture allows the reaching of the nominal operation characteristics [1].

In this work our research was focused on the process of low-temperature (150-350°C) low steam-to-carbon ratio (0.3-0.6) reforming of APG into methane-rich gas over Ni-containing catalysts in laboratory and pilot-scale reactors under pressure 1-20 atm. Special attention was paid to confirm stable carbon-free catalyst performance. The two-step macrokinetic scheme of model process (with propane-methane mixture) was suggested and the kinetic parameters have been derived by mathematic modeling of the experimental data.

The work was partially supported by MES (Russia) and grant MK-2737.2013.3

[1]. M.M. Zyryanova et al., Fuel 108 (2013) 282-291.

ID-438

Production of Hydrogen Using Hetero-System: Polypyrrole/TiO2 Under Visible Light

C. Belabed[b], Z. Benabdelghani[a], N. Haine[b], A. Etxeberria[c]

[a] Faculty of Chemistry, University of Sciences (USTHB), Algiers, Algeria

[b] Faculty of Physics, University of Sciences (USTHB), Algiers, Algeria.

[c] Universidad del Pais Vasco, UPV/EHU. P.O. Box 1072, 20080 San Sebastian, Spain.

Abstract

The research on alternative eco-friendly energy resources constitutes one of the challenges in the 21 century. Due to their possible applications in the conversion of the solar energy into electrical and/or chemical forms, the semiconductor materials have found very interest from both academic and industrial points of view. It was admitted that is estimated that very little part of the solar energy is efficiently used. Because of its abundance, there are several technologies developed to use this natural energy in order to diminish the dependence of the fossil fuels, mainly considered as responsible of the greenhouse gases. It is reported that the organic semiconductor materials can be used in photocatalytic processes in order to generate the hydrogen using a renewable energy source such as solar energy. Among them, the polymer materials are successfully applied in water splitting process.

Our aim in this contribution is focused on the photo electrochemical properties and photocatalytic hydrogen production. The photoactivity is improved on hetero-systems PANI/TiO_2 which inhibit considerably the lost of electron/hole (e^-/h^+) pairs and shifts the spectral photoresponse of TiO_2 toward longer wavelengths. We have focused our efforts particularly on the pH effect allowing the best hydrogen production efficiency. As an example, Figure 1 shows the evolution of hydrogen as a function pH.

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ID-439

The effect of Ni Seed Layer for Electroplating ^{63}Ni in Radioisotope Battery

Y. R. Uhm[a], B. G. Choi[b] , K. J. Son[a], K. Y. Park[a], J. S. Lee[a]

[a] Radioisotope Research Division, Korea Atomic Energy Research Institute (KAERI), 989 Daedukdaero, Daejeon 305-353, Republic of Korea

[b] Human Interface SoC Research Section, Electronics and Telecommunications Research Institute(ETRI)

E-mail: uyrang@kaeri.re.kr

Abstract

Ni layers with thickness of 200, 500, and 1000 Å, on the single trench P-N absorber were prepared by an e-beam deposition, which is seed layer for electroplating ^{63}Ni of beta-voltaic source. The optimum thickness of ^{63}Ni on the seed layer was about 2 μm, which was determined by analysis of self-shielding effect of beta-ray(β-ray). To establish the coating conditions for ^{63}Ni on P-N absorber, non-radioactive metal Ni particles are dissolved in an acid solution and electroplated on a Ni seed layer. The prototype for electroplating radioactive ^{63}Ni on the single trench P-N absorber with seed layer has been established. The electroplating was carried out by two-step processes such as preparation of ionic solution including ^{63}Ni, and coating processes on the seed layer. The experimental results showed that increasing the current density had a considerable effect on the average grain size of the deposits. The electroplating of Ni on the seed layer was carried out at current density of 10 and 20 mA/cm^2. The conductivity and the uniformity of the seed layer are enhanced, as thickness is increased. However, it was confirmed that the thick seed layer plays a role of increasing self-shielding of β-ray from the photo-voltaic measurement (I-V curves) by using e-beam with energy of 30 keV. To fabricate effective β-voltaic battery, the thickness of seed layer about 500 Å have been determined in the view of both preventing self-shielding β-ray and increasing conductivity on the surface.

Keyword: Radioisotope Battery, Beta-Voltaic, ^{63}Ni, Electroplating, Self-Shielding Effect

ID-440

Preparation of ^{63}Ni Sealed Source for Radioisotope Battery

J. J. Kim, K.Y. Park, Y. R. Uhm, K. J.Son, J.B. Kim, J. S. Lee

Radioisotope Research Division, Korea Atomic Energy Research Institute (KAERI), 989 Daedukdaero, Daejeon 305-353, Republic of Korea Tel : +82-42-868-4835
E-mail: uyrang@kaeri.re.kr

Abstract

Nanocrystalline nickel (Ni) coatings were synthesized by direct current electrodeposition at current density from 10 to 30 mA/cm^2 and pH=4. The bath was primarily composed of 0.2 M Ni ions, prepared by dissolving Ni metal particles in HCl. The experimental results showed that increasing the current density had a considerable effect on the average grain size of the deposits. The residual stresses were measured by deposit stress analyzer during electroplating Ni at the current densities to be 10, 15 20, and 25 mA/cm^2. The residual stress was shown as large values, as the current density was increased. The low current density played role of effective deposition of Ni ions on the substrate. The prototype for electroplating radioactive ^{63}Ni has been established. The proposed prototype for the synthesis could be applied to the electroplating radioactive ^{63}Ni in the glove box in a hot cell (Bank-2, HANARO Reactor in KAERI). The electroplating was carried out by two-step processes such as preparation of ionic solution including ^{63}Ni, and coating processes on the substrate. The non-radioactive Ni ions dissolved bath was coated on the electroplated ^{63}Ni layer for sealing radio-active layer.

Keyword: Radioisotope Battery, Sealed Source, ^{63}Ni, Electroplating

ID-441

Economic Benefits of Flare Gas Catalytic Reforming into Methane Rich Gas: Applications for ICE Based Power Generation Units and Methane Production for Local Needs

M.V. Vernikovskaya[a,b,c], P.V. Snytnikov[a,b,c], A. Malakhov[d], V.A. Kirillov[a,b,c], V.A. Sobyanin[a,b,c]

[a]Boreskov Institute of Catalysis, Pr. Ak. Lavrentieva 5, 630090, Novosibirsk, Russia Tel: +7-383-3269471
[b]Novosibirsk State University, Pirogova st. 2, 630090, Novosibirsk, Russia
[c]"UNICAT" Ltd, Pr. Lavrentieva, 5, 630090, Novosibirsk, Russia
[d]Novorocs Technologies LLC, 771 Elmgrove Rd, Rochester, NY 14624, USA
E-mail: vernikmv@catalysis.ru

Abstract

Development of shale oil reservoirs and new remote oil field territories stimulates researches for new technologies of associated petroleum gas (APG) /flare gas utilization. APG is a high-caloric gas of variable composition consisting of methane, ethane, LPG, nitrogen, carbon dioxide and some other components such as sulfuric compounds, helium, argon. Because of relatively high content of non-methane fraction, APG could not be pumped directly into gas pipelines especially at low temperature conditions of Russian North territories. Since oil fields in Russian North and Arctic shelf locates far away from industrial centers and cities where construction of transportation infrastructure comes highly expensive, the APG utilization approaches are focused mainly on generation of electric power, which can be used both for local needs and transported for long distances. On the other hand, while APG is flared at well sites, fuel such as diesel is brought in at high cost to provide for onsite power needs or is used as fuel for trucks.

APG cannot be used directly in a typical engine or gas turbine. Auto-ignition (engine knock) of heavy hydrocarbons will damage engine cylinder components. In gas turbines, APG results in coking, overheating, and blade damage. Specialized and costly rich-burn engines run directly on APG, but they cannot run on conventional natural gas. Another approach is to decrease engine output by 25 – 30%, in order to reduce damage to the engine. These options significantly increase capital expenses to the well operator, but even a typical rich-burn engine will not run well on some of the lower quality gases, with less than 55% methane. Moreover, APG volume at remote off-grid well sites often exceeds power demand by an order of magnitude.

Flaring of APG and volatile organic compounds (VOC) during oil and gas production has created an opportunity for capturing and monetizing these waste streams, by conversion to interchangeable, pipeline quality natural gas containing more than 90% methane by volume. In addition to the direct value of increased hydrocarbon recovery from shale oil reservoirs, the reduced emissions of hydrocarbons to the atmosphere will enable operators to affordably meet regulatory standards, further enabling more rapid development of shale oil reservoirs.

Comparative analysis of economic efficiency and commercial feasibility of the proposed technology was performed for a number of power generating units fuelled by methane-rich gas generated in the APG reformer, and similar power units fuelled by initial APG. Calculations conducted for different types of power plants with electrical power of ~100-1000 kW (for example, based on Perkins (Great Britain), Waukesha (USA), Deutz (Germany) gas internal combustion engines) show that recoupment of capital investment is significantly faster for power generation units equipped with catalytic reformer of APG into methane-rich gas mixture as compared to APG-fed power generation units. This is achieved by extended service life, longer time between overhaul services, nominal power characteristics of the units.

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ID-442

Application of EDTA-Degrading Bacterium Burkhol. Cepacia on The Biotreatment Process

W. T. Chen, S. M. Shen, C. M. Shu

Department of Safety, Health, and Environmental Engineering, National Yunlin University of Science and Technology (YunTech), 123, University Rd., Sec. 3, Douliou, Yunlin 64002, Taiwan, ROC, Tel: + 86 05 534 5621
E-mail: shucm@yuntech.edu.tw

Abstract

Ethylenediaminetetraacetic acid (EDTA), the target compound in this study, is often found in the effluent of secondary biotreatment units and can be biodegraded by Burkhol. cepacia. Prior to EDTA removal, raw wastewater was pretreated by chemical coagulation to remove heavy metals, followed by bioaugmentation with Burkhol. cepacia to biodegrade the target compound, EDTA. This method was used to remove EDTA and to thereby decrease the chemical oxygen demand (COD) present in the wastewater, as high COD is caused by EDTA. Raw wastewater and activated sludge samples were obtained from a printed circuit (PC) board plant and a wastewater treatment plant, respectively, both of which are located in an industrial park in Taiwan. To test a batch treatment process for EDTA biodegradation, EDTA was added to the raw wastewater at a concentration of 50 mg L–1, and then nutrients were added in diluted wastewater to generate activated sludge. The relative ratio of composition for COD : N : P : Fe in the samples was 100：5 ：1：0.5. After 27 days, the removal efficiencies for Fe-EDTA and COD were 100% and 92.0%, respectively. In additional experiments, the concentration of EDTA in raw wastewater samples was set at 100 mg L–1, 200 mg L–1, and 500 mg L–1 to generate activated sludge, but the removal efficiency for COD was not improved, and COD in the samples did not decrease. The values for COD in these samples ranged from 3.1% to 45.9%. Furthermore, we also tested experimental and control samples in a continuous treatment process to determine the most efficient method. For the experiments involving a continuous process, the raw wastewater EDTA concentration was 166 mg L–1 prior to addition of nutrients to generate activated sludge; the results from this experiment were not consistent with the ratio of composition for the batch process experiments. After 22 days, the removal efficiencies for Fe-EDTA and COD for the experimental samples were 71.46% and 62.58%, respectively. The results demonstrated that the batch process was more suitable for EDTA biodegradation.

Keywords: Biodegradation, Bioaugmentation, Burkhol. Cepacia, Ethylenediaminetetraacetic Acid (EDTA), Nutrients

ID-443

Electrochemical Properties of $La_2MgNi_8Co_{1-x}M_x$ (M = Al or In; x = 0 or 0.2) Hydrogen Storage Alloys

K. Giza[a1], L. Adamczyk[a], A. Hackemer[b], H. Drulis[b], H. Bala[a]

[a]Czestochowa University of Technology, Faculty of Production Engineering and Materials Technology, Al. Armii Krajowej 19, 42-200 Częstochowa, Poland

[b]Trzebiatowski Institute of Low Temperatures and Structure Research PAS, Okolna Str.2, 50-422 Wrocław, Poland

Abstract

The effect of the fabrication technology of La_2MgNi_8Co-based alloys doped with 1.7 at % of Al or In on their electrochemical hydrogenation properties has been examined. Three different procedures have been applied to manufacture test materials: melting of $La_2Ni_9Co_{0.8}M_{0.2}$ (M = Al or In) alloy precursor with Mg additions in sealed molybdenum crucibles in induction- or resistance furnaces (Technologies A and B) and by powder metallurgy route consisting of the mechanical alloying of $La_2Ni_9Co_{0.8}M_{0.2}$ alloy precursor- and Mg powders followed by high temperature sintering (Technology C). The electrochemical characteristics of the alloys including the discharge capacity, the H_2O/H_2 exchange current density, and the hydrogen diffusivity have been studied and presented versus charge/discharge cycling. It is demonstrated that the metallurgical process applied in the alloy manufacturing has a significant effect on electrochemical hydrogenation properties of the final materials. Our investigations indicate that the most promising parameters have been obtained for electrodes synthesized by powder metallurgy route followed by material pressing and sintering. Multi-cycled hydrogenation experiments at fast charge/discharge rates (–400/+400 $mA \cdot g^{-1}$) reveal a very good cycle life for Al- and In substituted alloys prepared by Technology C, with discharge capacities as large as 300 to 320 $mA \cdot h \cdot g^{-1}$.

ID-444

The State of Art Technique of Pre-Ozonation Processes for Intensification of Emission Control from Stationary Sources

K.Skalska

Faculty of Process and Environmental Engineering, Lodz University of Technology
Wolczanska 213, Lodz 90-924, Tel: +48 42 631 37 39
E-mail: kinga.skalska@p.lodz.pl

Abstract

This work demonstrates state of current literature in the field of environmental engineering research, i. e. utilization of ozone for waste gases treatment both from power plants and chemical plants. The idea of using ozone to oxidize NO into NO_2 in order to intensify the NO_x removal through absorption process was first patented in 1976 by Picchierauri. At that time the production yield of ozone generators was smaller than nowadays and not sufficient enough for industrial application. However, this did not stop growing interest in the application of ozone for flue gas treatment. Since then more patents were issued (e.g. Skelley et al., 1994; Tseng et al., 2001; Suchak et al., 2014). In 2001 the process called Low-Temperature NO_x absorption (LoTOx) won the Kirkpatrick Award. LoTOx enables to obtain 90% efficiency of NO_x emission reduction (Anon., 2001). This technology has been already installed in several facilities in the USA, i.e. Medical of College of Ohio; J&L Specialty Steel Midland, PA; Lion Oil Company in Eldorado, AR; Marathon-Ashland Oil in Texas City, TX (CATC, 2005) and the interest in Europe steadily grows.

The main concept of ozone utilization in flue gases treatment is to increase the ratio NO_2/NO_x in treated gases, because for power plants flue gases this ratio is around 0.05 whereas for flue gases from chemical industry it might be 0.5 or even close to 1. Ozonated gases can later be treated with different existing and well established emission control technologies, i.e. absorption in water, alkaline or acidic solutions, selective catalytic reduction (SCR), etc. The combination of this process with SCR or absorption was studied by various authors e.g. Jaroszyńska-Wolińska, 2002; Mok and Nam, 2004; Mok and Yoon 2006; Wang et al. 2007; Dora et al.2009, Asif and Kim, 2014. etc.. Another possibility is related with the use of ozone injection into exhaust gases from incineration processes in power plants (Jakubiak and Kordylewski, 2011). Ozone was used by various authors, including author of this work (Skalska et al. 2011a,b; 2012a,b), for oxidation of nitrogen oxides (NO_x: NO and NO_2) into nitrogen species that have better solubility in water , NO_2, N_2O_5 and HNO_3. This increases NO_x removal rate in the absorption process. Efforts are made worldwide to develop emission control technologies capable of removing several kinds of pollutants at the same time. As literature and patent survey proves ozone can also be used for elimination of multiple contaminants like: NO_x, SO_2, Hg, HCl (Wei-yi et al., 2011; Wang et al., 2007; Sun et al., 2014).

In contrast to previous review (Skalska et al. 2010) this work is focused on presentation of the state of the art in the field of off-gases ozonation and comparison of the published literature and newest patents. Furthermore author recent experiences prove growing interest among the industry.

Keywords: Nitrogen Oxides, Pre-Ozonation, Emission Control

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ID-445

A Comparison of Different Pretreatment Methods for Developing an Efficient Technology for Integrated Biohydrogen and Biogas Production from Lignocellulosic Biomass

K. Michalska[a], S.Ledakowicz[b]

[a] Textile Research Institute, ul. Brzezinska 5/15, 92-103 Lodz, Poland.
[b] Lodz University of Technology, Faculty of Process and Environmental Engineering, Department of Bioprocess Engineering, ul. Wolczanska 213, 90-924 Lodz, Poland. Tel.: +48 42 6313715
E-mail: stanleda@p.lodz.pl

Abstract

In this paper different two-step chemical and enzymatic pretreatment processes for simultaneous biohydrogen and biogas production from lignocellulosic biomass were studied. Dilute acid pretreatment, alkaline hydrolysis with the use of lime and sodium hydroxide, alkaline hydrogen peroxide pretreatment and Fenton's reaction were investigated to achieve high yields of lignocellulose structure conversion. The tested plant materials were three species of energy crops: *Miscanthus giganteus*, *Sida hermaphrodita* and *Sorghum* Moench. The aim of this work was to choose the best chemical pretreatment method that guarantees the supernatant of the highest quality after following enzymatic hydrolysis for both biogas and biohydrogen production. The results suggest that alkaline pretreatment prior to enzyme action gives the best effects for all three tested biomass species, providing high glucose yield, satisfactory xylose and low VFA concentrations in the achieved supernatants. The best results were obtained for *Sorghum* Moench (glucose yield 100%; xylose and VFA concentrations of 4.9 g/L and 684 mgCH_3COOH/L, respectively). Moreover, a proposal of the innovative integrated technology which allows for both efficient biohydrogen and biogas production from energy crops was developed. The idea of this unique technique (Fig.1) is to separate solids from liquid phase after enzymatic hydrolysis and use supernatants in two-step process: firstly to biohydrogen production, and in second step as a VFA-rich feedstock mixed with pretreated biomass for methanogenes metabolism.

Keywords: Biohydrogen, Biogas, Lignocellulosic Biomass,

ID-446

On the Use of DPSIR Model to Two Basins in the Northern of Algeria: Socio-Economic Pressions

A. Hani[a], S. Chouchane[b], B. Sakaa[a], N. Bougherira[a], L. Djabri[a]

[a] Water Resources and Sustainable Development Laboratory. Université Badji Mokhtar Annaba, BP 12, 23000 Algérie.
[b] Laboratoire d'Ingénierie des Surfaces, Badji Mokhtar Annaba University, 23000, BP 12, 23000 Algérie.
haniazzedine@hotmail.com

Abstract
This research has an objective to determine the effective variables in socioeconomic category of Integrated Water Resources Management for Saf-Saf and Seybouse basins characterized by fast growing demand of urban and rural populations and the demand of economic sectors including industry and agriculture. In this paper, the artificial neural network models were used to model and predict the relationship between water resources mobilization and socioeconomic variables. The results indicate that the feed-forward multilayer perceptron models with back-propagation are useful tools to define and prioritize the most effective variable on water resources mobilization and use. The model evaluation shows that the correlation coefficients are more than 94 % for training, verification, and testing data. The model aims to link the water resources mobilization and driving forces variables with the objective to strengthen the Integrated Water Resources Management approach.

Keywords Saf-Saf Basin, Seybouse Basin, Water Resources Mobilization, Multilayer Perceptron Network .Socioeconomic Variables. Integrated Water Resources Management

ID-448

Forecasting the Effect of Renewable Energy Consumption on Economic Welfare, Using Artificial Neural Networks

E. Naeimi, M. H. Askariazad, K. Khalili-Damghani

School of Industrial Engineering, Islamic Azad University (South Tehran Branch), Tehran, Iran

Abstract

Energy as a production process input, has an effective role on economic indicators such as gross domestic production (GDP), and using renewable energies should be develop because of limitation of fossil fuels and nuclear resource. In this research we investigated the impact of renewable energy consumption on economic welfare indicators (GDP, GDP per capita, annual income of urban households, and annual income of rural households) in Iran. For this purpose, we defined 4 models with 6 inputs and one output. The inputs are renewable energy consumption, share of renewable energy consumption, labor force, gross capital formation, technology factor and R&D renewable energy budgets. Our outputs are GDP, GDP per capita, annual income of urban households, and annual income of rural households and we assumed one of them in each model. The yearly available data were collected, from1971 to 2011 and artificial neural networks (ANNs) were used. To show the advantage of artificial neural networks, we compared it with multi-layer regression (MLR) model. In regression models, we used the log form of our data for calculation. Both ANN and MLR models showed significant effects of renewable energy consumption and share of renewable energy consumption on economic welfare in Iran. So Iranian energy policy makers should note that implementing new policies of renewable energies, may improve the economic welfare. The comparison results between artificial neural network and multi-layer regression models demonstrated that artificial neural network has more accurate prediction results than multi-layer regression. So we used the better model for predicting the economic welfare of 10 years (2007-2016), results showed that GDP, GDP per capita, annual income of urban households, and annual income of rural households will grow by 35.63%, 62.59%, 167.61% and 143.19% respectively from 2007 to 2016.

Keywords: Economic Welfare, Renewable Energy Consumption, Iran, Artificial Neural Networks, Multi-Layer Regression Model

ID-449

Thermo-Stability of the Photons Converter Applied in the Photovoltaic's Conversion Systems

M. Ayad, M. Fathi, M. Abderrazak

UDES, Unité de Développement des Equipements solaires / EPST Centre de Développement des Energies Renouvelables CDER, RN11 Bou-Ismail BP. 386, 42415 Tipaza, ALGERIA.
E-mail: ayad_h20@yahoo.fr

Abstract

The encapsulation of solar cells by photons converter systems based on Luminescent down shifting (LDS) materials is a new approach that can be followed to reduce the thermalization and transmission losses in solar cells and allow a better use of the solar spectrum. This is a purely optical method used for the enhanced response of the solar cells in the region of short wavelengths.

The LDS system is formed by doping of the flat poly methyl methacrylate (PMMA) layers with organic dyes. The PMMA layer doped absorbs high-energy photons and reemit of low energy in different directions (fluorescence).

Then, the input spectrum is red-shifted to better fit with the spectral response of solar cells. The number of bearing load will be higher, and an improvement in power conversion efficiency and the observed result of increase of the short–circuit currant Isc.

Alternatively, the converters of photons systems (LDS) are subjected to a set of constraints on exposure to environmental conditions, and these processes have detrimental effects on long-term performance.

In this work, we present the study of the thermo-stability of the converters photon systems under heath temperature, the effect of two cycles of increasing temperature in different optical and electrical properties as studied.

Keywords: Polymethyl-Methacrylate (PMMA), Organic Dyes, Spectrophotometry, Down-Shift System, Solar Spectrum, Solar Cells, Conversion Efficiency

ID-450

A Novel Deposition Configuration Based on Multilayer A-Sic for Photonic Applications

A-M. Ouadfel[a,b], A. Keffous[a] , A. Cheriet[a], C. Yaddaden[a], B.D. Rezgui[b], M. Kechouane[c], N. Gabouze[a], Y. Belkacem[a], H. Menari[a]

[a] Centre de Recherche en Technologie des Semiconducteurs pour l'Energétique
02 Bd Frantrz Fanon, BP.140 Alger 7 Merveilles, Algerie
Phone : +213 21 43 35 11 / +213 43 26 30 – Fax : +213 21 43 24 88 / +213 21 43 26 30
[b] Faculté de Physique, Université Houari Boumediene (USTHB), Bab ezzoaur, Alger
E-mail: keffousa@yahoo.fr

Abstract
In present work, SiC multilayer samples for energetic applications were successively prepared by alternating metal (Al, In, Pd,…) and amorphous silicon carbide (a-SiC) elaborated by thermal evaporation for the first one and by DC magnetron sputtering for the second one. Effect of thickness and nature of the metal on the optical, structural and electrical properties were investigated using secondary ion mass spectrometry (SIMS), photoluminescence (PL), UV-visible-NIR, Raman spectroscopy, infrared spectroscopy (FTIR) and electrical conductivity.

Keywords: Silicon Carbide; Multilayer; Optical Properties; Raman; Absorption

ID-451

Biohydrogen Production in Anaerobic Membrane Bioreactor with Integrated Gas Purification Membrane System

P. Bakonyi[a], N. Nemestóthy[a], J. Lankó[a], V. Ruiz[b], G. Buitrón[b], K. Bélafi-Bakó[a]

[a] Research Institute on Bioengineering, Membrane Technology and Energetics, University of Pannonia, Egyetem ut 10, 8200 Veszprém, Hungary Tel: +36 88 624385, Fax: +36 88 624292

[b] Laboratory for Research on Advanced Processes for Water Treatment, Instituto de Ingeniería, Unidad Académica Juriquilla, Universidad Nacional Autónoma de México, Blvd. Juriquilla 3001, Querétaro 76230, México

E-mail: bakonyip@almos.uni-pannon.hu

Abstract

In this work the establishment of a double-membrane bioreactor was aimed. Initially, a continuous hydrogen fermenter was coupled with a commercial Kubota® microfiltration membrane module and the production performance of the cell-retentive design was evaluated under various hydraulic retention times. As a result, it has been observed that altering HRT influenced the rejection feature of the microfiltration module while had an inverse effect on hydrogen productivity and yield, since shortened HRTs were accompanied by gradually decreasing H_2 yields and progressively increasing volumetric H_2 production rates. In the second series of the measurements, a Permselect® (PDMS) gas separation membrane module was installed to the AnMBR and its ability to separate hydrogen from the raw fermentation gaseous mixture was assessed. It could be concluded that the membrane has the potential to attractively concentrate biohydrogen on its retentate side and may be used for in-situ product recovery.

ID-452

Integrated Energy-Efficient Hydrogen Production from Low Rank Coal and Its Storage for Transportation

M. Aziz, T. Oda, Ta. Kurokawa, T.Kashiwagi

Solutions Research Laboratory, Tokyo Institute of Technology, 2-12-1-I6-25 Ookayama, Meguro-ku, Tokyo, 153-8550 Japan Tel: +81-3-5734-3809

E-mail: maziz@ssr.titech.ac.jp

Abstract

A novel integrated processes of hydrogen production and its storage is proposed in this study. To improve the total energy efficiency, an enhanced process integration (EPI) technology is evaluated and applied. Basically, EPI includes two main core technologies: exergy recovery and process integration. Exergy recovery is performed to recirculate effectively the energy involved in the process through exergy elevation and an effective heat pairing. Furthermore, the unrecoverable energy/heat from a process will be utilized in other processes through process integration. It results in minimization of exergy destruction in the overall integrated processes leading to high energy efficiency.

The integrated processes mainly consist of drying, gasification, shift reaction, carbon capture, and hydrogenation. Additionally, a high temperature electrolysis utilizing a renewable energy (RE) from RE generators in the mining sites is also integrated to produce additional hydrogen and oxygen for gasification. Hence, air separation unit can be omitted in the proposed process. Low rank coal (LRC) is utilized as the main material to be converted to hydrogen. LRC has characteristics of lower calorific value, high moisture content, high oxygen reactivity, etc. leading to some difficulties in its handling, conversion, storage and transportation. LRC is initially dried and converted to hydrogen-rich syngas through oxygen/steam gasification in the dual circulating fluidized bed reactor. After syngas treatment, clean syngas flows to the shift reactor to produce high hydrogen-concentration syngas. The exhausted CO2 rich flue gas is then fed to the carbon capture process for CO2 fixation. The produced hydrogen both from LRC gasification and high temperature electrolysis is then flowing to the hydrogenation plant where the hydrogen reacts with the toluene to produce methylcylcohexane (MCH). Toluene-MCH cycle is used for hydrogen storage and transportation due to its advantages on stability, cost, storage and transport easiness, as well as its successful demonstration plant in Japan.

Furthermore, energy and exergy analysis are conducted to evaluate the performance of proposed integrated-processes in term of energy efficiency. It is clear that the proposed processes results in significantly high energy efficiency leading to high feasibility of LRC-to-hydrogen conversion. Hence, the energy can be converted, stored, and transported with minimum exergy destruction.

Keywords: Hydrogen, Low Rank Coal, Production, Storage, Process Integration, Energy Efficiency

ID-453

Zns Decorated Graphene Composites with Enhanced Photocatalytic Hydrogen-Production Performance

C.J. Chang, K. W. Chu, M. H. Hsu

Department of Chemical Engineering, Feng Chia University, 100, Wenhwa Road, Seatwen, Taichung 40724, Taiwan, ROC Tel : 886-424517250 ext 3678
E-mail: changcj@fcu.edu.tw

Abstract

Photocatalytic hydrogen production from water splitting has attracted much attention because it can convert light energy to valuable H2 energy. ZnS exhibits relatively high activity for hydrogen production performance. Introducing graphene in composites is an effective way to improve the photocatalytic activity of semiconductor photocatalysts. Graphene with electrical conductivity nature can act as an excellent electron-transport matrix which helps the transfer of photogenerated electrons from the surface of ZnS to graphene. In this study, undoped or doped ZnS was loaded on the surface of graphene to prepare the composite photocatalysts for hydrogen production. Properties of the photocatalysts were investigated by field-emission scanning electron microscope, X-ray diffraction, nitrogen adsorption–desorption isotherms, photoinduced current, and photocatalytic hydrogen evolution test. Figure 1 shows the photocatytic properties of graphene@ undoped ZnS photocatalysts prepared with different ZnS growth time. Decorated ZnS content of the composite increases with increasing ZnS growth time. The photocatalytic hydrogen production rate of graphene@ undoped ZnS photocatalyst reaches 6 mmol h−1 g−1 (6000 μmol h−1 g−1). Introducing dopant in ZnS will increase the photocatalytic hydrogen production performance. Effects of decorated ZnS content and doping on the morphology, photoinduced current and photocatalytic hydrogen production were studied.

ID-455

Study on Hydrogen Embrittlement of API 5L X70 Steel under Cathodic Charging

T.Bellahcene[a], J. Capelle[b], M.Aberkane[a], Z. Azari[b]

[a] Laboratoire d'Elaboration Caractérisation des Matériaux et Modélisation (LEC2M), Université Mouloud Mammeri de Tizi-Ouzou, Algérie

[b] Laboratoire de Mécanique, Biomécanique, Polymère, Structures (LaBPS), Ecole Nationale d'Ingénieurs de Metz – Université Paul Verlaine de Metz, Ile du Saulcy, 57045 Metz, France

azari@enim.fr

Abstract

The hydrogen electrochemical charging of pipe line steel API 5L X70 was used to determine the hydrogen concentration in metal C_H; total quantity of evaluated Q_{ev} and absorbed Q_{abs} hydrogen; and coefficient of efficiency of hydrogen permeation in metal $k = Q_{abs}/Q_{ev}$. These parameters were evaluated for both unloaded and stressed specimens. The study was conducted in special soil solution NS4 with pH = 6.7 using the potentiostat VMP. The level of load for the stressed specimens corresponds of the internal pressure in pipe under exploitation P_{exp} = 70 bars. The obtained results showed the non-monotonic dependencies of hydrogen concentration C_H on exposure time. After achieving of maximum, hydrogen concentration decreases in time with some fluctuations. The efficiency of hydrogen absorption in metal is quite low and depends on time of exposition. Applied stress in pipe accelerates the hydrogen charging steel. The difference between hydrogen concentrations in stressed metal can exceed more than tree times the hydrogen concentration in unloaded metal.

Keywords: API 5L X70 Steel, Hydrogen, Polarisation, Concentration

ID-456

Unknown-Surface Adaptive Measurement Based on Non-Uniform B-Splines

X.M. He, L.L. Su, R. Zhang, X.G. Ji

Jiangsu Province Key Laboratory of Advanced Food Manufacturing Equipment and Technology,Jiangnan University,Wuxi 214122

Abstract

Surface measurement plays a key role in reverse engineering of free-form surfaces. Considering measurement precision and efficiency of geometry with the freeform feature from the point of view of measurement and reconstruction, continuous curvature adaptive measurement based on non-uniform B-splines is presented. In order to remove noise and point with big error in the measurement process, control coefficient is introduced into the hypotenuse-height method to adjust the algorithm of span,which make the span adjust timely. The coordinate measuring machine can measure whole compound free surface automatically and continuously with improvement in precision and efficiency. Last, the method is illustrated with examples. Curve fitting accuracy has achieved the 100 nm level and measurement accuracy of μm level. It has active guidance meaning and applied value to the engineering practice.

Keywords: Free-Form Surface Adaptive Measurement Non-Uniform B-Splines Adaptive Adjustment Of Span

ID-457

Reverse Engineering of Free-form Surface Based on the Closed-Loop Theory

X. M. He[a,b], J. F. He[b], M. P. Wu[a,b] , R. Zhang[c] , X. G. Ji[b]

[a]Jiangsu Province Key Laboratory of Advanced Food Manufacturing Equipment and Technology, Jiangnan University, Wui 214122, China

[b] School of Mechanical Engineering, Jiangnan University, Wuxi 214122, China

[c] School of Science, Jiangnan University, Wuxi 214122, China

Abstract

To seek better methods of measurement and more accurate model of reconstruction in the field of reverse engineering has been the focus of researchers. Based on this, a new method of adaptive measurement, real-time reconstruction and on-line evaluation of free-form surface was presented in this paper. Calculating the coordinates and vectors of points accorded to a Bézier curve with geometric characteristics of the free-form surfaces, adaptive guidance Coordinate Measuring Machining complete measuring and get point cloud. Fitting the point cloud to a surface model by the non-uniform B-spline method, extracting some check points from the surface models based on grids and a feature on the surface, review the location of these check points on the surface with CMM and evaluate the model, then update the surface model to meet the accuracy. Integrated measurement, reconstruction, evaluation with the closed-loop reverse process, established an accurate model. The results of example show that this method with high efficiency of data collection and accuracy of prediction, it can use of the geometric characteristics information of the surface, so that the measuring points distributed over the surface according curvature, real-time reconstruction and on-line evaluation and timely update model, the model can be completely expressed in the physical geometry with microns.

Key words: Closed-Loop Reverse Engineering; Adaptive Measurement; Real-Time Reconstruction; On-Line Evaluation; Free-Form Surfaces

ID-458

The Three-Dimensional Numerical Simulation and Experimental Research on Screw Compressor

H.Xueming[1,2], D.Jin[1], W. Meiping[1], L.Chenggang[2]

[1] School of Mechanical Engineering, Jiangnan University, Wuxi 214122, China
[2] Mechanical Science and Engineering, Huazhong University of Science and Technology, Wuhan 430074, China

Abstract

This paper presents the mathematical model of screw compressors' working process, in which the internal flow domains are divided into three kinds of fluids - the inlet fluid, the primitive volume fluid, and outlet fluid. Grid interface method and dynamic mesh technique of Computational Fluid Dynamics (CFD) theory were utilized to simulate the suction, compression, and discharge process in order to model the dynamic characteristics of the flow domains in a screw compressor.To verify the model is numerically accurate and the simulation method is effective, experiments on the pressure–volume changes in screw compressor were carried out. The Result has shown that the simulation data is in good agreement with the experimental data. Therefore, the numerical calculation model and the simulation method can be very useful for the screw compressor design and research.

Keywords: Screw Compressor ; CFD; Grid Interface; Dynamic Mesh

ID-459

Improving Solar Cell Efficiency with Polyaniline Counter Electrode

M. Re.Nateghi[a], M. B. zarandi[b], R. Azizi[a]

[a] Department of chemistry, Yazd Branch, Islamic Azad University, Yazd, Iran.
[b] department of Physics, Faculty of sciences, Yazd University, Yazd, Iran.

Abstract

Dye-sensitized solar cells (DSSC) present promising solution to global energy and environmental problems owing to their clean, cost-effectiveness and easy fabrication. However, enhancing the efficiency of the DSSC still is an important issue. A DSSC consists of several components, the most prominent being a titanium dioxide/conducting transparent oxide-based photoanode, a dye, I^-/I_3^- reversible redox electrolyte and a counter electrode [1-3]. Noble platinum is generally used as catalytic counter electrode for I^-/I_3^- redox reaction in electrolyte solution. The photoexcited electrons from the dye diffuse through the TiO_2 network in the photoanode and go to the counter electrode which generally consists of platinum (Pt) sputtered onto a fluorine-doped tin oxide (FTO) plate. The Pt in the counter electrode helps in the regeneration of dyes by catalyzing the I^- regeneration from the I_3^- species in the redox couple. Unfortunately, platinum is heavy and expensive for large scale commercial applications and reasonable efforts should be down to replacing cheaper alternatives. In this study, polyaniline was synthesized using more than one dopant (HCl and H_2SO_4 acids) and ammonium peroxy disulphate as oxidant for different polymerization temperature. In order to enhance chemical properties and electrical conductivity of PANI, polyethylene oxide (2000 g/mol) was added to the polymerization reaction vessel. Moreover, to increase the electrical conductivity of the prepared polymer, PANI was doped by iodine vapour at 60 °C for 20 min. Iodine doped polyaniline (PANI) counter electrodes (CEs) on fluorine-doped tin oxide (FTO) glass substrates were fabricated, using spin coating method. The effect of polymerization temperature on surface morphology, structure (such as doping level, conjugation and oxidization state), and electrocatalytic activity for I^-/I_3^- redox reaction of the obtained PANI CEs was investigated by scanning electron microscopy (SEM), UV-Vis absorption spectroscopy, cyclic voltammetry (CV), and electrochemical impedance spectroscopy (EIS). SEM results indicated that with the properly decreasing polymerization temperature from 30 °C down to 0 °C did not influence the specific surface area of PANI CEs. Meanwhile, the conductivity of the PANI CEs increased considerably because of enhanced conjugation. The overall energy conversion efficiency of the DSSC with Iodine doped PANI counter electrode prepared at low temperature reaches 7.10%, which is higher than that of the DSSC with Pt counter electrode (6.75%). This result is approximately 105% of the efficiency of Pt CE based-solar cells. The excellent photoelectric properties, simple preparation procedure and inexpensive cost suggesting that iodine doped PANI CEs polymerized at low temperature with chemical method may replace Pt CEs in DSSCs.

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ID-460

Hybrid Power System Supply for Electric Vehicle

M. Gaiceanu, R. Buhosu

Dunarea de Jos University of Galati

E-mail: Marian.Gaiceanu@ugal.ro

Abstract

In this paper a hybrid power system for supplying the electric vehicle is proposed. The power system combines two complementary technologies: fuel cells and one storage element (super capacitor). The objective of this paper is to maintain a high level of reliability with minimal cost through optimal design of hybrid electric vehicle system. For this reason, it is presented the optimum design method of a real size hybrid power generation.

The primary objective of this study is to propose a strategy for the control of an electric vehicle powered by a source consisting of a hybrid fuel cell main source and the auxiliary power super capacitor. The fuel cell supply is made by using the electrolysis of water.

Modeling, control design of the hybrid system is validated by using the Matlab/Simulink software environment.

Keywords: Fuell Cell, Electrolysis, Super Capacitor, Boost Power Converter, Electric Vehicle

ID-461

Optimizing Residential Energy Consumption in Romania

I. Smeureanu, M. Dardala, A. Reveiu, F. Furtuna

Bucharest University of Economic Studies, 6 Romana Square, 1st District, Bucharest, Romania Tel:+4.021.319.19.00

smeurean@ase.ro

Abstract

This paper proposes a modelling approach based on TIMES/VEDA systems, designed to optimize energy system model and connected aspects, like economic development and consumer behavior, in order to decrease energy consumption in households. Not only the economic and technological factors, but also the social factors have been used to set-up the energy model and to express the possible scenarios. A case study of Romania's residential energy consumption model is included.

TIMES (The Integrated MARKAL EFOM System) is developed by the Energy Technology Systems Analysis Programme, under the International Energy Agency. It is widely used for modelling a specific energy system at the national, regional, provincial, or community level. The model is driven by least-cost approach, and it is used in order to identify cost-effective responses to emission reduction targets.

The mathematical description using TIMES is based on the concept of a Reference Energy System, as a network of three basic entities: technologies, commodities and their connections, through commodity flows.

From a mathematical perspective, the model fits in linear programming with a dynamic solution; the objective function aims to minimize the total cost throughout the time horizon, using an update of the annual costs based on a discount rate.

The model takes into account the processes of the conversion technologies, describing equationally the efficiency of transforming the primary resources into energy, taking into account the technical transformation coefficients, costs, installed capacities coefficients, operating and maintenance time and costs.

The constraints of the model describe all energy flows: production of electricity and centralized heat, industrial processes, consumption by end-use technologies and lastly energy services.

The model restrictions are related to the legislation or market, being driven by the cost of obtaining a unit of energy and hence, the selling price; however, to a large extent, the market restrictions are in turn influenced by the relationships between suppliers and consumers, the consumer behavior having an crucial role.

The set of relations that are established between the magnitudes of variables that appear in the model, regarding the extraction, transportation, storage, energy conversion processes from one form to another, towards the final consumer.

Behavioral influences in energy consumption are modeled through virtual technologies, created by using data collected from sociological surveys, in order to capture the attitudes and behaviors of Romanians, regarding energy consumption. The technologies designed base on sociological data are combined, inside the designed model, with traditional and tangible technologies. An important result of this research approach is the possibility to include inside the energy model the real behavior of consumers, as well as economically rational technology choices.

The research results give us an insight about the importance of influencing the population to migrate towards new technologies and about the induction of consumer savings.

We consider very useful for Romania, and not only, the scientific results achieved, presented inside the papers because of some specificity of Romania's economy: a deep restructuring industry, an agriculture requiring major investments and energy consumption per household of more than 3 times higher than in some EU countries.

Keywords: TIMES Model, Reference Energy System, Consumer Behavior, Optimization Models, Sociological Survey

ID-462

Poly Aniline Derivatives Counter Electrodes for Dye Sensitized Solar Cells

Mahmoud Borhani zarandi[1], Mohammad Reza Nateghi[2], , Hossein Zarnegari[2], Samaneh Mozaffari[1]

[1]Department of Physics, Faculty of sciences, Yazd University, Yazd, Iran.
[2]Department of chemistry, Yazd Branch, Islamic Azad University, Yazd, Iran. Tel: +98 351 8211391;
E-mail: mnateghi@iauyazd.ac.ir

Abstract
Dye-sensitized solar cells (DSSCs) have currently attracted tremendous scientific interests for the conversion of sunlight into electricity because of their low cost and ease of fabrication [1,2]. The counter electrode (CE) is a crucial component of a DSSC and its price and capability determines the future large-scale manufacture of DSSCs [3]. Noble platinum is generally used as catalytic counter electrode for I/I_3^- redox reaction in electrolyte solution. Unfortunately, platinum is heavy and expensive for large scale commercial applications and obviously, developing an alternative CE with high catalytic activity, low electrical resistance, low-cost, and chemical stability is an important issue to enhance the practical application for the DSSC system. Li et al. used chemically prepared PANI as CE of DSSC, achieving better conversion efficiencies than that using Pt [4]. In the present study, poly diphenyl amine, poly benzidine and their copolymer, poly aniline and poly (diphenyl amine-co-p-phenylene diamine) were synthesized in 1.0 M H_2SO_4 solution on a conducting FTO glass by cyclic voltammetry technique to construct a low cost counter electrode for DSSCs. The potential sweep range was -0.2 V to 1.0 V with scan rate of 0.1 V/s and cycle repetitions of 50. In order to enhance the electrical conductivities of the prepared polymers, they were doped by iodine vapor at 60 °C for 20 min. The following order was obtained for conversion of sunlight into electricity efficiencies of the DSSCs constructed by the above mentioned polymer CEs. PANI > poly (diphenyl amine-co-p-phenylene diamine)> poly diphenyl amine> poly (diphenyl amine-co-benzidine)> poly benzidine. Comparison of the molecular structures of the prepared polymers reveals that poly aniline and poly (diphenyl amine-co-p-phenylene diamine) have similar structures in which the number of active centers forming polarons is higher than those of other polymers. So the greater doping level is achieved in the electrochemically synthesized PANI and poly (diphenyl amine-co-p-phenylene diamine). DSSC based on electropolymerized PANI counter electrode shows the best photovoltaic conversion efficiency (5.16%), which is comparable to 5.94% of that with Pt CE under the same experimental condition.

ID-463

Analysis of Air Velocity, Moisture and Thermal Regime in a Double-Shell Roof

Martin Kovac[1], Jaroslav Vojtus[2]

Department of Architectural Engineering, Faculty of Civil Engineering, Technical University of Kosice
Vysokoskolska 4, 042 00 Kosice, Slovak Republic
E-mail: [1]martin.kovac@tuke.sk, [2]jaroslav.vojtus@tuke.sk

Abstract

This work was based on the need to gain a better understanding of the air velocity using CFD simulation as a form of verification of the functionality of ventilated air gaps in real constructions. The moisture regime of roofs with open air layers is theoretically assessed as satisfactory in terms of operational reliability by a sufficient margin. We used different simulation software in order to reveal local imperfections, in order to realize moisture diffusion from residential spaces through ceilings without a vapour barrier which would ensure the free flow of unwanted condensation on cold surfaces of the envelope leading to defects in the roof.

Keywords: ANSYS, double-shell roof, condensation

ID-464

Simulation of Energy Demand in a Shopping Centre – Case Study

M. Kovac[1], K. Kovacova[2]

Department of Architectural Engineering, Faculty of Civil Engineering, Technical University of Kosice
Vysokoskolska 4, 042 00 Kosice, Slovak Republic
e-mail: [1]martin.kovac@tuke.sk, [2]katarina.knizova@tuke.sk

Abstract

The target of this contribution is the energy simulation of energy demand for the heating system in winter period and for the cooling system in summer period. The object of the energy simulation is the shopping centre situated in Kosice (Slovakia). It is solved the main passage of the centre that is basically the internal enclosed atrium connecting three stories. This space allows all customers to move in the centre and is also connected to the adjacent smaller shops. The passage has large glass surfaces on the exterior walls and on the roof. Mainly because of this state the interior is much overheated in summer period. There are proposed and analysed passive shading devices, there are solar window films. The energy simulation is elaborated in order to evaluate the yearlong operation of internal environment in term of energy demand.

Keywords: energy demand, energy simulation, shading devices, Design Builder, shopping centre

ID-465

Fabrication of Optimized Aluminum-Doped Zinc Oxide Films as Front Contacts for Cu (In, Ga) Se2-Based Solar Cells via Rf Magnetron Sputtering

John Paul Garcia[a], Stefano Rampino[b], Francesco Pattini[b], Edmondo Gilioli[b], Matteo Bronzoni[b], and Filippo Annoni[b]

[a] Delft Product & Process Design Institute, Delft University of Technology, Julianalaan 67, 2628 BC DELFT, The Netherlands, Phone number: +31 648 376752

e-mail: J.P.Garcia@tudelft.nl

[b] Istituto Materiali per Elettronica e Magnetismo IMEM – CNR, Parco Area delle Scienze, 37/A, 43124 Parma, Italy, Phone number : +39 0521269279

e-mail: rampino@imem.cnr.it, fpattini@gmail.com, edi@imem.cnr.it, matteo.bronzoni@imem.cnr.it, fil.annoni@gmail.com

Abstract

CIGS ($Cu(In,Ga)Se_2$)-based thin film solar cells are poised to attain efficiencies comparable to that of silicon-based solar cells, the dominant photovoltaic devices in the market nowadays. Although current technology has rendered scale-up production a reality, it has yet to reach its full potential as a viable means of energy production. For fully efficient CIGS-based thin film solar cells to develop, the fabrication processes of each of its components must be optimized.

In this study, an optimized aluminum-doped zinc oxide (AZO) thin film front contact for CIGS-based solar cells was fabricated via Radio Frequency Magnetron Sputtering (RFMS). The parameters of the technique were tweaked to obtain highly conductive and transparent AZO thin films. The optimized, 890 nm thick AZO film was found to possess a resistivity of 6.7×10^{-4} Ωcm and an average transmittance of 86% in the 400-1100 nm wavelength range. The parameters of the RFMS that were used to attain the high quality film are the following: a. Working gas (Argon); b. Working gas pressure (5.00×10^{-3} mbar); c. Heater temperature (200°C); d. Substrate-target distance (8.0 cm); and e. RF Power (120 W).

To test the suitability of RFMS for the large scale deposition of AZO, its thickness distribution over a large area substrate was measured. It was found that RFMS offered a uniform deposition of AZO on a 17.5 cm^2 substrate. As determined experimentally, the thickness distribution was characterized by the equation $J = J_0(0.7\cos\Theta + 0.3\cos^n\Theta)$, where J_0 is the particle flux perpendicular to the target and J is the particle flux at angle Θ. Moreover, RFMS AZO thin films were fabricated atop actual CIGS-based solar cells and their performances were quantified. Using the aforementioned optimized parameters for AZO deposition, it was found that RFMS yielded highly conductive and transparent AZO films which enabled the fabrication of an 11.4% efficient CIGS-based solar cell with a 6.25 cm^2 area.

ID-466

Pt Nanoparticles Intercalated Graphene Incorporated Polyaniline Counter Electrode For Dye Sensitized Solar Cells

Mohammad Reza Nateghi[1*], Mahmoud Borhani zarandi[2], Samaneh Mozaffari[2]

[1] Department of chemistry, Yazd Branch, Islamic Azad University, Yazd, Iran.

[2] department of Physics, Faculty of sciences, Yazd University, Yazd, Iran.

Tel: +98 351 8211391; e-mail: mnateghi@iauyazd.ac.ir

Abstract

Advances in Dye Sensitized Solar Cells (DSSCs) showed significant improvement since the first report by O'Regan and Grätzel in 1991 [1]. Counter electrode (CE), one of the indispensable components in DSSC, is usually constructed of conducting glass substrates coated with platinum films due to its excellent electrocatalytic activity for I_3^-/I^- redox couple. However, platinum is so expensive, and the cost of platinum CE is over 40% of the whole photovoltaic cell regardless of its preparation method [2]. Therefore, great effort has been made to develop low cost and more efficient cathodic materials. Polyaniline (PANI) is a promising candidate for CE materials used in DSSC because of its low cost, high-conductivity, and excellent catalytic activity for I_3^- reduction. However the conductivity of the polymer film is a key factor for efficient charge transfer and cell performance. Graphene has many interesting properties such as large surface area, ballistic transport on submicron scales, massless Dirac fermion charge carrier abilities and easily large scale low cost synthesis. By intercalation of Pt nanoparticles on the graphene nanoflakes and subsequently incorporation into the PANI matrix at very low level (0.8 wt %) a new nano composite is produced which is highly conductive and can be used as counter electrode in DSSC fabrication. Graphene flakes were prepared from direct ultrasonication of graphite powder in glacial acetic acid in the presence of Hexadecyl trimethylammonium bromide and subsequently well dispersed in THF solvent by ultrasonication [3,4]. Pt nanoparticles were prepared in THF solution of $PtCl_2$ by reduction method using $NaBH_4$ reducing agent. The colloidal solution of synthesized Pt nanoparticles was added to the ultrasonicated graphene suspension so that the Pt to graphene weight ratio of 1:2 in final solution is achieved and then sonicated again for 1 h to disperse and immobilize the Pt nanoparticles on the surface of the graphene plates. The resulted suspension solution was centrifuged to remove excess $NaBH_4$ and THF, and again dispersed in distilled water by ultrasonication. PANI powder prepared by chemical oxidative polymerization in HCl solution was added to the suspension solution of Pt-graphene nano particles so that the Pt:graphene:PANI weight ratios of 5:10:85 is achieved and ultrasonicated for 1 h. A thin film of the nanocomposite was coated on the FTO conductive glass by spin coating technique and used as counter electrod in fabrication of DSSC. DSSCs based on polymerized PANI and the new nanocomposite counter electrodes show photovoltaic conversion efficiencies of 4.76% and 6.19% respectively under the same experimental conditions. SEM, EDX, XRD, EIS, and UV-vis techniques were used to characterize Pt nanoparticles intercalated graphene and nanocomposite films.

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Tio$_2$ Anodes by a Polyol-Assisted Pyro-Synthesis for Rechargeable Batteries

Vinod Mathew[a], Jihyeon Gim[a], Muhammad Hilmy Alfaruqi[a], Sungjin Kim[a], Jinju Song[a], Baboo Joseph Paul, Jeonggeun Jo[a], Seulgi Lee[a], Sohyun Park[a], Jaekook Kim[a,*]

[a]Department of Materials Science and Engineering, Chonnam National University, Gwangju, South Korea
[*]Corresponding author. Tel.: +82-62-530-1703; fax: +82-62-530-1699.
E-mail: jaekook@chonnam.ac.kr (J. Kim)

Abstract

Anatase-type TiO_2 was prepared using a rapid polyol-assisted pyro-synthetic strategy performed at ambient temperatures followed by mild annealing at various temperatures. The XRD studies confirmed the phase characteristics of the prepared samples and electron microscopy images revealed that the size of the particles ranged between a few nanometers to less than hundred nanometers. Anatase-type TiO_2 is one of the few phases that exhibit impressive electrochemical reactivity with lithium and sodium. Hence, the prepared samples were tested for anode applications in rechargeable lithium and sodium batteries. As anticipated, the characteristic potential at 1.76 vs Li/Li^+ clearly confirmed the highly crystalline character of TiO_2. Among, the prepared samples, the 500 °C sample demonstrated the most impressive electrode properties. Precisely, a fairly steady capacity of 200 mAh g^{-1} was maintained versus lithium at 0.05 C even after 100 cycles with almost 100% Coulombic efficiencies. The reasons for the impressive performance were not only attributed to the optimum particle-size and annealing temperature but also the difference in the porous features in the prepared samples, as revealed by the pore distribution studies performed on the samples. The present study introduces a promising material to be used as a highly promising anode for rechargeable battery systems and also facilitates its use in a variety of other applications. Furthermore, the present strategy may provide simple solutions towards simple and large-scale production of functional nanomaterials useful for a wide range of energy-related applications.

Keywords: energy storage, rechargeable batteries, anodes, pyro-synthesis, nanomaterials, anatase-TiO_2, porous features

ID-468

Numerical Simulation of the Type Conversion in N^+-P-P^+ Si Solar Cells, Used for Space Applications, Under 1 Mev Electron Irradiation

A.Hammache, N. Sengouga* and Af. Meftah

Laboratory of Metallic and Semiconducting Materials (LMSM), Université de Biskra, BP 455 RP, 07000 Biskra, Algeria
E-mail : n.sengouga@univ-biskra.dz (N. Sengouga)

Abstract

Solar cells, used for space applications, are exposed to energetic particles such as protons and electrons. The energetic particles create defects in the active region of the solar cell and the latter performance can be severely degraded. One of the phenomenons observed in Silicon solar cells exposed to 1 MeV electron irradiation is type conversion of its active region. This behaviour is numerically simulated using the SCAPS software. The current-voltage characteristics of a Si n^+-p-p^+ structure are calculated under AM0 for different fluences of 1MeV electrons. It was found that, amongst the many defects created, only one of them is responsible for type conversion. It is a minority trap that is an electron trap in the p-type base of the n^+-p-p^+ solar cell.

Keywords: Si solar cells, 1MeV electron irradiation, type inversion, numerical simulation.

ID-469

Layered-Type $Li_xni_{1/3}Co_{1/3}Mn_{1/3}O_2$ Cathodes by a Simple Redox Reaction at Ambient Temperatures for Rechargeable Li-Ion Batteries

Baboo Joseph Paul[a], Jihyeon Gim[a], Duong Pham Tung, Jinju Song[a], Sungjin Kim[a], Vinod Mathew[a], Wangeun Park[a], Jaekook Kim[a,*]

[a]Department of Materials Science and Engineering, Chonnam National University, Gwangju, South Korea

[*]Corresponding author. Tel.: +82-62-530-1703; fax: +82-62-530-1699.

E-mail: jaekook@chonnam.ac.kr (J. Kim)

Abstract

Layered-type $Li_x(Ni_{1/3}Co_{1/3}Mn_{1/3})O_2$ cathode was synthesized by a simple redox reaction performed at ambient temperatures followed by two-step annealing at 600 and 950 °C respectively. The ambient strategy involves the spontaneous transfer of electrons between an aquo-ion and an oxo-ion to facilitate a change in the oxidation states of the transition metals and ultimately form the desired layered-type cathode at elevated temperatures. The lithium precursor content was varied to analyze the formation of layered-type cathodes at elevated temperatures and their variation in electrochemical properties. The XRD studies clearly confirmed the formation of layered-type structures corresponding to hexagonal α-$NaFeO_2$ (space group R-3m). The ICP studies confirmed the chemical stoichiometric composition of the prepared samples. FE-SEM images revealed that the particle growth occurred when heated at elevated temperatures of 950°C and the average particle diameter was around few micrometers. The electrochemical tests performed versus lithium indicated that competitive specific capacity values were registered for the prepared cathodes and the capacity retention was impressive on repeated charge/discharge cycling within the potential range of 3.0 – 4.3 V and a current density of 0.05 C. In particular, the sample prepared using a slightly high lithium content (~ 1.05 mol) demonstrated the highest capacity retention value (~ 98%) and also the highest discharge capacity (~ 141.6 mAh g^{-1}) after 50 cycles. The reasons for the impressive performance have been attributed to the presence of an optimum amount of excess lithium that not only suppress the formation of secondary impurities but also provide lithium toward capacity stabilization during charge/discharge cycling. Furthermore, the present ambient temperature strategy offers simple solutions to arrive at large-scale production of a variety of energy storage materials for useful applications.

Keywords: energy storage, rechargeable batteries, cathodes, redox reaction, $Li_x(Ni_{1/3}Co_{1/3}Mn_{1/3})O_2$, electrochemistry

ID-470

Nano-Crystalline $Li_3V_2(PO_4)_3$/C Cathode by One-Pot Pyro-Synthesis for Rechargeable Batteries

Jinju Song[a], Jihyeon Gim[a], Vinod Mathew[a], Sungjin Kim[a], Baboo Joseph Paul[a], Jeonggeun Jo[a], Seokhun Kim[a], Jaekook Kim[a,*]

[a]Department of Materials Science and Engineering, Chonnam National University, Gwangju, South Korea
[*]Corresponding author. Tel.: +82-62-530-1703; fax: +82-62-530-1699.
E-mail: jaekook@chonnam.ac.kr (J. Kim)

Abstract

A monoclinic $Li_3V_2(PO_4)_3$/C (LVP/C) cathode for lithium battery applications was synthesized by a polyol-assisted pyro-synthesis without further heat treatment. The polyol in the present synthesis acts not only as a solvent, reducing agent and a carbon source but also as a low-cost fuel that facilitates a combustion process combined with the release of ultrahigh exothermic energy useful for nucleation process.. An analysis of X-ray diffraction (XRD) patterns was used to determine the unit cell parameters of the prepared LVP/C. Electron microscopic studies revealed sphere-type particles with average particle-sizes in the range of 40 – 100 nm. When tested for Li-insertion properties in the potential windows of 3–4.3 and 3–4.8 V, the LVP/C cathode demonstrated initial discharge capacities of 139.7 and 190.3 mAh/g at 0.08 and 0.05 C current densities respectively with impressive capacity retentions for 50 cycles. The present study introduces nano-crystalline $Li_3V_2(PO_4)_3$/C to be used as a highly promising cathode for lithium ion battery systems and also its use in a variety of other applications. Moreover, the present strategy may provide highly crystalline nanomaterials under reaction times of a few seconds in open-air conditions without further heat treatment.

Keyword : one-pot pyro-synthesis, nano-crystalline, NASICON, cathode, rechargeable batteries

ID-471

Amorphous $Na_{0.5}mno_2$ Cathode Synthesized by Facile Reduction Process for Sodium Secondary Batteries

Jihyeon Gim[a], Jinju Song[a], Sungjin Kim[a], Vinod Mathew[a], Baboo Joseph Paul[a], Dongyun Kim[a], Sohyun Park[a], Sukyeong Nam[a], Jaekook Kim[a,*]

[a]Department of Materials Science and Engineering, Chonnam National University, Gwangju, South Korea
*Corresponding author. Tel.: +82-62-530-1703; fax: +82-62-530-1699.
E-mail address: jaekook@chonnam.ac.kr (J. Kim)

Abstract

A nonstoichiometric sodium manganese oxide $Na_{0.5}MnO_2$ cathode was synthesized by an ambient temperature strategy that involved facile reduction of aqueous sodium permanganate in sodium iodide and subsequent heat treatment at 250 °C under vacuum condition. Crystalline $Na_{0.5}MnO_2$ sample was also prepared at 600 °C at Air atmosphere for comparison and understanding of structural information using X-ray diffraction analysis. The annealed sample was confirmed to belong to P2-hexagenoal phase while the result of vacuum heated sample showed amorphous characteristic pattern without any specific peaks. The ICP-AES results approved that the stoichiometry of the sample to be $Na_{0.5}MnO_{2+\delta}$. Electron microscopy studies revealed that particle size of the amorphous is ranged from 30 nm to 60nm. The crystallinity of vacuum sample was checked by observing dark-field and bright-field image using Transmission Electron Microscopy analysis. BET revealed the surface area of sample to be 40.179 m^2 g^{-1} showing mesoporous properties. The amorphous $Na_{0.5}MnO_2$ cathode delivered an average discharge capacity of 200 mA h g^{-1} at low current density. Ex situ XANES studies confirmed the reversible intercalation of sodium into $Na_{0.5}MnO_2$ and suggested the accommodation of over-stoichiometric Mn^{4+} ions to contribute towards the performance of the electrode.

Key words: Sodium ion batteries, Manganese, Energy storage, Amorphous, Sodium permanganate

ID-472

Scandium Doped Porous Glass Microspheres for Hydrogen Storage

Sridhar Dalai[1], Vijayalakshmi.S[2*], Pragya Shrivastava[3] Pratibha Sharma[4]

[1,2,3] Centre for Research in Nanotechnology and Science, Indian Institute of Technology Bombay (IITB), India

[4] Department of Energy Science and Engineering, Indian Institute of Technology Bombay (IITB), India

[2*] Corresponding author Telephone No.: +91-22-25767671

Email id : [1,2,3,4] : sridhar.d@iitb.ac.in, vlakshmi@iitb.ac.in, pragya_shrivastava@iitb.ac.in, pratibha_sharma@iitb.ac.in

Abstract

Developing hydrogen as the next generation energy carrier, has become the research target, world-wide in the energy sector. Hydrogen is definitely a clean energy source with a very high chemical energy density, approximately, 39 $kWhkg^{-1}$. This paper focuses on a fully reversible physical adsorption of hydrogen on modified porous glass spheres at moderate temperature and pressure. The DOE target for such physisorption of hydrogen on porous materials is ~ 2wt % at temperature 77 K and pressure 100 bar. Keeping the DOE target, porous walled hollow glass microspheres from amber colored glass were prepared by flame spherodisation method. After ascertaining the fabrication parameters for complete conversion of glass powder to hollow glass microspheres (HGM), experiments were done to modify the glass microspheres to form nano-porous walled HGM. Effect of blowing agents to develop the pores as well as tailor the pores to nano size was studied. In this paper, the authors report the effect of scandium acetate on the pore formation on the HGM wall. Washed and dried amber glass powder was thoroughly mixed with scandium acetate solution using probe sonicator, gently dried at 60^{o}C on a magnetic stirrer. The scandium loading on the glass powder was 1, 2 and 2.5 wt%. The glass powder was flame spherodised on air-acetylene flame to get nano porous-walled HGM with scandium oxide doping. The samples prepared were labeled as HASc0, HASc1, HASc2, HASc2.5, where the numbers in the sample code represent the wt% of scandium in the feed glass. The chemical composition and morphology of the samples were analyzed using ESEM, FESEM and FEG TEM with EDX facility. The ESEM and FESEM images confirmed that the conversion of the feed glass to HGM was > 95% for all the samples prepared. The presence of scandium along with Si, Na, Ca, Al, Mg, K, Fe, O and S was observed in the FESEM EDX report. Further characterization of the samples to study the doping of scandium oxide on the HGMs was done using FTIR and XRD techniques. Very weak FTIR signal for proving the presence of Sc-O was seen in the scandium 1 % doped HGM. Clear FTIR signal for scandium acetate was obtained for the scandium acetate blended feed glass powder. The XRD of all the HGM samples showed a hump centered at 2θ value 22^o. Hydrogen adsorption on the samples was done at 10 bar pressure for 100 and 200^{o}C on Sievert's type adsorption apparatus. The hydrogen adsorption capacity on HGM with no scandium loading was found to be only 1.23 wt %. The hydrogen adsorption on the HASc1 was > 2.2 wt.% at 100^{o}C and pressure 10bar. The hydrogen storage on the HGM samples takes place by diffusion through the nano and micropores of the HGM wall. Hence the DOE target of hydrogen storage at 77K cannot be achieved using HGM. But the hydrogen storage equivalent to DOE target for porous materials at moderate temperature and pressure is achieved.

Keywords: Amber glass, Porous glass microspheres, Scandium acetate, Hydrogen storage.

ID-473

$Na_3V_2(PO_4)_3/C$ Cathode Prepared by a Polyol-Assisted Pyro-Synthesis for Rechargeable Sodium-Ion Batteries

Sungjin Kim[a], Jinju Song[a], Baboo Joseph Paul, Jihyeon Gim[a], Vinod Mathew[a], Seokhun Kim[a], Jaekook Kim[a,*]

[a]Department of Materials Science and Engineering, Chonnam National University, Gwangju, South Korea
[*]Corresponding author. Tel.: +82-62-530-1703; fax: +82-62-530-1699.
E-mail: jaekook@chonnam.ac.kr (J. Kim)

Abstract

The long-term success of large-scale rechargeable battery systems mainly depends on two major aspects of cost and safety concerns. Progressive advancement in non-aqueous electrolyte based battery technologies is visualized not only in terms of a shift from Li-ion to Na-ion battery systems but also to investigate the feasibility of developing structurally stable phosphates rather than oxides as intercalation hosts in order to suit the demands of the larger format market. In this study, $Na_3V_2(PO_4)_3/C$ cathode was synthesized by a polyol-assisted pyro-synthetic reaction and subsequent sintering at various temperatures. The XRD patterns of all these samples were well indexed to the pure NASICON-type structure. Electron microscopy images revealed the presence of nanometer to micrometer sized particles in all the prepared samples. The electrochemical measurements revealed competitive electrode performances of all the prepared cathodes versus sodium. In particular, the sample heated at 800 °C exhibited discharge capacities of 235 $mAhg^{-1}$ that correspond to an extraction of 4 Na per formula. The cathode also demonstrated steady capacity retention and impressive rate capabilities that maintained 56% of theoretical capacity at 2.67 C. The reasons for the better electrochemical properties were attributed to the combined contributions of carbon painting, carbon networking, dual porosity, and high sample surface areas. The present synthetic strategy thus offers the possibilities to achieve high rate capability even in electronically unfavorable phosphate electrode for rechargeable sodium ion batteries.

Keywords: energy storage, sodium batteries, cathodes, pyro-synthesis, polyol, nanomaterials, $Na_3V_2(PO_4)_3/C$

ID-474

Photo-Electrochemical Studies of Dye Sensitized Solar Cell

Mahaveer Genwa

Department of Chemistry, Deen Dayal Upadhyaya College (University of Delhi), Shivaji Marg, Karampura, New-Delhi, Delhi-110015, INDIA,

E-mail: mahaveergenwa@yahoo.com,

Abstract

The photogalvanic effect in electrochemical cells, employing Bromothymol blue as photosensitizer, Sodium Lauryl Sulphate as surfactant and Oxalic acid as electron donor, was experimentally investigated. Seven different standard H-cell configurations were set-up by modifying the electrolyte. Long-term open-circuit voltage measurements were conducted in order to test the stability of the cells. Light on-off reproducibility experiments were also carried out during lengthy cell operations. The photopotential and photocurrent generated by this cell were 880 mV and 215 µA, respectively. The effect of various parameters likes pH, light intensity, diffusion length, reductant concentration, dye concentration, etc. on the electrical output of the cell has been studied. The current voltage (i-V) characteristics of the cell have also been observed and a tentative mechanism for the generation of photocurrent has been proposed. Performance of the cell was determined in dark at its power point.

Keywords*:* Bromothymol blue, Sodium Lauryl Sulphate, Photopotential, Photocurrent, Diffusion Length.

ID-475

Near Infrared Quantum Cutting for Solar Cells in Cef_3:Yb^{3+} Codoped Nanophosphors

Mayuri Gandhi,Nayan Agrawal*, Harshita Bhatia*

Centre for Research in Nanotechnology & Research (CRNTS), Indian Institute of Technology, Powai, Mumbai 400076, India, Phone-+91-22-25768692

emal-mngandhi@iitb.ac.in

Abstract

Over the past decades , the study of rare earth Co-doped luminescent materials have become one of the most important topic in nanoscience because of their great potential applications in Light Emitting Devices, solid state lasers , telecommunications, opto-electronics, biological labels and remote sensing applications. Optical transitions for rare earth co doped material are governed mainly by the fact that the 4f electrons in the antepenultimate shell are very effectively shielded from their chemical environment outside the atom by the 5s and 5p electrons. The absorption and emission properties of rare earth doped/Co- doped material can be further tailored by controlling the local environment, such as site symmetry, crystal field strength and electron phonon interaction strength of rare earth dopants. Rare earth fluoride has been attracting attention by the virtue of its technological importance because of its various properties like low phonon energy ,large optical transmission domain, high resistivity , high density, high radiation resistance , fast response and anionic conductivity. The CeF3 nanophosphors with [Tb,Yb], [Eu,Yb],[Ho,Yb], [Nd,Yb], [Er,Yb], codoped system were prepared by coprecipitation method and characterized by X-ray diffraction (XRD), scanning electron microscope (SEM) and transmission electron microscopy (TEM). Their photoluminescence properties including excitation spectra and near infrared (NIR) emission spectra and fluorescence spectras were studied. In the CeF3: Yb3+ nanophosphors an intensity infrared emission originated from Yb3+ 2F5/2 - 2F7/2 transition at 900-1050 nm matching to the energy of Si band gap of Si-based solar cells was observed under the excitation of 5d level of Ce3+. The quantum efficiency (QE) increases with increasing Yb3+ concentration..In the Co doping mechanism of RE ions, one of the RE3+ ions act as a sensitizer that absorbs the photon efficiently at certain wavelength and transfers the excitations to the other RE ion (acceptor ions). Here in this paper, CeF3 was chosen as a base material and co doping of RE into host matrix. CeF3 has low vibrational energies and therefore quenching of the excited state of the RE ions will be minimal. This is especially important for the RE ions emitting in the NIR part of the spectrum because they are sensitive to quenching by high energy vibrations. Various methods like physical, chemical & biological methods have been reported for the synthesis of nanophosphors with uniform size, morphology and composition. Here in this paper, we have used co-precipitation synthesis method to prepare CeF3 Co-doped RE nanophosphors. In order to control the growth and agglomeration of the nanoparticles, organic surfactant, oleic acid was used. Quantum cutting (QC) phosphors via downconversion (DC) have been investigated for the lighting and display industry, however, the potential, application in solar cells has been reported recently only. The efficiency of solar cells can also be enhanced by cutting one high energy photon into two or more low energy photons with energy closed to the band gap of the solar cell (i.e. NIR QC)

Keywords: near-infrared quantum cutting; nanophosphors; efficiency, CeF_3

ID-476

Nanostructured Catalysts Prepared via Electroless Deposition for Hydrogen Release from Nabh$_4$

David Richardson, Fernando M.F. Rhen

Department of Physics and Energy, Materials and Surface Science Institute, University of Limerick, Ireland

Phone +353 61 234824

Email: david.richardson@ul.ie, fernando.rhen@ul.ie

Abstract

Viable hydrogen fuel cells require a cheap, easily accessible source of pure hydrogen with a large storage capacity. Sodium borohydride is an ideal storage material with a storage capacity of 10.8 wt. % and the hydrogen can be controllably released with the use of a suitable catalyst. Nanostructured catalysts are of particular interest due to their increased catalytic surface area, which increases the rate at which hydrogen is produced. Potential catalysts need to have a large hydrogen production rate, be cheap to produce and durable with good recyclability to be practical for future technologies.

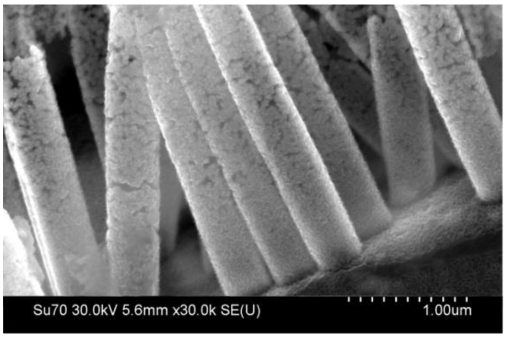


Fig. 1 SEM image of Co-Ni-Fe-B nanotube array

We have prepared a wide variety of nanostructured alloys deposited via electroless deposition and investigated their behaviour as hydrogen releasing catalysts. The nanostructured catalysts are deposited on a porous polycarbonate membrane to form a nanotube array connected by a thin film at both ends as shown in Fig. 1. We have studied a range of alloys including Co-Ni-Fe-B, Co-Ni-B, Ni-B and Co-B as potential catalysts. As the catalysts are deposited on a polycarbonate membrane recovery of the nanostructures from the hydrogen generation solution is simple which increases their potential recyclability.

Hydrogen generation was investigated at 25 °C in a pH 12 solution containing 0.025 M NaOH and 0.25 M NaBH$_4$. The solution bath was placed in a sonicator to ensure maximum hydrogen release from the catalyst surface and the hydrogen was collected via a water displacement method. We found that Co-B alloys show the largest hydrogen generation rate of 2685 ml min^{-1} g^{-1} of catalyst, followed by Co-Ni-Fe-B with a rate of 2030 ml min^{-1} g^{-1}. However, the membrane surface area is the limiting factor of these catalysts. The hydrogen generation rates stated above correspond to rates of 6350 ml min^{-1} m^{-2} of membrane for Co-B and 3665 ml min^{-1} m^{-2} for Co-Ni-Fe-B.

The Ni-B alloy shows the lowest hydrogen generation rate of only 700 ml min^{-1} m^{-2}. However, the hydrogen generation rate increases to 2550 ml min^{-1} m^{-2} with the addition of Co to the alloy to form Co-Ni-B. This indicates that Co is the key element in the electroless deposition bath to deposit an active nanostructured catalyst.

We have also found that the largest hydrogen generation rates were recorded for catalysts that had low deposition times. At low deposition times the nanotubes are end-open with a large pore diameter and the nanostructured surface area is maximised. However, as deposition occurs the nanotube pores begin to close and the catalytic surface area is reduced, thus reducing the hydrogen generation rate. Therefore, nanostructured catalysts with low deposition times have the best hydrogen generation rates.

Acknowledgements: This research is supported by the Irish Research Council (RS/2011/270), Science Foundation Ireland (12/IP/1692) and the Irish Research Council New Foundations grant.

ID-477

Effect of Annealing Environment on the Optical, Electrical and Thermoelectric Properties of MBE Grown ZnO Thin Films

Khalid Mahmood[1], M. Asghar[2], M. Yasin Raja[3] Ian Ferguson[3]

[1]Department of Physics, GC University Faisalabad, Pakistan

[2]The Islamia University of Bahawalpur, Bahawalpur, Pakistan

[3]University of North Carolina, Charlotte, USA

E-mail: khalid_mahmood856@yahoo.com

Abstract

In this paper, we have demonstrated the effect of annealing environment on the optical, electrical and thermoelectric properties of MBE grown Zinc Oxide on Si (001) substrate. The grown films were annealed in oxygen, zinc, vacuum and zinc in vacuum rich environments at 600 ^{0}C for one hour. The grown films were characterized by X-ray diffraction (XRD), Photoluminescence spectroscopy (PL), Raman spectroscopy, Hall measurements and Seebeck effect. The PL results showed that intensity of band edge emission (3.28 eV) was improved by annealing in oxygen environment and degrades by annealing in Zn, vacuum and Zn in vacuum environments while FWHM showed vice versa behavior. Sebeck measurements also showed similar trend that Seebeck coefficient and power factor improved with annealing in oxygen. The Hall measurements demonstrated that sample annealed oxygen environment has lowest carrier concentration (3.97×10^{17} cm^{-3}) while sample annealed in Zn in vacuum has highest carrier concentration (5.11×10^{19} cm^{-3}). The improvement of optical and electrical properties while annealing in oxygen can be related with the fact that incoming oxygen spices fills the oxygen vacancies related donor defects and improves the structure. These results were discussed in detail with the help of available literature.

Keywords: ZnO thin films, MBE, Annealing Environment, Optical Properties, Thermoelectric Properties

ID-478

A Fuzzy System to Evaluate the Environmental Effects of Electricity Generation Technologies

Fausto Cavallaro

Department of Economics, Management, Society and Institutions (EGSI)-University of Molise Via De Sanctis, 86100 Campobasso, Italy

E-mail: cavallaro@unimol.it

Abstract

The power plants provided the energy required for the economic and technological development in last decade. At the same time the environmental effects of electricity generation are significant because modern economy uses large amounts of electrical power. So power plants activity can produce positive and negative effects on the population which must be taken into account. In many cases some kinds of power generation systems - due by release of air pollutants, radioactivity, water and soil contaminations (oil spill)- can have a significant adverse impact on the environment increasing health risks and reducing standard of living of local communities.

Considering the crucial importance of this problem, some authors have carried out evaluations of the environmental impact of the various types of electricity generation by means of several approaches. Although some of these methods are excellent environmental evaluation tools they are unfortunately unable to manage uncertain input data.

Fuzzy-set based methods have proved to be able to deal with uncertainty in environmental topics. The innovative contributions proposed by fuzzy-sets relate, on the one hand, to the representation of vague, imprecise and uncertain information, and on the other, to handling such information using fuzzy rules and tools. This approach offers a solution to the problem of human interpretation (data expertise, etc.).

In this paper a methodology based on fuzzy-sets is proposed to assess the impact on local scale of the sustainability of the most important electricity power production technologies.

ID-479

Low Temperature Hydrogen Sensing in Graphene Oxide-Doped Tungsten Trioxide Nanostructures Produced by Aqueous Chemical Growth

B.T. Sone[1,2], M. Khenfouch[1,2], S.S. Nkosi[2], B.W. Mwakikunga[1,3], B.Julies[4], and M. Maaza[1,2]

[1]UNESCO-UNISA Africa Chair in Nanosciences-Nanotechnology, College of Graduate Studies, University of South Africa, Muckleneuk Ridge, P.O. Box 392, Pretoria, South Africa; [2]Nanosciences African Network (NANOAFNET), Materials Research Department, iThemba LABS-NRF, P.O. Box 722, Somerset West, 7129, South Africa; [3]Council for Scientific and Industrial Research, P. O. Box 395, Pretoria 0001, South Africa; [4]Electron Microscopy Unit, Physics Department, University of the Western Cape, P.B. X17, South Africa,
Tel: +2773 733 9628
Email: sonebert@gmail.com

Abstract

With the need to limit the adverse impact that using fossil fuels has on the global climate it has become necessary to find other environmentally friendly energy sources. In this light the Hydrogen economy has been proposed to replace the current fossil-fuel dependent economy. For safety in the former, sensors able to detect H_2 at low temperatures are being investigated. Recently, we demonstrated the use of ACG to prepare micro/nanostructured WO_3 porous thin films on plain glass microscope slides [1] that could be employed for H_2 sensing. The films were shown via scanning electron microscopy to largely consist of nanoplatelets, some of which were aligned perpendicular to the substrate surface while others existed as hierarchically organized microspherical structures. Transmission electron microscopy and X-Ray diffraction analysis showed the annealed films to exist predominantly in the monoclinic and hexagonal phases. When employed for hydrogen sensing the WO_3 thin films showed optimum sensitivities at 300 ºC with lowest sensing temperature occurring at 200 ºC. To reduce the H_2 sensing temperatures the WO_3 thin films were doped with graphene oxide using ACG. Raman spectroscopy (Fig. 1a) showed the inclusion of graphene oxide in the WO_3 thin films with peaks at 799.66 cm^{-1} and 702.61 cm^{-1} that could be attributed to short and long W-O-W bonds in the stretching mode [2]. The D band peak at 1455 cm^{-1} could be ascribed to sp^3 carbons present in edge defects or the breakdown of translational symmetry in graphene oxide. The G band peak at 1519.86 cm^{-1}, to first-order scattering of the E2g phonon mode in in-plane bound sp^2 carbons present in graphene oxide. From photoluminescence, peaks were observed at 388 nm and 405 nm (deep blue-violet emissions) that could be attributed to band-to-band transitions synonymous with WO_3 in the nanocrystalline state. The broad green-yellow emissions at 542 and 553 nm could be ascribed to deep level defects in the WO_3 thin films; red emission at 665 nm, to the presence of graphene or graphene-oxide allied to the WO_3 micro-/nanostructures. The presence of graphene oxide saw the sensitivity of the WO_3 thin films increase by a factor of five (Fig.1b) while the minimum temperature for H_2 sensing was observed to reduce to 100 ºC. The undoped WO_3 thin films were shown to have a lower sensitivity to CO gas as opposed to H_2 within the 200-350 ºC range. This behaviour can be employed in the selective sensing of H_2 in the presence of CO.

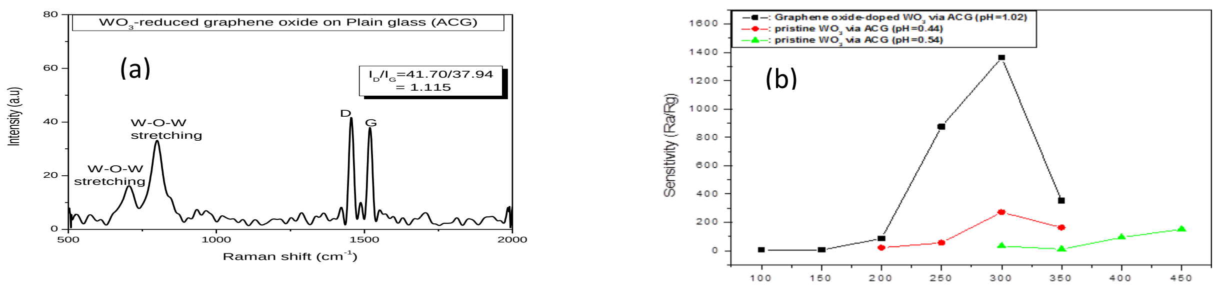


Figure 1: (a) Raman of Graphene oxide-doped WO_3; (b) Comparison of sensitivities of graphene oxide-doped WO_3 and undoped WO_3 to H_2.

ID-480

GA-Based PV Model Parameters Extraction

Abdelghani Harrag(1,2)* & Dalal Boutchicha(2)

1 CCNS Laboratory, Department of Electronics, Faculty of Technology, Ferhat Abbas University, Bejaia Road, Maabouda, Setif 19000 Algeria

2 Department of Electronics, Faculty of Technology, Mohamed Boudiaf University, 166 Ichbilia, Msila 28000 Msila Tel: +213 796 796 6142

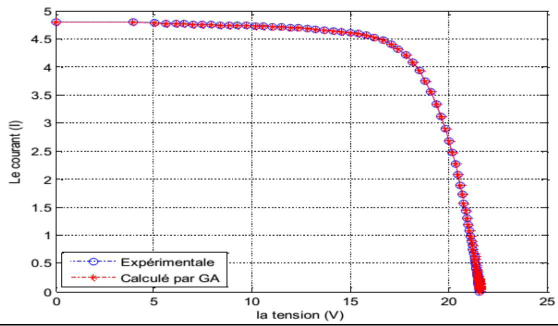
E-mail: a.b.harrag@gmail.com

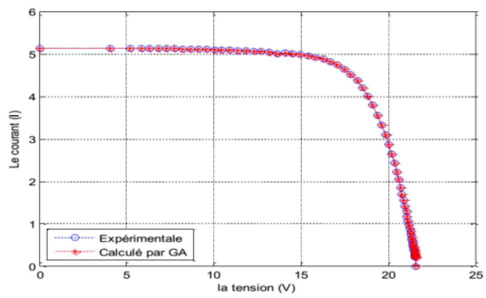
Abstract

To better understand the acting physical mechanisms within the solar generator (cell, module, field), several methods have been proposed for the identification of the different parameters that affect their characteristics, not only for increase their performance, but also to simulate their behavior and optimize their different characteristics. In this work, we propose a new technique based on genetic algorithm for the extraction of electrical parameters (the saturation current, the serial resistance, the parallel resistance and the ideality factor). The models with five and seven parameters respectively are considered. The genetic algorithm is used as a tool for optimization to increase the probability of reaching the global minimum solutions in a short time with a very good accuracy based on the minimization of the quadratic error between experimental and theoretical characteristics. The simulation results show that the accuracy of the heuristic approach is effective for modeling in the case of solar modules. The values of squared errors are around zero (5.8297×10^{-8} and 3.0751×10^{-7} for the five parameter and seven parameters models respectively). On the other hand, the results were obtained after only seven generations which can be considered very fast for a nonlinear optimization problem with many physical constraints. The results prove that the GA is very suitable for estimating electrical parameters needed for modeling the PV array.

Electrical parameters (5 parameters model)	Value
I_{ph} (A)	4.8034
I_s (A)	6.975×10^{-7}
R_s (Ω)	0.8690
R_{sh} (Ω)	420.7004
n	1.4443

Electrical parameters (7 parameters model)	Value
I_{ph} (A)	4.8077
I_{s1}(A)	3.928×10^{-6}
I_{s2} (A)	8.687×10^{-7}
R_s (Ω)	0.5362
R_{sh} (Ω)	453.7285
n_1	1.5697
n_2	1.6060





ID-481

Parallel Active Filtering of Harmonic Current Generated by a Three-Phase Bridge Rectifiers No Controlled

S.Ouchen [(1)]

LGEB laboratory genie electric Biskra, University MOUHAMMED KHIDER Biskra Algeria +213772493375

E-mail : Ouchen_sabir@yahoo.fr

Abstract

Static converters generate non sinusoidal currents and absorb reactive power. These perturbations (harmonic) are the origin of many problems and affect electrical equipment's connected to the power supply.

In this article an active power filter is used to eliminate harmonics generated by a nonlinear load (uncontrolled three phase bridge rectifier) with RL and RC load

A simulation by MATLAB SIMULINK of power supply.Active power filter and a nonlinear load using two types of control strategies (hysteresis and PWM technique).

The instantaneous power methods (p-q theory) are applied to calculate and identify harmonic current.

Spectral analyses before and after filtering harmonic is carried out in order to compare the results and determine power active filter efficiency.

The total harmonic distortion (THD) is 72.37% before using shunt active filter; this is reduced to 4.39% for RC load. Concerning RL load, the THD was 23.53% is reduced to 3.85% after using shunt active filter.

The obtained results show a significant harmonies current reduces reduction and the active filter auto-adaptively to load variation (RL1-RL2; RC1-RC2;RL1-RC2)

This active filter is efficient and has show a good filtering characteristics, reducing harmonic to a value 5% satisfying the international recommendation.

ID-482

Neural Network Model for Solar Irradiation Prediction

Abdelghani Harrag(1,2)* & Hanane Djemai(2)

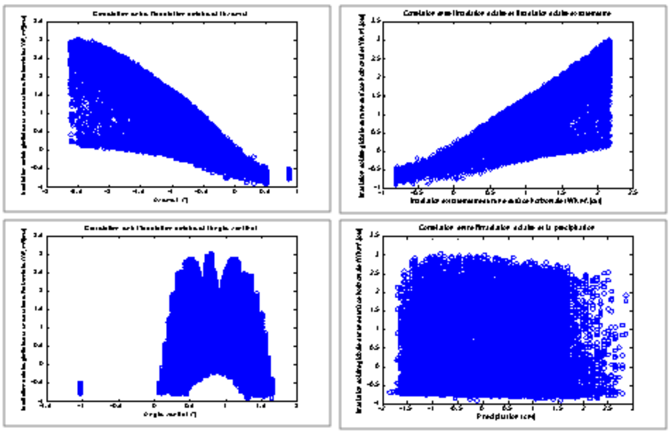
1 CCNS Laboratory, Department of Electronics, Faculty of Technology, Ferhat Abbas University, Bejaia Road, Maabouda, Setif 19000 Algeria

2 Department of Electronics, Faculty of Technology, Mohamed Boudiaf University, 166 Ichbilia, Msila 28000 Msila tel : +213 796 796 6142

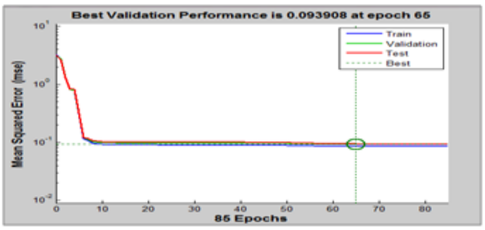
E-mail: a.b.harrag@gmail.com

Abstract

Algeria naturally has a significant solar potential. This qualitative constant favors the exploitation and development of this energy resource. However, the use of this energy requires knowledge of the potential of solar radiation on horizontal and inclined planes. In fact, the objective of this paper is to develop a neural model that can be used to predict the daily global solar radiation average received on a horizontal surface. Several models using different parameters were studied in order to choose the most efficient model based on error between real and predicted irradiation.
The results indicate that the model using as input variables: azimuth, zenith angle, extraterrestrial solar radiation, relative humidity, precipitation and wind speed, is the most efficient among the studied models.
Below some illustrating results.



Model	RMSE
1	0.9198
2	0.3005
3	0.4573
4	0.4157
5	0.2998
6	0.2967
7	0.4087
8	0.2927



ID-483

GA-Based Self-Organization of PV Array Configuration

Abdelghani Harrag[(1,2)*] & Seifeddine Houd[(2)]

[1] CCNS Laboratory, Department of Electronics, Faculty of Technology, Ferhat Abbas University, Bejaia Road, Maabouda, Setif 19000 Algeria

[2] Department of Electronics, Faculty of Technology, Mohamed Boudiaf University, 166 Ichbilia, Msila 28000 Msila

Tel : +213 796 796 6142

Email: a.b.harrag@gmail.com

Abstract

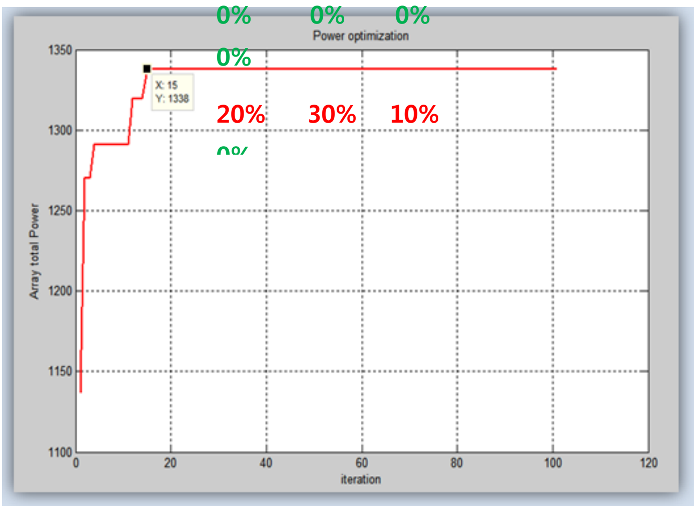
This paper concern the study and simulation of a PV array self-organizing configuration. we introduced a new method to reconfigure the PV array using a genetic algorithm. The proposed method involved the simulation of a PV array of 16 panels 4 strings with 4 panels in series and associated parallel as well as an algorithm that controls the improvement of the overall performance under different conditions and at any time. The results are obtained by simulation under Matlab/Simulink. The rate of improvement varies between 17.75% and 55.51% in all studied cases, which is huge compared to a static configuration operating below the total power available. Another important point is the number of iterations needed to find the optimal configuration (between 5 and 84 for a population of 50 individuals ie 50 configurations tested at each generation). This means that in the worst case (84 iterations), we performed 84x50 = 4200 configurations instead of 1.84×10^{19} necessary in case of exhaustive search to test all possible configurations. This last point is very important in the implementation of the proposed system in auto-tuning of the system in real time condition.

Configurations

Initial matrice				Final matrice			
1	**5**	**9**	**13**	7	6	14	10
2	**6**	**10**	**14**	3	2	5	12
3	**7**	**11**	**15**	9	4	1	16
4	**8**	**12**	**16**	8	11	13	15

P_{init} = 1136.326 W	**P_{final} =1338.0 W**
Improvment = 201.7184 W	
rate (%) = 17.7518	
Need time = 15*$t_{iteration}$	

Shading Pattern



ID-485

Degradation of CdTe Thin Film Solar Cells under Stress Conditions

Nima E. Gorji, Ugo Reggiani, Leonardo Sandrolini

Department of Electrical, Electronic and information Engineering, University of Bologna
Via Risorgimento 2, Bologna 40136, Italy, +39-05120-93590
E-mail: Nima.eshaghigorji2@unibo.it, Ugo.reggiani@unibo.it, Leonardo.sandrolini@unibo.it

Abstract

CdTe thin film solar cells suffer from the degradation of electrical parameters under stress of light, temperature or bias. Inter-diffusion of defects mostly from metallic back contact towards the junction of CdS/CdTe accumulates the recombination centers in the depletion region, changes the band diagrams and the electric field there and degrades the performance. The light induced defect, N, from the excess light generated carriers, n, across the film are coupled via [1],

$$\frac{dN}{dt} = \alpha n - \beta N \qquad (1)$$

where *α* and *β* represent defect creation and annihilation, respectively. Solving Eq. (1) coupled with balance equation in steady state and taking into account the drift current under bias leads to a time-dependent estimation for the degradation rate of the performance parameters. This approach is applied in our numerical analysis to understanding the effect of light generated excess carriers on the operation of the short-circuited or open-circuited device. We develop our numerical analysis using AMPS-1D simulator known to PV community.

Simulation Baseline

Two different stress conditions are considered assuming that the devices are left under I. open-circuit and II. Short-circuit conditions both under light. The above conditions have been predicted in AMPS-1D: 1 sun light, 1.5AM and bias of 0-1 V including also the typical open-circuit voltage of CdTe solar cells ($V_{oc\sim}$0.85 V). The above range of biasing enables us to provide the open-circuit (I=0, V_{oc}=0.85 V) or short circuit conditions (V=0). For each case, we inserted the new value of n and N in the table of contents of AMPS-1D, ran the program and recorded the performance parameter when the performance parameters changed significantly.

Simulation results

Fig. 1 shows the degradation rate of the electrical parameters under open-circuit and short-circuit condition and under light stress. The time intervals remind us the term αΔt which can be tuned by the exact definition of α unknown so far. The first conclusion is that light can degrade the device parameters over time as a result of defect creation with a significant rate at the junction of CdS/CdTe. The V_{oc} doesn't show a sever degradation and J_{sc}

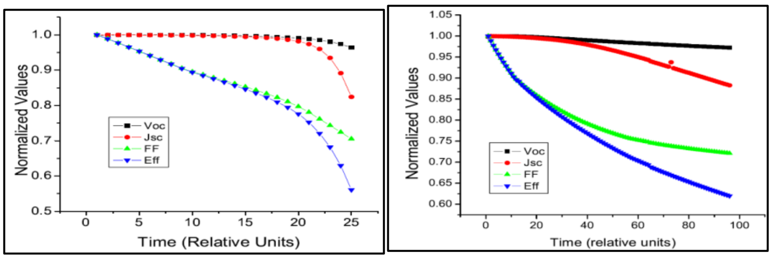


Fig. 1 Degradation rate of short-circuited (up), open-circuited (down) CdS/CdTe device condition under light.

falls by about 10%, still not much change. Dissimilarly, FF and η have significant fluctuations representing that the series resistance increases by defect generation and reduces the quality of the junction over time. These results resemble two CdTe devices that are left under open or short-circuit condition under light and are characterized after each times steps. The degradation in open-circuited device is more significant than the shorted one. In prior condition, the V_{oc} is diminished by the light induced bias and the defect accumulation will continue over time. In contrary, short-circuit condition keeps the device still biased and avoid the extra diffusion of the ion mobile towards the junction which in turn, shows better stability over time [2]. In all the simulations, the carrier generations coupled with defect creation were strongly effective on the performance parameters if increased in junction rather than bulk part of the CdTe layer.

Refereces

[1] R. Harju, V. G. Karpov, D. Grecu, and G. Dorer. J. Appl. Phys. 88 (2000) 1794-1799.
[2] N. E. Gorji, U. Reggiani, L. Sandrolini, Sol. Energy, 86 (3 (2012) 920-925.

ID-486

Structure and Electrochromism in Thin Films of Urchin-Like WO_3 Microspheres Prepared by Aqueous Chemical Growth

B.T. Sone [1,2,3], S.N. Mailu[3], T. Malwela[4], E. Coetsee[5], H. Swart[5], E. Iwuoha[3], and M. Maaza[1]

[1]Materials Research Department, iThemba LABS, P.O. Box 722, Somerset West,7129, South Africa.

[2]NANOAFNET-Materials Research Department, iThemba LABS-NRF, Somerset West, South Africa.

[3]SensorLab, Chemistry Department, University of the Western Cape, Bellville, South Africa.

[4]National Centre for Nanostructured Materials, CSIR, P.O. Box 395, Pretoria,

[5]Physics Department, University of the Free State, P.O. Box 339, Bloemfontein, South Africa

Tel: +27737339628

Email: sonebert@gmail.com;

Abstract

Cooling and heating of buildings accounts for an estimated 30-40% of primary energy used worldwide [1]. Windows often made of glass even with good thermal insulation, are still a major source of energy leaks in many buildings. Thermal regulating windows that offer reversible optical transparencies at the click of a switch or a change in temperature offer huge potential for energy savings in such environments. Electrochromic materials such as WO_3 capable of reversibly switching optical properties on application of a small voltage (< 1V) are therefore currently the subject of renewed interest [1].

Aqueous Chemical Growth (ACG) a low cost, wet-chemistry method [2] has been recently used to prepare thin films of WO_3, that may find application in electrochromic windows. Through this method crystalline thin solid films of WO_3 were grown on un-seeded F-doped SnO_2-coated glass (FTO) [3], at 80-95 ˚C, for a period of 18-24 h. Scanning Electron Microscopy (SEM) showed that the thin films produced contained WO_3 in the form of urchin-like microspheres and fir-trees. A cross-section micrograph of the films, obtained using FIB-SEM, showed them to be highly porous; 2-3 µm thick. X-ray Diffraction analysis post-annealing at 500 ˚C showed WO_3 in the films to be in the hexagonal and cubic phase. From X-Ray Photoelectron Spectroscopy we deduced that tungsten oxide in the film was sub-stoichiometric, $WO_{2.82}$, with W being present in the W^{6+} state. For electrochromism the WO_3 thin films showed, upon H^+ injection/extraction, fairly fast, reversible, optical switching times (< 20 s) (from semi-transparent to deep blue) which could be ascribed to the high porosity of the films and the "open" channels in the perovskite-like hexagonal $WO_{2.82}$. Increase in the scan rates from 10-100 mV/s resulted in an increase in charge injection/extraction into and from the films albeit irreversibly showing that the semi-porous WO_3 films are unstable over 10-12 cycles in acidic media. The H^+ extraction and injection processes are diffusion controlled, with fast diffusion coefficients for H^+ injection/extraction of 3.59×10^{-10} and 1.95×10^{-10} cm^2/s at 100 mV/s respectively, being observed. Using Cyclic Voltammetry coupled to UV-Visible-Near IR spectrophotometry we were able to evaluate the change in optical densities (ΔOD) and the Coloration Efficiency (CE) in the thin films at 650 nm. These results suggest that ACG is a technique that holds potential for producing WO_3 thin films that can be used in electrochromic windows.

ID-487

An Energy Efficient Approach Towards Construction

Atul Vaibhav, Ashutosh Saxena

National Institute of Technology,Allahabad, India

Abstract

This project involves designing a single floor building using low energy materials and brings forth the two most vital aspects of any construction- 1) Energy Efficiency 2) Economy.

Firstly we calculated the dimensions, then volume of materials required in the construction. Those being constant we did the calculations (both energy-wise and financial) in two contrasting levels; if we would have used conventional materials, using alternative low energy materials and produced ratios for both.

This building is designed keeping in mind the energy scenario of a developing country like ours which in addition will give us an economical advantage towards the creation of any edifice. The conventional properties designed and constructed in Allahabad, India show a high energy content, and have the propensity of being expensive with a reduced life. To cumber which, we have designed the construction procedure for any building in the city, considering the 3 most important factors: Orientation, Substitution of conventional with alternatives that not only discount the effective cost by about 70%, but also decrease the effective energy by about 60%.

We started off from taking a random plan, and orient the rooms and fenestration, so as to have maximum natural lighting and ventilation, using criteria picked up from various manuals of 5 nations.

Further, we chose the optimum amounts of replacements that can be made in the conventional material to bring about a considerable reduction in the net costs and energy content. The reduction of embodied energy, thus, increases the life of a structure, that too at a reduced cost, which will be extremely beneficial not only in the Indian scenario, but also for the entire construction world. For instance, the substitution of conventional modular bricks with clay fly ash bricks reduces cost by the ratio 0.3206 and energy by 0.6443. Thus our second step for planning construction of a random plan can be clearly implemented in concordance with above.

Keywords: embodied energy, low energy materials, energy efficiency, orientation

ID-488

A Discussion about the Energy Priorities of Turkey

D. Alkas

[1]Istanbul University, Department of Environmental Engineering, 34320, Avcilar, Istanbul, TURKEY
Tel : +905323503108, Fax: +902124737180
E-mail: denizal@istanbul.edu.tr

Abstract

Energy is the most important input for the sustainability of civilization. Rapid increase of population resulted the increase of the energy demand also in Turkey as in the world in recent years. The energy demand of Turkey is increasing more than its energy production. The Electricity Production Co.(EUAS) which is a government organization for electricity production in Turkey has projected that the total energy consumption will be 222,4 mtoe and the domestic energy production will be only 66,1 mtoe respectively in 2020. Turkey needs more energy resources but must provide environment besides energy production also taking economic conditions into account. Some energy production technologies can cause important environmental effects and need high costs to maintain.

Turkey has quite important energy resources as coal, hydropower, oil, natural gas, solar, wind, geothermal and biomass energy. Unless the utilization of some of these resources is not enough for the demand of the country. Coal and lignite are the largest energy resources of Turkey but the reserves of oil and natural gas are relatively smaller. Solar, wind, geothermal and biomass energy utilization is so far to the desired level. The use of coal for electricity generation caused environmental problems like air pollution in big cities and the greenhouse gas effect. Coal mining also led to environmental problems such as land degradation and sedimentation. Another energy production way of Turkish government is utilization of hydropower plants all around the country but in recent years utilization of very small hydropower plants are caused harmful effects on the natural environment of the project areas. Turkey also imports natural gas from foreign countries and that makes Turkey dependent to these countries everyday more.

The Turkish government aware of these problems and supports the development of energy resources. There are targets to increase the share of renewable energy resources to at least 30% and fully utilize the wind energy, solar energy and geothermal energy until the year 2023. This study aims to compare the energy alternatives of Turkey and it is recommended that the Turkish government must give the primary importance to utilization of solar and wind energy utilization plants with also supporting of private enterprise.

Keywords: Energy, renewable, government,environmental effect

ID-489

Effect of Slag on the Characteristics of Heat-Treated Self-Compacting Mortars in Marine Environment

R. Derabla

Department of Civil Engineering, University of 20 August 1955, B.P 26 road of Elhadaik, Skikda, Algeria,
Tel: (00213) 667252593
E-mail: rderabla@gmail.com

Abstract

Heat treatment is extensively used to accelerate the process of the strength development of concrete and self compacting concrete for prefabrication purposes. Because mortar serves as the basis for the workability properties of self-compacting concrete (SCC), these properties could be assessed by self-compacting mortars (SCMs).

This study was conducted to determine the effect of the substitution level of cement by ground granulated blast furnace slag (GGBFS) on the physical and mechanical characteristics of heat-treated SCM prisms under two storage environments as freshwater and seawater.

The cycle regime of heat treatment process achieves a temperature of 60 °C and total duration of 24 hours. The test results are presented and discussed.

ID-490

The Energy Performance Model of Mechanical and Natural Ventilation

Ing. Richard Nagy, PhD.1, Doc. Danica Košičanová, PhD. [1], Ing. Ján Lojkovics[1]

[1]Institute of Building and Environmental Engineering, Civil Engineering Faculty, Technical University of Kosice, Slovakia
E-mail: Richard.nagy@tuke.sk. Danica.kosicanova@tuke.sk jan.lojkovics@tuke.sk

Abstract

The paper deals with the energy efficiency of the ventilation systems (ventilation units) in different design alternatives (with heat recovery, without recovery, effective fans, etc…). The alternatives of operation of the ventilation system at intervals during the day and throughout the year are also presented. The calculation of the airflow was executed in accordance with laws and standards valid in the EU and Slovakia (EN 15251, EN 13779, etc.). A large potential for energy savings in the Slovak building generally, due to the fact that majority of the buildings were constructed before 1989, before first important requirements for energy performance and savings of building.

ID-491

Energy Recovery from Municipal Green Waste by Thermo-Chemical Conversion Process - a Central Queensland Study

Ashfaque Ahmed Chowdhury[1] , M G Rasul[2]

[1]Central Queensland University, School of Engineering and Built Environment, Faculty of Sciences, Engineering and Health, Bryan Jordon Drive, Gladstone, Qld 4680, Australia, Phone: +61411767886

[2]Central Queensland University, School of Engineering and Built Environment, Faculty of Sciences, Engineering and Health, Bruce Highway, Rockhampton, Qld 4701, Australia. Phone: +61402431669

Email: m.rasul@cqu.edu.au , a.chowdhury@cqu.edu.au

Abstract

In this study, a thermo-chemical conversion process known as Pyrolysis is adopted to convert naturally available municipal green waste to biocoal and condensate product. Pyrolysis technique is one of the efficient and environmentally sustainable thermo-chemical conversion processes to convert biomass to usable energy. Here, pyrolysis technique is employed to produce bio-coal, organic or bio-oil and aqueous liquids from municipal green waste. Bioenergy derived municipal green waste from the Central Queensland region in Australia is is yet to be characterised. The sample, naturally available green waste from Rockhampton region, is pyrolysed in a short sealed rotary furnace with attached off gas condenser. The condensate is further processed using a centrifuge which rotates rapidly and uses centrifugal force to separate substances of different densities and produced organic and aqueous fractions. Test results show that the organic component of the pyrolysis condensate had typical carbon content and calorific value. Detailed results of the pyrolysis and characterisation test work will be presented in this study.

Keywords: Municipal Green Waste (MGW), Thermo-Chemical Conversion, Pyrolysis, Bio-oil, Bio-coal.

ID-492

Energy Performance of Institutional Buildings Survey and Analysis in Subtropical Climate

Ashfaque Ahmed Chowdhury[1] , M G Rasul[2], M M K Khan[3]

[1]Central Queensland University, School of Engineering and Built Environment, Faculty of Sciences, Engineering and Health, Bryan Jordon Drive, Gladstone, Qld 4680, Australia Phone: +61411767886

[2]Central Queensland University, School of Engineering and Built Environment, Faculty of Sciences, Engineering and Health, Bruce Highway, Rockhampton, Qld 4701, Australia. Phone: +61749309676

[3]Central Queensland University, School of Engineering and Built Environment, Faculty of Sciences, Engineering and Health, Bruce Highway, Rockhampton, Qld 4701, Australia. Phone: +61749309631

Email: m.khan@cqu.edu.au , a.chowdhury@cqu.edu.au, m.rasul@cqu.edu.au

Abstract

Energy analysis and assessment are required to identify how much, where and how energy is used within a facility. The purpose is to analyse and assess the energy consumption pattern through historical data analysis of campus buildings of CQUniversity (CQU) located in Rockhampton, Australia. This study reports the findings from the audit of a campus building and the measurements of the indoor environmental parameters related to the internal load. Then monthly monitored energy usages of the campus buildings are used to analyse the effects of climatic variation on energy consumption. The novelty of this study is that the developed correlations between the energy utilisation and weather pattern can be used to design future sustainable building in subtropical region. Most importantly, the increased energy consumption pattern in the buildings will provide a good indication on the design feature and energy efficiency to the building industries.

Keywords: Energy audit, Energy analysis, Energy consumption.

ID-493

Numerical Simulation of the Turbulent Flow around an Aspirated S809 Airfoil

Ouahiba GUERRI and Ahmed BEKHTI
Centre de Développement des Energies Renouvelables Route de l'Observatoire, BP 62, Bouzaréah, CP 16340, Alger, Algérie
E-mail: o.guerri@cder.dz

Abstract

The work presented here focuses on the flow control around the S809 airfoil, a thick profile developed for wind turbine blade. The aim of this study is the improvement of the aerodynamic profile performances.

Flow control devices have been widely used in aeronautic industry or for automotive. Then different techniques have been developed to control the boundary layer: passive means or active methods based on the blowing and/or suction or synthetic jets as in modern active flow controls. In wind turbines, aerodynamic control is mainly used to keep rotational speed and power output of the turbines within a certain range. Then usually, active control based on blade pitch variation or passive control based on dynamic stall are used. However recently, devices based on synthetic jet actuators were used by Yen et al. (2013) as a novel approach to the dynamic stall control of a vertical axis wind turbine. In this paper, the control technique applied is suction of the boundary layer which result in drag reduction.

This study is carried out by numerical simulation of the flow around the aspirated S809 airfoil. The governing equations are described by the unsteady Reynolds averaged Navier Stokes (URANS) equations and turbulence is represented by a Reynolds Stress turbulence model, the R_{ij} EBRSM, a low-Reynolds-number turbulence model.

First, computational grid and turbulence model validations are performed for a circular cylinder. These simulations are carried out for an isolated cylinder and for a cylinder with suction control, the Reynolds number based on the free stream velocity and the cylinder diameter being Re = 10^5. The obtained results are in good agreement with experimental data reported in the literature.

Then, the simulations are carried out for the airfoil without control and set at an angle of attack of 18°. The equations are solved for an incompressible flow at a Reynolds number based on the airfoil chord Re = 10^6. Contours of velocity and vorticity around the body without suction exhibit highly complex flow with Von Karman street vortices in the wake. Expected mean lift and drag coefficients are obtained.

Thereafter the flow around the airfoil with suction is considered. The contours of the flow field velocity show that separation on the external upper surface of the airfoil is delayed by suction.

As expected, it is found that the aerodynamic performances of the airfoil are improved. Better lift to drag ratio is obtained. Moreover, vortex shedding is suppressed by the suction. It is thus expected that vortex induced vibrations will not occur and that the dynamic stall effects will be reduced.

ID-494

Exergoeconomic Analysis of a Cement Plant: a Case Study

Adem Atmaca*, Recep Yumrutas,

University of Gaziantep, Department of Mechanical Engineering, 27310 Gaziantep, Turkey.
* Corresponding author. Tel.: +90 342 317 1734; fax: +90 342 360 1170.
E-mail: aatmaca@gantep.edu.tr, adematmaca@yahoo.com (A. Atmaca), yumrutas@gantep.edu.tr (R. Yumrutas).

Abstract

In this study thermodynamic and exergoeconomic formulations are provided and applied to an actual cement plant located in Gaziantep, Turkey. The overall energy and exergy efficiencies of the plant is found to be 59.37% and 38.99% respectively. The exergy destructions, exergetic cost allocations, and various exergoeconomic performance parameters are determined by using the exergoeconomic analysis based on specific exergy costing method for the entire plant and its components. The specific unit exergetic cost cement produced by the cement plant is calculated to be 180.5 USD/GJ. The specific manufacturing costs of clinker and cement are found to be 33.11 USD/ton and 41.84 USD/ton respectively.

Keywords; cement, energy, exergy, exergoeconomics, efficiency.

ID-495

Active Vibro-Control Of Smart Circular Plates Layers Due to Plane Sound Wave

Korosh Khorshid[a,]

[a]Sound and Vibration Laboratory, Department of Mechanical Engineering, Faculty of Engineering, Arak University, Arak, 38156-88349, Iran.

Abstract

Active vibrations and modeling of structures coupled with piezoelectric becomes the subject of a large number of studies because piezoelectric materials are used widely in electronics, ultrasonic, smart structures and etc due to advantages of this material property in the high accuracy, low weight and high sensing capability [1-3]. In engineering application, piezoelectric material as an open circuit is used in the model of sensor and absorber [4, 5] and closed circuit is used in the model of the actuator and resonator [6] that used in acoustic noise suppression, active damping and active vibration control widely .

In this study active vibration control analysis of a circular plate coupled with piezoelectric layers on both sides by using an accurate method is presented based on classical plate theory (CPT). In the relation of piezoelectric, electrical potential in the transverse direction earned by satisfaction of electric boundary conditions (open circuit) and Maxwell's electricity equation. The proposed analytical method is validated with available data in the literature. Using numerical data provided, the effect of different piezoelectric patch thickness and host patch thickness on the plate natural frequencies are examined and discussed in detail. In this paper, Linear-Quadratic Regulator (LQR) and Fuzzy Logic Controller (FLC) are used to control the transverse deflection of a circular plate which is excited by plane sound pressure waves.These methods are used on the bases of the piezoelectric output as a sensor. Using the output of the sensor, the transverse control force is determined. By applying the transverse control force at the plate, the amplitude of the transverse deformation will be controlled and reduced .

ID-496

Implementation Of MPPT Algorithm for Photovoltaic System Based Current Controller

Houda Brahmi[1], Rachid Dhifaoui[2]

1 Higher Institute of Medicals Technologies (ISTMT),9 Rue Zouhair Essafi 1006 TUNIS.
2 National Institute of Applied Sciences and Technology (INSAT),Centre Urbain Nord, BP 676, 1080 Tunis Cedex.
Unit Research on Power System and Electrical Machines (RME)

Abstract

This study presents an efficient control for photovoltaic (PV) generator computing the Maximum Power Point (MPP). The mathematical model of photovoltaic generator is presented. The variation of series and shunt resistor are taken into account in the PV model and are dynamically identified using Newton Raphson algorithm. The proposed control strategy is based on the current control of PV generator. Simulation results and experimental realization are presented to validate the advantages of the proposed control study.

Keywords: Modeling of photovoltaic generator; Maximum Power Point Tracking,Boost converter , push-pull converter ; Hysteresis controller.

ID-497

Software Smarttan for Operation Modes Optimization of Main Pipelines

Zhapbasbayev U.K.[2)], Makhmotov E.S.[1)], Rziev S.A.[1)], Bekibayev T.T.[2)], Ramazanova G.I.[2)]

[1)] JSC “KazTransOil”, 010000 Astana, 19 Kabanbai batyr street, Bloc B, Kazakhstan
[2)] Kazakh-British Technical University, 050000 Almaty, 59 Tole bi street, Kazakhstan
tel. +7(727) 266-83-12
E-mail: uzak.zh@mail.ru, Makhmotov@kaztransoil.kz

Abstract

The pipeline management is aimed at forecasting of transported product’s condition inside the pipeline. In addition to temperature, such operating parameters as oil volume (flow rate) and pressure describe the transported product’s condition inside the pipe. Oil flow operating parameters are determined by the pumping equipment and heating unit. Such optimal values as pumping volume, heating temperature and pumping pressure, which are required for oil flow transportation in main pipelines, possible to forecast by heat-hydraulic calculations.That helps to find energy-saving modes and energy efficiency of oil pipeline transportation. Optimal pressures of pumping equipment and heating temperature are determined in optimization calculations for forecasting of energy-saving pumping modes of viscous oil.

Energy consumption in main pipelines during oil flow transportation is determined by 80–85%of pumping equipment’s performance. Variable frequency drives (VFD) of main pumps allow reducing the energy consumption and providing smooth start and transition from one mode to another. Soft regulation of rotation frequency enables to define the energy-saving modes of pumping equipment. Optimal values of oil flow pressure and temperature are depend on many factors (such as heating temperature, oil rheological properties, soil temperature, heat transfer coefficient, pumping volume, pipeline characteristics, safety regulations for pressure and temperature on oil pipelines). Heat-hydraulic calculations allow predicting the optimal values of pressures and oil heating temperature in dependence of said mode parameters.

Software SmartTran is designed to monitoring, modeling and optimization of operating modes of main pipelines of JSC “KazTransOil”.

Software main features:

1. Maximum productivity definition at acceptable operating modes of pumping equipment and safety pipelineexploitation;
2. Modeling of stationary operating mode of main pipeline;
3. Modeling of transition operating modes related to change of heating temperature, productivity, rheological properties, passing oil pumping in and pumping out;
4. Modeling of energy-saving operating modes of pumping equipment in the presence of VFD;
5. Modeling of energy-saving operating modes of transportation at optimal oil heating temperature;
6. Modeling of stationary pumping modes while depressant entering for rheological properties improvement of high-pour-point oil;
7. Modeling of non-stationary modes of region restart at short stop of main pipeline.

Software has a modern and user-friendly interface, and a database for information storage about the main pipeline, pimping equipment, oil rheological properties, path profile and etc.

Maximum pumping volumes in optimal calculationsare determined by adjusting of pressure-volume characteristics of pumping equipment in compliance with main pipeline safety regulations, energy-saving volume modes in dependence on input data (planned pumping volume, pressure-volume characteristics of pumping equipment, heating temperature, soil temperature, oil rheological properties).

The results of optimization calculations of software SmartTran are in agreement with production data, and enable to determine rational operating modes of main pipelines JSC “KazTransOil”.

ID-499

A Numeric Study of Effect the Temperature and Pressure on a PEMFC

Elif Eker Kahveci* , Imdat Taymaz

Department of Mechanical Engineering,University of Sakarya,Serdivan, Sakarya, TURKEY
E-mail: eeker@sakarya.edu.tr, taymaz@sakarya.edu.tr

Abstract

The performance of a PEM fuel cell depends on design and operating parameters such as cell operation temperature, operation pressure, relative humidity, mass flow rate of feed gases, channel geometries in current collector plate and the characteristics of the membrane, GDL, catalyst. In this study, a three-dimensional, single-phase model has been established to investigate the performance of PEM fuel cell with serpentine flow fields. The numerical simulation was realized with a PEM fuel cell model based on the FLUENT computational fluid dynamics (CFD) software. The simulation results were illustrated polarization curves including I–V and I–P curves. The performance of a PEM fuel cell increases with the increase of operating pressure because of partial pressure and diffusivity of reactant gases resulting in decreasing the mass transport resistance. It is also found that temperature has an important effect on the performance of PEM fuel cell by the results of study. The increasing temperature increases the performance of the system. Even though after exceeding a definite temperature cell performance decreases.

ID-501

Marble Powder Self Compacting Concrete Sustainability Subject to the Cycles Water / Air

ZEROUB Hamid, CHAID Rabah
Research Unit Materials, Processes And Environment Urmpe Boumerdes University

Abstract

Previous studies have investigated the durability of normal concrete in various aggressive environments. This communication presents the study of the durability of self-compacting concrete (SCC) made with the addition of limestone filler and an addition of marble powder as a substitute. Conservation methods are:

- of air water cycles / (immersion / drying)
- tap water as a control.

We followed the evolution of mechanical strength in bending and compression with a servo press.

Key words : marble powder ;SCC; mecanical behaviour;durability.

ID-502

Investigation of Effect of Air Velocity in Turbulent Non-Premixed Flame

Zafar Namazian, Jafar Namazian

Department of engineering, Yasuj branch, Islamic azad university, Yasuj, Iran
telephone number, 989124301812
E-mail: z.namazian@gmail.com, jafarnamazian@yahoo.com

Abstract
In this study, turbulent methane-air flame is simulated to determine the effect of air velocity on the length of the flame, the temperature distribution and mole fraction species. The results obtained by simulation in Fluent code. The combustion chamber is a cylinder with a radius of 0.25m and a length of 1m. Fuel flowing with specific rate through the center of chamber at radius 0.003m and air flowing between two circles of radius 0.003m and 0.009 respectively. The space between the two cylinders of radius 0.25m and 0.009m is filled by still air which is in contact with the surrounding environment. To solve the turbulence flow k-ε model is used. According to the results, at a certain flow rate of fuel, by increasing the air velocity, the flame is thinner and lower maximum temperature, the greater the penetration of oxygen into the fuel as well as fuel consumption increases.

Keywords: non-premixed flame length - turbulent flame-adiabatic flame temperature

ID-503

Build-In Transparent Collector Construction

Ján Lojkovics; . Prof. Danica Košičanová, Richard Nagy, Marek Kušnír, Martin Štefanco

Technical University of Košice, Civil Engineering Faculty, Institute of Architectural Engineering, Department of Indoor technologies and building services

E-mail: jan.lojkovics@tuke.sk; danica.kosicanova@tuke.sk; richard.nagy@tuke.sk; marek.kusnir@tuke.sk; martin.stefanco@tuke.sk;

Abstract

There are several ways to utilize renewable energy sources. Collectors are well known as one of the oldest build-in or post-mount construction at buildings. This paper presents idea of transparent sun collector based on insulation glass unit, with inner and outer liquid circulation. The heat absorbed from the sun in inner circuit liquid is transferred and transmitted by heat exchanger to the secondary circuit. Where energy can be stored or used in preheating devices in hot water delivery systems. This system can be applied in buildings with huge transparent or non-transparent glass based facades with suitable needs for hot water for example in administrative buildings, swimming pools, gyms etc. Research at current state deals with mechanical construction of window and prepares laboratory tests and build in measurements of construction itself.

Keywords: transparent collector, liquid-filled window, sun power, energy savings, renewable energy sources, vertical mounted collector

ID-504

Enhanced Catalytic Activity of Co-B/Glassy Carbon and Co-B/Graphite Catalysts for Hydrolysis of Sodium Borohydride

Ercan Özdemir

Clean Energy and Nanotechnology Research Center, Gebze Institute of Technology
Çayırova Campus, 41420, Gebze, KOCAELİ
E-mail: e.ozdemir@gyte.edu.tr

Abstract

This study focuses on the evaluation of catalytic activity of cobalt boride catalysts supported on graphitic and amorphous carbon derivatives with low surface area, e.g. graphite and glassy carbon, prepared by two different routes. The hydrogen generation rates over catalysts synthetized by conventional impregnation reduction and our novel pre-reduction precipitation approach were compared for hydrolysis of alkaline sodium borohydride solution. An unsupported Co-B cluster was also prepared for comparison. In the pre-reduction precipitation route, unlike the conventional method, Co–B colloidal particles were firstly synthesized via reduction of cobalt salt and precipitated onto carbon support. This simple one-pot synthesis method improves hydrogen generation volume significantly. Structural properties and morphology of the catalysts powders were carried out by XRD, SEM, BET and FTIR techniques. Furthermore, the variations of hydrogen generation rate with reaction temperature, NaOH and $NaBH_4$ concentration were also measured. The results revealed that catalytic activity of the supported Co-B catalysts were found higher than that of unsupported one. Among all catalysts, Co-B/graphite (12 wt% Co) which was synthesized pre-reduction impregnation route exhibited the best catalytic activity. Co-B/graphite prepared by pre-reduction route enhanced the volume of hydrogen evolution from 7390 to 8374 mL g^{-1} min^{-1} at 30 ^oC despite same Co content. Similarly, hydrogen generation volume over Co-B/glassy carbon was extended from 7860 to 8315 mL g^{-1} min^{-1} under the same experimental conditions. Consequently, the cobalt catalysts via this route exhibit excellent catalytic activities comparable to the precious metal catalysts for hydrolysis reactions, and candidate catalysts for fuel-cell applications. Additionally, the experimental results also indicated that the activity for the catalysts correlated strongly with the operation conditions and reactant concentrations. The optimum reaction temperature and concentrations were found as 50 ^oC, 10 wt% NaOH and 10 wt% $NaBH_4$, respectively.

Keywords: Hydrogen production, cobalt boride, graphite, glassy carbon, heterogeneous catalyst, sodium borohydride

ID-505

Bianchi Type-VI Universe with Wet Dark Fluid in Lyra manifold

S. D. Tade and Megha K. Tote

Department of Mathematics, Jawaharlal Nehru College, Wadi, Nagpur-440023 (India)

e-mail: sdtade@yahoo.co.in

Abstract

In this paper, Bianchi type-VI space-time is considered in the presence of wet dark fluid source in scalar-tensor theory of gravitation proposed by Sen [Z.Phys.149: 311, 1957] based on Lyra geometry. Corresponding field equations are solved in the form of spatial volume V to find exact solutions. Some physical properties like expansion factor θ, shear scalar σ^2 and the deceleration parameter q are also discussed for two cases i.e. dust universe $(\gamma = 0)$ and zeldovich universe $(\gamma = 1)$.

ID-506

Hydrostatic Extrusion of Al/Cu Clad Ingots Prepared by Direct Chill Continous Casting

Jongsup Lee[1, a], Yong-Bae Kim[1, b], Jung-Han Song[1, c], Eung-Zu Kim[1, d], Duk Jae Yoon[1, e], Sangmok Lee[1, f]

[1] Metal Forming Technology R&D group, Korea Institute of Industrial Technology, 7-47, Songdo-Dong, Yeonsu-Gu, Incheon, 406-840, Korea

E-mail: [a]jongsup@kitech.re.kr, [b]yb_kim@kitech.re.kr, [c]jhsong@kitech.re.kr, [d]ezkim@kitech.re.kr, [e]ydj@kitech.re.kr [f]sangmokl@kitech.re.kr

Abstract.

Clad materials consisting of two or more metals are required by industry due to their properties, which cannot be obtained with individual materials economically. Typical examples of the clad materials are copper clad aluminum(CCA) wires. CCA wires offer a 50% reduction in weight for equivalent conductivity as compared to copper alloy, and this material is 30~40% less expensive than a copper alloy[1].

In general, hybrid materials are manufactured by various processes, including extrusion, rolling bonding, welding and diffusion bonding. However, these processes can lead to low bonding strengths and are associated with, high costs and low efficiency because the interface is generally formed by the contact of two solid metals. On the other hand, it is well known that continuous casting is an ideal method for producing clad materials, which can solve the problem of a low bonding strength. In this method, two liquid metals are put into contact directly, and then resulting in good metallurgical bonding. Recently, the direct-chill continuous casting method was proposed as a feasible means of producing a circular clad ingots[2].

The hydrostatic extrusion process is known to have many advantages over conventional extrusion processes. The most significant feature of this process is that there is no friction between the billet and the die. Excellent lubrication between the material and the die and hydrostatic pressure enable higher extrusion ratios, lower die angles, lower working temperatures and more uniform metal flows[3]. Uniform flows can be obtained during this process, and relatively low working temeperature with higher extrusion ratio is the most appropiate enviroment for the fabrication of clad products. Thus, the hydrostatic extrusion process has been applied for the fabrication of various clad wires[4]. Even though the hydrostatic extrusion, there exists the worability limit, in which sound extrusion can be completed without any defects due to clad structure such as the sheath fracture for soft-core and hard-sleeve clad billets.

In this study, the hydrostatic extrusion of Al/Cu clad ingots prepared by direct-chill continuous casting was carried out. The core and sleeve of the clad ingots are made of the commercial 1050 Al alloy and the OFC(Oxigen free Copper). Al/Cu billets were extruded with various extrusion ratio and at various work temperatures to investigate the workability limits of Al/Cu clad billets. It is concluded that the sheath fracture is more probable at higher working temperature and with higher extrusion ratio. Microscopic investigation of the Al/Cu extrudes especially the interface region was also carried out in order to verify the thickness variation of the diffusion layer, which may affects the bonding strength of the extrude. With aids of the lower working temperature of the hydrostatic extursion, no remakabile change of the thickness of the diffusion layer occurred during the process. Thus, it is possible to optimize the thickness of diffusion layer for maxium bodning strenght during the subsequent process such as post heat-treament.

Keywords: Direct chill casting, Hydrostatic extrusion, Al/Cu clad ingot, Workability limit

ID-507

Ultrasound Disintegration Facilities for Improving of Lignocellulose Substrate Fermentation

Marcin Dębowski, Marcin Zieliński, Mirosław Krzemieniewski

University of Warmia and Mazury in Olsztyn, Department of Environment Engineering, Warszawska 117 St.
10 – 720 Olsztyn, Poland, Tel. +48895234124
E-mail: marcin.debowski@uwm.edu.pl

Abstract

Mechanical treatment of lignocellulose is feasible through the use of ultrasound waves. Disintegration of ultrasound-treated particles of the dispersed phase proceeds as a result of the phenomenon of compression, stress and cavitation of gas bubbles that are formed at the interphase of a multi-phase system. Destruction of substrate structures enabled bio-degradation of organic biomass in the anaerobic process. Once cell walls are damaged, cytoplasm and cellular enzymes release, and substrates released in this way (in the soluble or colloidal form) are instantly available to the biological system via anaerobes. It has already been demonstrated that COD of sludge liquids (COD of dissolved substances) increases immediately after supersonication of the substrate, which means sonolysis of solid substances (damage of structures and releases of cellular material) and, consequently, intensification of the hydrolytic phase of fermentation. This, in turn, affects the shortening of time and increasing effectiveness of the other phases of the fermentation process.

The prototype for lignocellulose substrate disintegration with ultrasounds consists of 5 tubular segments with rectangular cross-section. The size of a single segment is 100 mm x 100 mm x 850 mm. The active volume of one segment is 8 liters. Segments are made of acid-proof steel and are coupled with one another. The effluent from ultrasound disintegrator is discharged to the substrate pretreatment tank. The facility consists of tubular segments with square cross-section and ultrasound converters mounted so as to ensure the best disintegration of the organic substrate. It works in a cycle of automatic feeding and emptying by means of a circulating pump which feeds the substrate.

Ultrasound disintegrator:

- Power: 10 kW
- Converters: n=60
- Frequency: 23 kHz +/- 2 %
- Active volume of disintegrator: 40 l
- Number of working cycles per day (feeding/disintegration/discharge): 54 x d
- Time of a single disintegration cycle (feeding/disintegration/discharge): 30 / 900 / 30 s
- Total time of disintegration: 13.5 h/d
- Volume of disintegrated substrate: 2150 l/d
- Unitary quantity of energy used for disintegration: 55.5 Wh/l
- Required daily quantity of energy: 120 kWh/d
- 20 magnetic activators of fluids with diameters of: 70 mm +0.1/-0.1 mm mounted as 4 activators per the longer side of each segment of disintegrator
    - height: 20 mm +0.1/-0.1 mm
    - direction of magnetization: alongside dimension of 20 mm
    - sheath: Nickel (Ni+Cu+Ni)
    - Magnetic properties of N38 material: remanence induction Br 1.21-1.25 [T], coercive force HcB min. 899 [kA/m], coercive force HcJ min. 955 [kA/m], magnetic energy density (BH)max 286-302 [kJ/m^3]

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ID-508

Small Agricultural Microbiogas Power Plant with Ultrasound Disintegration System

Marcin Zieliński, Marcin Dębowski, Mirosław Krzemieniewski

University of Warmia and Mazury in Olsztyn, Department of Environment Engineering
Warszawska 117 St., 10 – 720 Olsztyn, Poland, Tel. +48895234124
E-mail: marcin.zielinski@uwm.edu.pl

Abstract

The abstract presents the characteristics of a technological system of an small agricultural microbiogas power plant equipped with innovative facilities - ultrasound disintegration system. The biogas production plant consisted of the following objects and facilities:

- manure disposal field MDF: n=1,
- substrate pretreatment tank / hydrolyzer SPT: n=1,
- ultrasound disintegrator UD: n=1,
- fermentation tank FT: n=1,
- post-fermentation tank PFT: n=1,
- retention tank RT: n=1,
- biogas desulfurization filter BDSF: n=1,
- gas boiler: n=1.

Solid substrates – manure collected at a disposal field in direct vicinity of biogas power plant facilities. With the use of a self-propelled feeder, the substrates are exported from the disposal field to a substrate pretreatment tank (SPT) once a day. Cattle slurry is also discharged to the SPT. Hydration in the SPT, which simultaneously plays the role of a hydrolyzer, should reach ca. 90%. In the SPT, the substrate will be mixed and homogenized with a mechanical agitator mounted in tank's axis. The SPT is the site where the first acidic phase of methane fermentation proceeds. Appropriate temperature conditions are maintained in the tank with a heating system (thin-walled PCV pipes mounted inside the tank, alongside its walls).

The increase in biogas production efficiency is expected to be achieved through the use of ultrasound conditioning process. To this end, a mixture of substrates from SPT will be pumped over via the existing pumping system by a set of disintegrators. The processed substrate will return to the SPT. Afterwards, from the SPT the substrates will be fed to a fermentation tank (FT) with a rotary pump and will flow through a milling disintegrator. The FT is the site where the exact process of biogas production proceeds. Methane fermentation will be carried out in mesophilic conditions at ca. 35 ^{o}C. A fermenter will be heated with hot water circulating in a closed system between heat exchange system in a technical room and a system of pipes in fermentation tank (FT) and post-fermentation tank (PFT). Heat used for heating tanks in the biogas power plant will be produced from biogas combustion in a gas boiler. The mixture of digested sludge flows gravitationally from the fermentation tank FT to the post-fermentation tank PFT, where complete fermentation and process extinguishing occur. The post-fermentation tank PFT is also equipped in an agitating system, but is not heated. From the PFT, the digested sludge passages to a retention tank RT. The volume of this tank ensures ca. ten-day retention of digested sludge. From this tank, the digested sludge is discharged via gully emptiers to a sludge tank located outside the biogas works, from where it is exported as a fertilizer.

Biogas produced during methane fermentation is collected from fermentation tank FT and post-fermentation tank PFT. Through a filter with bog iron ore, biogas reaches the gas boiler, where it is combusted, which results in heat generation. Biogas is accumulated only in the gas zone of FT and PFT tanks. The boiler is switched on automatically at pressure above 10 mbar. Biogas accumulated in the gas zone of FT and PFT tanks is combusted. When pressure of biogas drops to 5 mbar, the unit is switched off automatically and remains in stand-by mode until the pressure in the gas installation again increases to the appropriate level.

Acknowledgments This work has been co-financed by the ERA-NET BIOENERGY of the National (Polish) Centre for Research and Development (NCBiR), entitled *Small but efficient – Cost and Energy Efficient Biomethane Production*.
SE. Biomethane

ID-509

Energetic Efficiency of the Biogas Plant Equipped With Ultrasound Disintegration System

Mirosław Krzemieniewski, Marcin Zieliński, Marcin Dębowski

University of Warmia and Mazury in Olsztyn, Department of Environment Engineering
Warszawska 117 St., 10 – 720 Olsztyn, Poland, Tel. +48895234124
E-mail: m.krzemieniewski@uwm.edu.pl

Abstract
The abstract presents the energetic characteristics of a technological system of an agricultural microbiogas power plant that operates based on the solution of an ultrasound disintegrator. It also compares profits and energetic expenditures linked with ultrasound disintegration technology.
The technological system of biogas plant produces high quantities of heat. On the average, it is assumed that 30 % of the produced heat is consumed for own needs of the biogas power plant to ensure appropriate process temperature at the level of 35^{o}C – 40^{o}C. The remaining quantity of heat may be used for own needs of a user. Estimates of heat production rates and possibilities of heat supply to individual recipients were presented below.
Possibility of providing heat to individual recipients: $M = C_t / q_u$
where:
C_t – total net production of heat
M – number of inhabitants possible to be provided with heat by biogas power plant
Q_u – unitary need for heat per capita within a year 26.2 GJ/M x year

Table 1. Potential of thermal energy production

Technological system	Gross production of heat	Net production of heat	Possibility of providing heat to individual recipients
Technological system without disintegration	285.0 GJ/year	199.5 GJ/year	7
Technological system with ultrasound disintegration	403.2 GJ/year	317.7 GJ/year	12

Potential of electric energy production in technological system without ultrasound disintegration and with ultrasound disintegration

Table 2. Technological system with ultrasound disintegration.

Specification	Power [kW]	Working time [h/d]	Energy consumption [kWh/d]
Disintegrator HAL 50	1.5	2	3.0
Rotary pump AL-50	2.2	3	4.4
Agitator 1	0.5	12	6.0
Agitator 2	1.0	12	12.0
Ultrasound disintegrator	10	13.5	135
		Total:	160.4

The energetic value of biogas produced in the system with ultrasound disintegration:403.2 kWh/d
Energetic gain: 403.2 kWh/d – 160.4 kWh/d = 242.8 kWh/d

Table 3. Technological system without disintegration

Specification	Power [kW]	Working time [h/d]	Energy consumption [kWh/d]
Disintegrator HAL 50	1.5	1	1.5
Rotary pump AL-50	2.2	2	2.2
Agitator in SPT	0.5	12	6.0
Agitator in FT	1.0	12	12.0
		Total:	21.7

The energetic value of biogas produced in the system without ultrasound disintegration: 285.0 kWh/d
Energetic gain: 285.0 kWh/d – 21.7 kWh/d = 263.3 kWh/d

The applied method of ultrasound disintegration enables increasing biogas production from the analyzed substrates by 25% on average. Energy demand in the disintegration process is counterbalanced by higher production of energy. Considering energetic expenditures, the system without ultrasound disintegration is significantly more energy-efficient.

Acknowledgments This work has been co-financed by the ERA-NET BIOENERGY of the National (Polish) Centre for Research and Development (NCBiR), entitled *Small but efficient – Cost and Energy Efficient Biomethane Production*. SE. Biomethane.

ID-510

Synthesis and Characterization of Fe Phtalocyanine (Fepc) Prepared From Microwave Irradiation

A. Belmokhtar[1], A. Yahiaoui[1], A. Benyoucef[1] M. Belbachir[2]

[1]Laboratoire de chimie Organique, Macromoléculaire et des Matériaux (LCOMM), Université de Mascara, Faculté des Sciences et de la Technologie, BP 763 Mascara 29000, Algérie.

[2]Laboratoire de Chimie des Polymères, Faculté des sciences, Université d'Oran, BP 1524 El- Menouer 31000 Oran, Algérie.

E-mail: belmokhtaraek@yahoo.fr

Abstract

The synthesis and charaterization of a Fe- phtalocyanine is described. This compound is synthesized by microwave–assiseted methods. Here we report the synthesis of a phtalocyanine Fer (FePc) obtaine. The effect of amount of catalyst and time on the polymerization yield of the polymers was studied. Structure was confirmed by elemental analysis, ^{1}H-NMR, ^{13}C-NMR, UVvis, FTIR, sepctroscopies, and voltammetry cyclique.

Keyword: Fe- phtalocyanine, microwave–assiseted, polymerization, characterization

ID-511

Water Pollution of Wadi Meboudja, Annaba N.E. Algeria

Sabiha CHOUCHANE[a*], Toufik CHOUCHANE[b], Azzedine HANI[c]

[a]Département de Chimie, Faculté des Sciences, Université Badji-Mokhtar, BP 12 Annaba 23000 Algérie.
[b]Unité de Recherche Appliquée en Sidérurgie Métallurgie URASM/CSC, B.P.196, Annaba 23000, Algérie.
[c]Laboratoire Ressource en Eau et Développement Durable
E-mail : chouchsam01@yahoo.fr

Abstract

An alarming increase in water pollution cause enormous difficulties which creates an adverse impact on our environment. In this work, we tried to make a detailed study on the pollution of the Meboudja Wadi (N.E Algeria) with toxic metals (iron, manganese, lead), suspended solids and oils-fats. The results obtained revealed that water of the Meboudja Wadi is very turbid during the high seasons and strongly oily during the low seasons. Similarly, the metal contamination is more important to the waters surrounding the steel complex with an obvious dominance in iron and to a lesser extent manganese. The presence of such pollution in this natural setting is worrisome by the fact that it is located in an urban site, agricultural and influence of sub-flush water recourses. Even more, the waters of the river drain directly to the Mediterranean sea through the Seybouse Wadi untreated.

Keywords: Meboudja Wadi, water, pollution, discharges, toxic metals

ID-512

Effects of Heat Treatment on the Microstructural Evolution in Weld Region of X70 Pipeline Steel

Kelthoum Digheche[1], Khawla Saadi[1], and Zakaria Boumerzoug[2,a*]

[1]Department of Chemical Industry, Biskra University, B.P. 145, Biskra- Algeria.
[2]Laboratory of semiconductor and metallic materials, Biskra University, B.P. 145, Biskra- Algeria.
Tel : 00 213775759694
E-mail : zboumerzoug@yahoo.fr

Abstract
Welding is one of the most important technological processes used in many branches of industry such as industrial engineering, shipbuilding, pipeline fabrication among others. Generally, welding is the preferred joining method and most common steels are weldable. This investigation is a contribution to some scientific works which have been done on welding of low carbon steel. This present work presents the results of the effect of isothermal heat treatment at 200, 400 and 600 °C on microstructural evolution in weld region of X70 pipeline steel. The welding process has been realized was welded in three passes by industrial arc welding. We have found that the heat treatments cause recrystalization reaction and phase transformation, particularly in fusion zone.

Keywords : Welding, low carbon steel, heat treatments, microstructures.

ID-513

Prediction modeling of the impurity for production of silicon ingots in CCZ process

Sungmin Kwon, Minsu Kim*, Jaehak Jung

Chemical Engineering Bldg. #402. Yeungnam University, Korea, Republic Of. E-mail* : alstnrla@ynu.ac.kr

Tel : +82.53.810.3513

Abstract

Czochralski method is the most frequent way of PV single silicon ingot production in single crystal ingot growing. Comparing with CZ process, CCZ process is the method which better than CZ process in production speed, yield and productivity. It shift batch process of CZ process to continuous process. CCZ process crystallized the crystal with injection polysilicon. However, the result between first production ingot and last production ingot was irregular among concentration of impurities in the melt. The impurities which contained in melt, flow in to the crystal when it grows, cause the instability of crystal's uniformity.

To contribute this study, we develop the modeling which is able to predict the concentration of an impurity to produce a solar cell. For producing single crystal silicon ingot though the CCZ process. Among the study, the impurity concentration of the raw materials can be identified and able to calculate the purity and volume of raw materials that should be infused. This study can be expected to produce the crystal with uniformity and high productivity of the single crystal silicon solar cell.

Keywords: Czochralski, Solar cell, Productivity, Impurities, Modeling

ID-514

System Buildup the Performance Monitoring Results of High Concentrator PV Module

Sang min Ji*,Jae hak Jung, Jangkyun Kim

Yeungnam University – Chemical Engineering, Korea, Republic Of. E-mail : jsmokok1@naver.com

Abstract

According to the progress of manufacturing technology head to III-V multi-junction compound semiconductor solar cells. The high Concentrator PV solar cells have been produced, which can offer more 40% of efficiency. The competition and interest toward to High concentrate photovoltaic generate system is increasing centering around the global companies in United States, Germany and Japan etc. Due to the combination of High CPV and Concentrator Optical Device which can provide 30% more than solar cell module. The demand of testing power generation, characteristics and reliability about prototype at the field test, is rising dramatically. However, there is a obstructive factor due to characteristic of High CPV, which acquired precision tracking device, MPPT tracking device, High magnification concentrator. Lack of the research and approach toward the existed Si-PV module and the other outdoor evaluation technology is also minus cause about development and activation. Through this research, there was a opportunity to develop and install the High CPV module outdoor generation and evaluation system. We have experimentally evaluated Energy Rating and Performance Degradation using prototype of High CPV modules through continuous operation during three months period.

Keywords: Concentrator PV, Direct Normal Irradiation, Energy Rating, Maximum Power Point Tracking, Performance Degradation

ID-516

New Nuclear Advanced Facilities at Cvrez

X.C. Arnoult, M.Zychova, M.Ruzickova, J. Berka, F. Di Gabriele, O. Srba

Centrum Výzkumu Řež , Hlavni 130, 250 68 Husinec-Rez – Czech Republic
Phone: +420 266 172 465
Email: xavier.arnoult@cvrez.cz

Abstract

The SUSEN program is divided in four sub-programs and teams: Technological Experimental Loops (TEL), Structural and System Diagnostics (SSD), Material Research (MAT) and Material Fuel Cycle (JPC). TEL team is in charge of the development large-scale experimental loops to improve the quality and quantity of data about the behavior of coolants used in the primary circuit and the corrosion of steel in contact with coolants. The coolants investigated are: supercritical water, helium and lead-bismuth. The SSD team is in charge to perform in hot-cells various kinds of mechanical tests on irradiated materials in the range from room temperature to 800°C (tensile test, creep test, tension-torsion test and fatigue test in different type of loading) and microstructure investigation with SEM and TEM. The goal of this paper is to present the facilities designed and built in the frame of the SUSEN program in the Centrum Výzkumu Řež, allowing research and development in the area of Generation IV and nuclear fusion reactors.

Keywords: mechanical test, high temperature, corrosion, loops.

ID-517

Structural Properties of Polystyrene (PS) / Ferroelectric Barium Stannate Titanate Ba ($Ti_{0.9}Sn_{0.1}$) O_3 Ceramic (BST) Composite

M-Ali AL-Akhras, [1*] Subhi Saq'an[1] and Zeinab Ghadieh[1]

[1] *Bio-Medical physics Laboratory, Department of Physics, Jordan University of Science & Technology (JUST), P.O. Box 3030, Irbid 22110, Jordan.*

[*]To whom correspondence should be addressed: E-mail: alakmoh@just.edu.jo

Tel: +962-2-720100 extn. 23421 Office, 23420 Lab.

Fax: +962-2-7201071

Abstract

A composite of polystyrene PS/Ferroelectric Barium Stannate Titanate BST with different BST concentration (1 , 5, 10, and 15 wt% samples) was prepared. Structural properties were investigated by X-Ray Diffraction (XRD), Thermogravimetric Analysis (TGA), and Scanning Electron Microscope, (SEM). Our results showed that increasing the BST concentration leads to increase chain-chain separation (d), this result confirms the BST entered into polystyrene and get a good composite without any reaction. The increment of chain-chain separation wasn't uniform, so it is accepted that the addition of BST to Polystyrene in this composite follow the non additive law in Chemistry. The non uniform behavior of sample PS/BST 10wt% may occurred when it reaches a critical mass for BST, and may a chemical reaction take place at this point which leads to change in composite structure at this concentration. A Weight loss of 0.62%-1.13% was observed in temperature range above 100 ºC, which didn't affect neither the electrical nor the optical measured quantities, this weight loss may be due to moisture. SEM of sample PS/BST 15wt%, before and after annealing showed randomly distributed within polystyrene matrix with no surface contact between them and the holes disappeared after annealing. This is another proof that they inserted in polystyrene and made a good composite. Also it may have surface charges.

Keywords: Polystyrene; Ferroelectric Barium Stannate Titanate; Ceramic

ID-518

Spectroscopic and Optical Properties of Yb^{3+}:LiGd*(WO4)*2 Fiber Crystal and Powders

B.Rekik[a], M.Derbal[a]
[a]University Blida1, Bp 270 route de Somaa Blida, Algeria
E-mail : Brahimre1@yahoo.fr

Abstract

The spectroscopic and optical characterization of the Yb^{3+} doped double Lithium–Gadolinium tungstate LiGd(WO4)2 (LGW) from the absorption, fluorescence, luminescence and lifetime measurements is presented. We show absorption diffuse spectra in the UV, visible and NIR regions of LiGd(WO4)2 for 1, 3, 5, 10, 15, 50 and 100% on Yb^{3+} for powders, and 1% on Yb^{3+} for fiber crystal in NIR, recorded at room temperature, especially that of the $^2F_{7/2}\rightarrow{}^2F_{5/2}$ transition lying in the 975nm which makes it suitable for diode laser pumping

We compared emission for all samples to map the band at 496 nm due to the $(WO_4)^{2-}$ group, exciting samples around 266 nm and 355 nm for powders materials. but to give efficient laser emission by Yb^{3+} in NIR, we excite a fiber crystal at 980 nm.

The absorption and emission cross-section are determinate, they are equal to 12 .25x 10^{-20} cm^2 at 775nm and 22.04 x 10^{-20} cm^2 at 995nm respectively. The radiative lifetime is found to be equal to (0.376 ± 0.00043) ms[3].

The energy-level scheme of Yb^{3+} ion is drown, with a partition function calculations of $^2F_{7/2}$ and $^2F_{5/2}$ levels of Yb^{3+} ions in $LiGd(WO_4)_2$.

The laser gain for a given inversion of population is determined for various inversion population ratios (B= N_2 / N_t = 0 25 50 75 100%).

ID-519

Solar Irradiation on Lawsonia Inermis Sensitized with Red Blood Cells: Effect of Osmotic Fragility

R. Alkhatib[a], M. AL-Akhras[b]

[a]Department of Biotechnology and Genetic Engineering, Jordan University of Science & Technology (JUST), P.O. Box 3030, Irbid 22110, Jordan. Email: rqalkhatib@just.edu.jo.

[b]Bio-Medical physics Laboratory, Department of Physics, Jordan University of Science & Technology (JUST), P.O. Box 3030, Irbid 22110, Jordan. E-mail: alakmoh@just.edu.jo

Abstract

In spite of the observations indicating that *Lawsonia Inermis* is an agent capable of causing oxidative hemolysis, it is still universally used in cosmetic, medicine, etc. *Lawsonia inermis,* which is commonly known in the Middle East as "Henna", is native to tropical and subtropical regions of Africa, southern Asia, and northern Australia. It is mainly in the semi-arid zones. It was reported that the pharaohs in Egypt used henna to treat skin diseases. Henna seed extraction has shown to induce hemolysis in a faster rate than normal; meanwhile henna powder did not even at high concentration. This suggests that henna is not sensitive to sunlight. Our results suggest that the seeds extraction of *Lawsonia Inermis* could be potentially used as a photodaynamic therapy agent.

ID-520

Ignition of Combustible Gases in Water

Vyacheslav Teslenko, Alexey Drozhzhin, Ruslan Medvedev, Igor Batraev

Lavrentyev Institute of Hydrodynamics SB RAS, Novosibirsk, Russia
E-mail: teslenko@hydro.nsc.ru, E-mail: drozh@hydro.nsc.ru
E-mail: ruslan@hydro.nsc.ru, E-mail: ibatraev@gmail.com

Abstract

The possibilities of reducing the energy consumption in transformation of chemical energy into heat and mechanical ones due to fundamental change of technologies of fuel combustion are considered by using the methods of combustion of gases being under development.

Keywords: Combustion in bubbles; Underwater mover; Heat generator

ID-521

A Research on Water Pumping with Cetrifugal Pump Using Solar Energy

H. Huseyin OZTURK

Dept. of Agricultural Machinery, Agriculture Faculty, Cukurova University
Sarıcam, Adana, Turkey. Tel: 0 322 3386408, Fax: 0 322 3387165
e-mail: hhozturk@cu.edu.tr

Abstract

The basic method for providing water for the purpose of irrigation is to deliver water from water source to the field and this movement of water requires some amount of energy. Photovoltaic water pumping (PWP) systems are particularly suitable for water supply in remote areas where no electricity supply is available. Due to the high initial costs of the PWP systems, it necessary to dimension photovoltaic installations as accurately as possible.In this study, some technical parameters of irrigation system powered with solar energy used to run a centrifugal pump have been investigated. For this purpose, the electrical properties such as current, voltage and power and efficiency of the PVWP system consists of 5 modules including 72 PV cells were determined. Water pumped, hydraulic powers and efficiencies of the centrifugal pump run with electricity generated PV cells were calculated.

The efficiency of electricity generation of the PV system varied from 4.8 % to 5.4% and the average electrical efficiency was 5.2 %. When the power given to shaft of pump are 1000 W, 1500 W, 2000 W and 3000 W, the flow rates of the pump were determined as 4,76 L/s, 7,14 L/s, 9,52 L/s and 14,28 L/s, respectively. In this case, hydraulic powers of the pump were calculated as 700 W, 1050 W, 1400 W and 2100 W, respectively. The average efficiency of the centrifugal pump was 70% at different flow rates and shaft powers and constant total head (H_m= 15 mSS).

Keywords: Solar irrigation, Photovoltaic, Centrifugal pump

ID-522

Improve the Production of an Indirect Solar Still

R. Kerfah, B. Noura, A. Zaaraoui

Univ. Khemis Miliana, Industrialist Fluid Measurement and Applications Laboratory, route de Theniet El-Had, 44225 Khemis Miliana, Algeria, Tel / Fax: 00 213 27 66 16 97 e-mail: rkerfah @ yahoo.fr

Abstract

Desalination of seawater and brackish water by different processes (thermal, filtering membranes) knows an important development following the increase of population, industrial activities and agriculture in countries which suffer from a shortage of natural fresh water. Solar desalination is one of the most development applications of renewable energy to water desalination. Thus, different devices have been used to improve the daily water production of the direct solar desalination. For instance, by coupling the basin solar still with a flat plate collector, parabolic concentrator, hot water storage tank and a vertical reflector. We can also increase the production of the basin solar still by the reuse of the latent heat of condensation, cooling the glass cover and increased condensing surface by fins.

In this paper, a thermal-economic analysis of modular solar still was investigated For that, a modular solar still was designed and the effect of condensation chamber area on the productivity and distilled water cost was examined. Simulations were performed on meteorological data of Algiers (Algeria) using Liu Jordan method. Results show that increasing the surface area of condensation chamber decreased the distilled water. The average annual production varied between 1248 and 842 litres for 2m^2 and 6 m^2 of condensation chamber respectively. On the other side, increasing surface of condensation chamber increase the cost of distilled water. The cost of litre of distilled water varied between 0.04 \$ and 0.1 \$ for 2m^2 and 6 m^2 of condensation chamber respectively.

Keywords: Condensation, Evaporation, Distillate, Natural convection, Modelling

ID-523

Photovoltaics in Greece: An Interesting Recent Experiment

EN Giannini, ZB Maroulis, A Moropoulou, GP Siouti

Laboratory of Process Analysis and Design, National Technical University of Athens.

Abstract

Recently, an interesting experiment completed in Greece concerning the photovoltaic penetration into the electricity production sector. Based on appropriate laws, in accordance to the related European directives an explosive penetration process was completed within less than 3 years resulting up to 7% share of photovoltaics in electricity production instead of the previous negligible one. The legislation was based on to licensing simplification and mainly on to generous Feed-in-Tariffs. This approach transformed the photovoltaic technology from a forbiddingly expensive to a competitive one. This work aims to summarize the related legislation and to reveal its effect on the resulting penetration. A sigmoid-shape penetration was observed based on the pulse-type feed-in-tariffs applied. Moreover, the resulting problems along with their solution are also presented.

ID-524

Neutron Diffraction Studies on $ZrCo_{0.9}Fe_{0.1}D_3$ to Explain Improved Durability Against Disproportionation Reaction

R. A. Jat[a], R. Singh[b], S.C. Parida[a], A. Das[b], R. Agarwal[a], S.K. Mukerjee[a] and K.L. Ramakumar[c]

[a]Product Development Division, [b]Solid State Physics Division, [c]Radiochemistry & Isotope Group, Bhabha Atomic Research Centre, Trombay, Mumbai-400 085, India Tel. No.: +91 22 25594875E-mail: avtar@barc.gov.in

Abstract

Intermetallic compound ZrCo is being considered as a suitable candidate material for storage, supply and recovery of hydrogen isotopes in International Thermonuclear Experimental Reactor (ITER) Storage and Delivery System (SDS). However, it has been reported that upon repeated hydriding-dehydriding cycles, ZrCo undergoes disproportionation as per the reaction; $ZrCo + H_2 \leftrightarrow ZrH_2 + ZrCo_2$. This results in reduction in hydrogen storage capacity of ZrCo, which is not a desirable property for ITER SDS. It is anticipated that suitable ternary alloying of ZrCo can improve its durability against hydrogen induced disproportionation. In an earlier study, we have thoroughly investigated the effect of Fe on hydrogen isotope storage behaviour of $ZrCo_{0.9}Fe_{0.1}$ alloy and found that Fe substitution improves the durability against disproportionation. However, the exact phenomenon responsible for improved durability of ZrCo upon Fe substitution was not understood. Therefore, objective of the present work was to explain the improved hydrogen storage behaviour of $ZrCo_{0.9}Fe_{0.1}$ alloy by studying the effect of Fe on crystal structure of $ZrCoD_3$ using X-ray powder diffraction (XRD) and neutron powder diffraction (NPD) techniques.

$ZrCo_{0.9}Fe_{0.1}D_3$ was prepared by direct reaction of deuterium gas with activated alloy. NPD patterns were recorded on a multi PSD based neutron powder diffractometer (λ = 1.2443Å) at Dhruva reactor, BARC, India. The XRD and NPD patterns were analyzed using FULLPROF program. XRD study reveals the formation of single deuteride phase similar to $ZrCoD_3$ for $ZrCo_{0.9}Fe_{0.1}D_3$. NPD pattern of $ZrCo_{0.9}Fe_{0.1}D_3$ is shown in Fig. 1. Rietveld refinement was carried out by varying the background, occupancies, position of atoms. The deuterium atoms were allowed to occupy $8f_2$ and 8e sites addition to the earlier reported $4c_2$ and $8f_1$ sites. A significant reduction in χ^2 was observed with addition of these extra sites for hydrogen occupation. It is observed that among $8f_2$ and 8e sites the hydrogen occupies only 8e sites. In an earlier study [4], it has been reported that in $ZrCoD_3$ ~ 3.8% of deuterium goes to a new site 8*e*. Since the Zr-D distance (1.937 Å) in 8e sites for $ZrCoD_3$ is smaller than Zr-D distance in ZrD_2, the deuterium of 8e site does not get released upon desorption and forms a stable ZrD_2 phase thus leading to the partial disproportionation of the material. In case of $ZrCo_{0.9}Fe_{0.1}D_3$ the occupancy of new site 8e was found to be 1.8% which is lower than the value for $ZrCoD_3$ [4]. In addition, the Zr-D distance in 8e site for $ZrCo_{0.9}Fe_{0.1}D_3$ is 2.201 Å which is higher than the value for $ZrCoD_3$ [4]. The crystal structure of $ZrCo_{0.9}Fe_{0.1}D_3$ with new deuterium site (8*e*) is shown in Fig. 2. Based on this decreased occupancy of 8e site, which is responsible for hydrogen induced disproportionation, and increased Zr-D distance it can be proposed that the durability of $ZrCo_{0.9}Fe_{0.1}D_3$ against disproportionation should be higher than that for $ZrCoD_3$. This observation is supported by cyclic absorption-desorption experiments on $ZrCo_{0.9}Fe_{0.1}$-H_2/D_2 systems reported by Jat et al. .

ID-525

Overview of Solar Energy Potential and Photovoltaic Installations in Algeria

Z. Bouzid[a], N. Ghellaia, T. Mezghiche[b]

[a]Materials and Renewable Energy Research Unit, University of Tlemcen, Algeria Tel: +213 774 92 87 67
[b] Architecture Institute, University of Blida, Algeria Tel: +213 553 60 78 10
E-mail : bzd.zakaria@gmail.com, E-mail : na_ghellai@yahoo.fr, E-mail : tinhinane.mez@gmail.com

Abstract

Solar energy, found everywhere on Earth, represents an attractive alternative for electricity production, thanks to photovoltaic technology (PV). Thereby, not only it decreases the dependence to fossil fuels, but it also protects the environment against eventual greenhouse gas releases. Algeria, which owns the most important solar field of the Mediterranean Basin (169440 Twh/year), is an ideal candidate for large-scale exploitation of solar energy. In this context, we offer you through this work a balance sheet of general energy consumption and production in this country as well as a summary of the most important realized or currently planned projects for the exploitation of photovoltaics in Algeria.

Keywords: Algeria, Solar energy, Photovoltaics, Renewable energy.

ID-526

The Effect of the Preparation Method of Graphene Oxide on the Photocatalytic Performance of Graphene-$ZnIn_2S_4$ for Hydrogen Generation under Visible Light

R. Zhu, F. Tian, J. Tan, F. Ouyang, G. Cao

Harbin Institute of Technology Shenzhen Graduate School, Shenzhen Key Laboratory of Water Resource Utilization and Environmental Pollution Control, Shenzhen 518055, P. R. China Tel : 86+0755+26032557

E-mail : rszhu@hitsz.edu.cn

Abstract

Hydrogen is a clean energy. It's significant to produce hydrogen from the splitting of water using a visible-light photocatalyst. $ZnIn_2S_4$ has recently been studied for its unique catalytic property. Preparing graphene based $ZnIn_2S_4$ composites has been demonstrated to be a promising method to achieve high hydrogen generation activity, since graphene possesses large specific surface area, unique electronic properties and chemical stability.

General, RGO can be prepared by the chemical reduction of GO, which may be produced through the oxidation of pristine graphite via the Hummers method followed by ultrasonic exfoliation. In the traditional methods, the obtained GO precipitate was usually dried in the oven or vacuum drier, and then collect for further use. It's found that the GO could be gather together after drying process and it's hard to disperse from each other again though treated with ultrasonic. We prepare the GO solution without drying process and then used for the preparation of graphene-$ZnIn_2S_4$.

All samples have almost the same XRD pattern, which could be assigned to the hexagonal $ZnIn_2S_4$. Compared with pristine $ZnIn_2S_4$, the BET surface area of graphene-$ZnIn_2S_4$ samples is improved when “GO solution” and “GO dried in the oven” used. The optimal amoumt of graphene should be 0.1 wt.% and 0.3 wt.% for these two methods. However, All the catalysts prepared with “GO dried in the vacuum drier” show the negative impact.

The photocatalytic activities are shown in Fig.1. The results show that the preparation methods of graphene oxide have obvious effects on the activities of graphene-$ZnIn_2S_4$ and “GO solution” shows the best effect. The affective order is closely related to the BET surface area which could be caused by the different preparation method of graphene oxide.

ID-529

Optical properties and Raman investigations of $CuInSe_2$ thin film prepared from $CuInSe_2$ powder

L. S. Hamideche [a], A. Amara [a], A. Boussekssou [b], A. Benaldjia [a], A. Drici [a], N. Benslim [c].

[a] Laboratoire d'Etude et de Recherche des Etats Condensés (LEREC), Département de Physique, Faculté des Sciences, Université Badji Mokhtar , Annaba, Algérie

[b] Laboratoire de Chimie de Coordination du CNRS 205, route de Narbonne 31077 Toulouse Cedex 04, France

[c] Laboratoire d'Etude de Surfaces et Interfaces de la Matière Solide (LESIMS), Département de Physique, Faculté des Sciences, Université Badji Mokhtar, Annaba, Algérie.

Abstract

Thermally evaporated thin film was deposited from $CuInSe_2$ powder obtained via mechanical alloying of Cu, In and Se elements. The ball milled powder is achieved with a rotational disc speed of 300 rpm and a milling time of 30 min. The investigated materials were analysed by X-ray diffraction. They exhibited a chalcopyrite-like structure (fig 1). The Raman spectra of $CuInSe_2$ powder and $CuInSe_2$ thin film show a dominant A_1 mode at 171 cm^{-1} and 179 cm^{-1} respectively. The optical absorption is calculated using the equation:

$$\alpha h\nu = A\,(h\nu - Eg)^{n} \qquad (1)$$

Transmittance measurements performed on thin film indicated that the material has a band gap of 1.02 eV (fig 2).

ID-530

Characterization of MO_y-$M_xCe_{1-x}O_{2-\delta}$ (M: Co, Ni & Cu) Nano Powders and Anode Materials for Low and Intermediate Temperature Solid Oxide Fuel Cells

Ö. Yıldız[a], A. M. Soydan[b], M. Akel[b], E.F. İpçizade A. Ata[b]

[a] Kocaeli University, Faculty of Engineering, Department of Metallurgical and Materials Engineering, TR-41380 Kocaeli, Turkey Tel : +90 262 303 30 51

[b] Gebze Institute of Technology, Faculty of Engineering, Department of Material Science and Engineering, TR-41400 Gebze/Kocaeli, Turkey

E-mail : oyildiz@kocaeli.edu.tr

Abstract

The development of new anode materials is necessary for low and intermediate temperature solid oxide fuel cells (SOFCs) to improve fuel cell lifetime and performance and to decrease operating temperature. In this study, new nanocrystalline anode powder materials with the novel composition: MO_y-$M_xCe_{1-x}O_{2-\delta}$ (M = Ni, Co and Cu) were synthesized by glycine nitrate process (GNP). The crystal structure, morphology, specific surface area (SSA), particle size and distribution of the synthesized powders, and cell performance were investigated using various techniques (e.g, BET, SEM, XRD, TEM). The results demonstrated significant improvement on the powder characteristics to optimize the property of the anode materials. The synthesized nano powders consisted of two main phases with fluorite and rock salt crystal structure. The nano scale particle size and distribution ranged from 5 to 600 nm with a high SSA of 14.95-20.50 $m^2.g^{-1}$, which are quite important characteristics for high performance anode materials such as porosity, density and contact surface area. Electrolyte supported single cells having LSM/GDC/ceria-based anode produced from aforementioned nano powders exhibited high performance of 0.35 $W \cdot cm^{-2}$ at 700 °C under 25 ml/min. pure and dry methane feeding. Dry hydrogen (99.9%) was used as a starting gas to reduce anode layer side for 30 min.

Keywords: Nano Powders, Combustion Synthesis, Ceria-Anode Materials, SOFCs

ID-531

The Sustainable Development or Imposing Command and Control Measures

Z. Dimitrijević, I. Salihbegović

Public enterprise Elektroprivreda BiH, Vilsonovo šetalište 15, 71 000 Sarajevo, BiH Tel : +38733751765, +38733751717
E-mail address: z.dimitrijevic@elektroprivreda.ba, E-mail address: i.salihbegovic@elektroprivreda.ba

Abstract

Sustainable development should become the central objective of all sectors and policies which imply assessments including estimate of its environmental, economic and social impact of the full effects of a policy proposal. To provide help for each country of South Eastern Europe, Energy Community has offered the “Study on the need for modernization of large combustion plants”. The Study is done by using CBA to present the necessity of reducing the pollutants emissions from LCP in each contracting party of Energy Community Treaty. The introduction of command and control measures is envisaged through the application of the Best Available Techniques for reaching limit emission values for each unit that is in operation after 2017 regardless the remain LCP’s unit operational time. Well known fact is that command and control measure yields predictable results, which are accompanied by high costs because for all polluters must be taken the same actions. The aim of this paper is to point out the fact that the Study was not conducted in accordance with the principles of sustainable development and the same should be reconsidered in terms of finding the necessary balance between the protection of air quality and economic conditions in each member country of the Energy Community Treaty.

Keywords: Sustainable development, Command and control measures, Economic instruments

ID-532

Design of Radioisotope Thermo-electric Generator for Lunar Mission in Korea

J. Hong, K. J. Son, J.B. Kim, Y. R. Uhm, J. J. Kim

Department of HANARO Utilization & Research, Korea Atomic Energy Research Institute (KAERI), 989 Daedukdaero, Daejeon 305-353, Republic of Korea Tel : +82-42-868-4420

E-mail : jthong@kaeri.re.kr

Abstract

Many researchers have been studied in generating electric power using radioisotopes as a source material. In particular, since a radioisotope thermo-electric generator (RTG) was developed in 1960s and used as the power source of a spacecraft, RTG has been the main power source of the spacecraft owing to its high reliability and extremely long lifetime. RTG is an equipment that converts the heat energy dissipated from radioisotope into electric power. The Korean government planned to achieve a lunar mission within 10 years, and KAERI needs to support an RTG to supply electric energy to the rover, which would carry out exploration activities on the surface of the moon. In this study, a fundamental electrically heated thermo-electric generator (ETG) has been developed, and a preliminary test has been carried out to check its performance. Initially, a conceptual 2D design was developed with reference to previously developed RTGs in NASA. After several iterations according to the results of heat transfer analyses and radiation shield analyses, the key design parameters were drawn. Then, the 3D design was developed by considering the workability, and FE heat transfer analyses were carried out to enhance thermal electric conversion efficiency. In addition, structural analyses were also carried out to keep the radioisotope source safe from external shock. Using a design that reflects the results of FE analyses, an ETG was fabricated. Several preliminary tests have been carried out to check the heat insulation issue, structural issue, workability issue, and the method of weight reduction.

Keyword: Radioisotope Thermo-electric Generator, ETG, spacecraft, radiation shield analysis, heat transfer analysis, structural analysis

ID-534

Study of the Inhibitive Properties of Carbon Steel as an Environmentally Friendly in Salt Solution

K. F. Al-Sultani[a] , F. A. Alseroury[b], S. A. Abdulsada[c]

[a]Asst. Prof., College of Materials Engineering, University of Babylon, Iraq.
[b]Faculty of Science, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia.
[c]Ass. Lect., College of Engineering, University of Kufa, Iraq.
E-mail : alsultani@yahoo.com

Abstract

Carbon steel, the most widely used engineering material, despite its relatively limited corrosion resistance used in large tonnages in marine applications, nuclear power transportation, chemical processing , petroleum production and refining, pipelines, mining, construction and metal-processing equipment.

The main objective of the present work involved the study of the inhibitive properties of natural product as spearmint plant extract as a safety and an environmentally friendly corrosion inhibitor for low carbon steel in (3.5% NaCl) solution. Results showed when the immersion model in (3.5% NaCl) solution that contains the inhibitor with concentration of (15% in volume), it's getting decrease in lost weight , indicating a layer of adequate oxide on the surface of steel, indicating that the amount of loss weight decrease with increasing concentration of inhibitor and this shows the damper on his ability to form a protective layer.

Keywords: Corrosion inhibitor, Low carbon steel, Aqueous media

ID-535

Empirical Model for the Estimation of Global Solar Radiation on Horizontal Surface in Algeria

M. Fekih, A. Bourabaa, R. Hariti, M. Saighi

Laboratory of Thermodynamics and Energetically Systems / LTSE
University of Science and Technology Houari Boumediene, U.S.T.H.B, Physics Faculty
Algiers – Algeria
E-mail: fekih.mali2005@ yahoo.fr

Abstract

In Algeria the global solar radiation and its components is not available for all locations due to which there is a requirement of using different models for the estimation of global solar radiation that use climatological parameters of the locations.

Empirical constants for these models have been estimated and the results obtained have been tested statistically. The results show encouraging agreement between estimated and measured values.

Keywords: Global solar radiation, Empirical model, Semi arid areas.

ID-536

Carbon footprint in Tainan public transportation system

C.C. Chang, F.L. Wu

Department of Transportation and Communication Management Science and the Research Center for Energy Technology and Strategy, National Cheng Kung University, No. 1, University Road, Tainan 70101, Taiwan.
Phone: 886-6-2757575, Fax: 886-6-2753882
E-mail: chan5305@mail.ncku.edu.tw

Abstract

This paper bases PAS 2050: 2011 standard to develop models to examine the passenger carbon footprint of the Tainan public transportation system No.88. The energy of diesel, CNG, LPG, biodiesel, and electricity are studied to explore which one gets more environmental benefit. Three phases and three scenarios are studied. This paper found, the carbon footprint (pkm) from low to high are: CNG, electricity, diesel, biodiesel, and LPG. The carbon footprint (pkm) of a service life cycle with CNG is only 27% of diesel, 30% of electric, 25% of LPG, and 27% of bio-diesel bus. More passengers take bus will lower carbon footprint. Hence, policies are to encourage people to take public transport mode to work or travel is necessary. This paper also suggests the public transportation should take CNG to be the main power of mass transportation, which could reduce greenhouse gas emissions from transportation system.

Keywords: Carbon footprint, Life cycle assessment, CNG, Mass transportation, Environmental benefit

ID-540

Mechanical Property of Surface Hardened Light Magnesium Alloy by Friction Stir Process

Y.S. Lee[a], H.S. Yoo[b], C.Y. Hyun[b], J.W. Hwang[b]

[a]*Dep. of Materials Science and Engineering, Hanyang University, Seoul, Korea*
[b]*Dep. of Materials Science and Engineering, Seoul National University of Science and Technology, Seoul, Korea*
E-mail: cyhyun@seoultech.ac.kr

Abstract
AZ31 Mg-based alloy has been being developed for as an energy-saving structural material for the application of automotive and aircraft due to its light weight. For improvement of surface microstructure and strength of the alloy, carbon nano tube (CNT) was dispersed in surface region of AZ31 alloy to produce surface nano-composite by applying friction stir process (FSP). For the FSP, multi wall CNT was filled in a shallow groove in AZ31 plate and then syringe-shape tool made of high speed tool steel was mechanically rotated in the groove at the rotating speed of 1400rpm. Severe plastic deformation and high speed stirring dispersion process at room temperature produced metal matrix CNT/AZ31 nano-composite. The surface composite was analyzed using an optical microscope, micro-Vickers hardness and nano-indentation. The hardness of composite region was observed to be higher than that of matrix region.

ID-541

Energy Efficiency Analysis of a Coal Gasification System

A. Gungor[a], A. Kocer[b]

[a]Akdeniz University, Faculty of Engineering Department of Mechanical Engineering 07058 Antalya, Turkey
E-mail: afsingungor@hotmail.com
[b]Akdeniz University, Vocational School of Technical Sciences 07058 Antalya, Turkey
E-mail: akocer@akdeniz.edu.tr

ABSTRACT

The coal gasification process is used in commercial production of synthesis gas as a means toward clean use of coal. The conversion of coal into gaseous products creates opportunities to produce more energy forms or chemicals and to separate CO_2 in an effective manner for sequestration.

The exergy analysis is the main indicator to refer the quantity and quality of energy used in the coal gasification process. In this regard, the scientist, researchers, policy makers and engineers who are trying to find impressive and useful solutions for the gasification process, aim at minimizing the energy consumption, maximizing the energy saving, and thus, developing the environmentally benign gasification that produce non-toxic exhaust emissions, improve the production capabilities, reduce the environmental impacts, and rise the exergy performance. From this point of view, this study investigates synthesis gas production by coal gasification using exergy analysis, and evaluates thermodynamically the potential of synthesis gas production from coal. The effects of by-pass ratio on the exergetic performance of the gasifier have also been investigated.

Keywords: Gasification, exergy, energy, efficiency, coal, modeling

ID-542

Manufacturing & Electrical Characterization of Intermediate Temperature Micro Tubular Solid Oxide Fuel Cells

O. Yıldız[a], A. M. Soydan[b], E. F. Ipçizade[b], O. Y. Akduman[b], R. Akdeniz[b]

[a]Kocaeli University, Faculty of Engineering, Department of Metallurgical and Materials Engineering, TR-41380 Kocaeli, Turkey

[b]Gebze Institute of Technology, Faculty of Engineering, Department of Materials Science& Engineering, TR-41400 Gebze/Kocaeli, Turkey

Abstract

With their rapid start up time and elimination of sealing problems, tubular solid oxide fuel cells are expected to be the first prototypes in the fuel cell commercialization. Co-extrusion of anode and electrolyte double-layers in micro tubular solid oxide fuel cells is a promising manufacturing technique with its high production rate and low cost. Polymer ceramic ratio of the extrusion batch, extrusion rate, sintering temperature and raw powder characteristics are found to be highly effective over the mechanical & electrical properties of the final cells. Nano powders obtained by using GNP combustion method and examined with BET, SEM & XRD were mixed with several binding & extrusion polymers such as poly ethylene glycol, poly vinyl alcohol and butvar. Green tubes with 3.1 mm cell diameter; composed of a 250 micron thick Ni-YSZ Anode and 100 Micron YSZ electrolytes are co extruded. Mechanical analysis including layer porosity and layer specific surface area & electrical examinations of the cells were performed by using Impedance analyser & fuel cell performance analyser.

Keywords: Intermediate Temperature, Micro Tubular, Solid Oxide Fuel Cell, Co-extrusion

ID-543

A New Approach in Fabrication of Micro Tubes for Solid Oxide Fuel Cells

O. Yıldız[a], A. M. Soydan[b], E. F. Ipçizade[b], O. Y. Akduman[b], R. Akdeniz[b]

[a] Kocaeli University, Faculty of Engineering, Department of Metallurgical and Materials Engineering, TR-41380 Kocaeli, Turkey

[b] Gebze Institute of Technology, Faculty of Engineering, Department of Materials Science& Engineering, TR-41400 Gebze/Kocaeli, Turkey

Abstract

Solid oxide fuel cells (SOFCs) have the highest energy efficiency among various fuel cells, but problems like; deformation due to heat stress, slow start-up/shut-down, limit their use. Micro tubular SOFCs (MT-SOFCs) are expected to be a solution to these problems with their durability under rapid changes in cell operating temperatures. Anode-supported micro tubes of the MT-SOFCs are fabricated by following a new route. The prepared batch was extruded in rod shape, then transformed into tubular shape under specifically controlled burnout regime that forces the polymer to drag ceramic particles trough the surface. In this study, it is examined that mechanical properties and porosity of sintered tubes depending on organic content and sintering time.

Keywords: Micro Tubular, Solid Oxide Fuel Cell, Anode-supported, Fabrication

ID-544

The Effects of Cathode Material Compositions on the Electrochemical Performance of Micro Tubular Solid Oxide Fuel Cells

O. Yıldız[a], A. M. Soydan[b], E. F. Ipçizade[b], O. Y. Akduman[b], R. Akdeniz[b]

[a] Kocaeli University, Faculty of Engineering, Department of Metallurgical and Materials Engineering, TR-41380 Kocaeli, Turkey

[b] Gebze Institute of Technology, Faculty of Engineering, Department of Materials Science& Engineering, TR-41400 Gebze/Kocaeli, Turkey

Abstract

The reactions on cathode sides are the limiting factor of cell performance in solid oxide fuel cells (SOFCs). Cathode is required to have preferentially high oxygen ion conductivity and high electronic conductivity. The effects of the LSCF, LSCF-GDC, LSCF-YSZ and LSM-YSZ cathode materials on electrochemical performance of the Ni-YSZ anode supported micro tubular SOFC (MT-SOFC) are investigated in this study. Cathode layers have been fabricated by dip-coating method from the LSCF, LSCF-GDC, LSCF-YSZ powders which were synthesized by Glycine-Nitrate Process (GNP) on the surface of YSZ-8 electrolyte tubes. SEM and electrochemical analysis respectively indicated that cells which were fabricated by different cathode materials, has different density of porosity and power density with hydrogen as the fuel at 550°C, 600°C, 650°C, 700°C, 750°C. Different performance values were measured for each different cathode compositions.

Keywords: Micro Tubular, SOFC, Cathode, Anode-Supported, Glycine-Nitrate Process

ID-545

Three-dimensional Computational Fluid Dynamics Modeling of Micro Tubular Solid Oxide Fuel Cells

A. M. Soydan[a], A. Ata[a], B. Tunaboylu[b],

[a] Gebze Institute of Technology, Faculty of Engineering, Department of Materials Science& Engineering, TR-41400 Gebze/Kocaeli, Turkey

[b] Istanbul Şehir University, College of Engineering and Natural Sciences,Department of Industrial Engineering, TR-34662 Üsküdar/İstanbul, Turkey

Abstract

In today's world, by preventing time and cost losses due to experimental studies computational modeling is a very useful and important technique in the development of fuel cells and fuel cell systems. In this study electrochemical & mechanical properties of a Micro Tubular Anode Supported Solid Oxide Fuel Cell (SOFC) was investigated in order to define the optimum cell dimensions and gas feeding system .Three-dimensional Computational Fluid Dynamics (CFD) model with anode, electrolyte, cathode & current collector layers under H_2 & air flow has been developed. A combination of CFD code in Fluent for mass & energy solutions and Fluent SOFC module for electrical & electrochemical solutions was used in the developed model. Distributions of temperature, current density, electrical potential, activation potential, pressure and gaseous (fuel and air) concentrations through the cell structure and electrolyte surface were investigated. Fuel cell variables such as materials selection (YSZ – Ceria) and fuel flow rate and its effects on potential, current and temperature distribution over the cell and fuel utilization are calculated and studied. Modeling results and their comparison with real time performance results represents that the created SOFC model, reasonably matches and results indicates uniform distributions of current density over the active cell area. The layers thicknesses, materials and dimensions of the cell, have a substantial effect on the overall cell performance.

Keywords: Micro Tubular, Solid Oxide Fuel Cell, 3-D Computational, Fluid Dynamics Modeling

ID-546

Quantitative and Qualitative Study of Water Resources in the North-East of Algeria

D. E. Fadel

Département de Géologie, Badji Mokhtar University, Annaba 23000 Algéria
E-mail : derradji_d@yahoo.fr

Abstract

The region study area includes two wilaya located in North East of Algeria (Annaba and El Tarf), it is characterized by an intensive agriculture and an important industrial development. The water balance established by the method of Thornthwaite reports an annual precipitation average about 681.47 mm at the Salines station and an agricultural deficit of 156.13 mm.

Water resources in the study area are abundant, especially superficial waters with a volume of 701 Mm3 / year. The Volume of groundwaters is 135 Mm3 / year. The interpretation of chemical analyzes results identified a sodium-chloride dominant facies for superficial waters and groundwaters with the appearance of some chlorinated-calcic and sulfated- sodic facies.

The establishment of the superficial waters alteration map in the north-east of Algeria allowed classifying surface waters in the region according their alteration. Indeed, the water sources quality of the dune massive are good, unlike the river Seybouse waters are the most contaminated in région.

Keywords: Water resources, water potential, needs, pollution, vulnerability, alteration

ID-549

Effect of the Fluid Temperature on the Crude Oil Fouling in the Heat Exchangers of Algiers Refinery

R. Harche, A. Mouheb

Laboratory of Heat Transfer Phenomenon, Department of Process Engineering, Faculty of Mechanical and Process Engineering, University of Sciences and Technology Houari Boumediene (USTHB), BP 32 EL-ALIA, 16111 Bab Ezzouar Algiers, Algeria Tel: 00213 0550.74.01.17

E-mail: s_r_harche@yahoo.fr

Abstract

Crude oil fouling in refinery preheat exchangers is a chronic operating problem that compromises energy recovery in these systems. Progress is hindered by the lack of quantitative knowledge of the dynamic effects of fouling on exchanger heat transfer. Generally, crude oil flows through the tube side while various other hot streams and pump-around streams flow through the shell side in the heat exchangers.

Fouling in heat exchangers has been the subject of intensive research by several groups of investigators. For that, in this study, we will consider the fouling phenomenon of the heat exchangers tubes for the preheat circuit of the Algiers refinery E101 CBA and FED, which are used for the heating of the crude oil before its division, are exposed to the problem of fouling at the tube side of heat exchangers.

ID-551

Hydropower Plant Regime Management According to the Market Conditions

H. Coban, R. Varfolomejeva, A. Sauhats, I. Umbrasko

(Riga Technical University, Institute of Power Engineering,
Azenes iela12/1., Riga, LV-1048, LATVIA
E-mail: hasanas.coban@gmail.com, E-mail : renata_varfolomejeva@inbox.lv
E-mail : sauhats@eef.rtu.lv

Abstract
The dimensions and significance of the modern systems prove the necessity to change principles of the systems management. In order to decrease carbon dioxide (CO_2) emissions, fight climate change, not adhere to fuel resources and increase energy security while decreasing its dependences on foreign countries, many country governments took actions to exploit its domestic resources and raise the renewable energies in the electricity production, that is why renewable energy is a key issue in today's world and may continue to play a globally essential role in the future.
Turkey has a large renewable energy potential it is still on a development process and has relevant natural hydropower potential, which is about 1.1% of the worldwide and 13.75% of the European potential.
The main purpose of this work is to develop optimal short-term planning models for price taker hydropower producer working in the existing regimes. Those models have to deal with the huge level of uncertainties the water power introduces into the power system. An optimization tool known as generalized reduced gradient method for nonlinear optimization tasks is used to plan hydropower production under uncertainties.
Hydropower stations (20 MW or less) operation effectiveness under the conditions of market relations is defined by means of income value that is determined during the calculation period. This income can be obtained in the regime providing as large as possible HPP electric energy production with particular water consumption within a considered period. The value of these incomes can be calculated in accordance with pre-set market prices for electric energy within the calculated period.
This paper addresses optimization techniques, model applications, and operational issues. Our goal was devoted to the problem of small HPP control regimes optimization. The task of a small HPP operation regime is solved for the maximum income within the cases of the known variation of prices at the market.
The developed forecasting and optimization technics are established on optimization of the Cobanli HPP in Turkey considering hydropower production and flood control. Optimization of powerhouse regimes operation rules provides optimal solutions that have a larger hydropower potential compared to the present regulations. Simulations with a balanced optimum solution show a substantial increase of energy production. It's concluded that real-time optimization in normal flow situations provide solutions that trades-off the immediate and the future value of hydropower production. We construct a model for scheduling hydropower system under uncertainty and fixed of electricity price and water inflow rates trying to achieve the maximum revenue.

ID-552

Challenges in Biofuel Production from Neem Oil

M. Elkadi*, A.E. Pillay, J. Manuel and N. Li

***Department of Chemistry, The Petroleum Institute, PO Box 2533, Abu Dhabi, UAE

Abstract

It is commonly known that the yield of triglycerides in transesterifcation reactions is affected by the presence of water. In the particular case of biodiesel production from neem oil, if water is present in the renewable oil feedstock, the production yield as well as the quality of the produced biodiesel can be affected due to many reasons. For example, the production of soap as a byproduct can reduce the yield and detriment the quality of the fuel due to unreacted oil remaining present in the biodiesel.

In this study, using different types of commercial neem oil, we will explore the effect of water on the yield of biofuel production as well as the influence of different homogeneous catalysts e.g. NaOH, KOH and TBAH.

The results showed significant differences in the yield of biofuel which could be attributed to the undesirable saponification side-reaction shown below.

ID-553

Organic Field Effect Transistor with Interfacial Self Assembled Monolayer Layer

M.Uygun, S. Berber

Gebze Instiute of Technology

Abstract

Studying on organic systems used in electronics has been growing rapidly in recent years. Electrochromic Devices (ECD) such as organic Light-Emitting Diodes (OLED), Organic Field-Effect Transistors (OFET), and Organic Light-Emitting Transistors (OLEFET) have wide range of applications. During this study this devices are successfully produced in laboratory. A well known strong and light-emitting polymer Poly [2 - methoxy-5 - (2 - ethylhexyloxy) - 1,4 - phenylenevinyl main] (MEH-PPV) and Poly[2-methoxy-5-(3′,7′-dimethyloctyloxy)-1,4-phenylenevinylene] (MDMO-PPV) is used as a thin film obtained by spin coating technique, and self-assembled polymer (SAM) are used between dielectric-semiconductor as an regenerative intermediate layer then OLEFET are produces and good device stability are obtained.

ID-554

Effect of Carbon Source on Capacity of Lithium Iron Phosphate Batteries

S. Sevinç[a] , R.D. Çakan[b]

[a]Department of Material Science and Engineering, Gebze Institute of Technology , Gebze, Kocaeli, Turkey
[b]Department of Chemical Engineering, Gebze Institute of Technology , Gebze, Kocaeli, Turkey
E-mail: sserkansevinc@gmail.com

Abstract

Olivine-type $LiMPO_4$ (M = Fe, Mn, Co, Ni) has become of great interest as cathodes for next-generation high-power lithium-ion batteries due to their high capacity, excellent cycle life, thermal stability, environmental benignity and low cost. $LiFePO_4$ is a attractive candidate among them with its relatively high voltage (3.5 V vs Li/Li+) and theoretical gravimetric capacity (170 mAh/g). Here we investigate the electrochemical properties of $LiFePO_4$/C prepared by using different carbon source in aqueus and non aqueous batteries. $LiFePO_4$ nano praticles were prepared by solvothermal method at 180 ^oC using ethylene glycol as the solvent. The samples were characterized by various techniques , Brunauer-Emmett-Teller (BET) method, scanning electron microscopy (SEM), X-ray diffraction (XRD) to ablish their composition, morphology, particle size and surface area. Electrochemical measurements at 0.1C rate show that the $LiFePO_4$/C carbon source significantly improves the charge and discharge capacity.

Keywords: Lithium, Solvothermal, Ethylene Glycol

ID-555

Tin Oxide Catalyst Support for Durable PEM Fuel Cells

B. Duymaz[a], F. Dundar[a, b]

[a]Nanotechnology Research Center, Gebze Institute of Technology, Cayirova, Kocaeli Turkey
[b]Mechanical Engineering Dept., Meliksah University, Talas, Kayseri, Turkey

Abstract

Durability of Proton Exchange Membrane (PEM) fuel cells should be improved for commercialization. Catalyst support materials are one of the critical sub components of PEM fuel cells which degrade under real life conditions. Ceramic materials are resistant to harsh conditions of fuel cells, however they only have decent electrical conductivity. Tin oxide, as a ceramic support, was mixed with Vulcan XC-72 (carbon) to obtain a high performing durable catalyst support. Catalysts were prepared with NaBH4 reduction method. Catalysts were evaluated with cyclic voltametry coupled with rotating disc electrode method. Sweeping potential (0.6 – 1.2 V) accelerated durability test was applied on catalysts. Kinetic current values at 0.85 and 0.9 V were compared, where only activation loss was present. 40 % performance loss was observed with carbon supported platinum catalyst whereas 30 % performance loss was observed with 8% C / SnO_x supported platinum catalyst. Furthermore, MEAs were prepared with decal transfer method and compared with each other.

Keywords: Fuel Cells, PEM, Catalyst, Durability, Tin Oxide

ID-556

Prospect of Iran Natural Gas Export Projects

H. Omidvar

Member of IGU Marketing Committee
Head of Communication Affairs with Science & Research Centers,
Research & Technology Dept., National Iranian Gas Company
No.77-Southern Aban St. - Karimkhan Ave.-Tehran-1598753113-Iran
Tel:+98-21-81315646, Fax:+98-21-81315682, Email: omidvar@nigc.ir

Abstract

Iran holds the second largest gas reserves in the word with over 34 trillion cubic meters (TCM) of natural gas. Due to lack of geological surveys in certain geographical regions in Iran. It is likely to explore further reserves in the future. Hence, for utilizing this energy carrier, it is essential to have comprehensive and explicit planning knowledge. The study of gas industry development policies is indicative of certain barriers in utilizing prospective opportunities. Iran is one of the largest gas rich countries in the world that production capacity exceeds domestic consumption and gas injection requirements. Gas can be utilized as feed stock in petrochemical plants and refineries or exported through pipeline or LNG. Through re-injection of gas to oil reservoirs, while increasing the oil recovery ratios, the produced gases from fields shared with other countries could be stored into domestic gas fields.

Gas consumption in domestic markets and its substitution with oil products, in addition to providing environmental benefits, will also result in optimum consumption of these products and relieving the government

from the heavy burden of existing and heavy expenditures of importing these products from foreign countries.

The need for energy sources in the world along with the enormous natural gas reserves in the country opens broad economical/political dialogue scene towards us and contributes an outstanding strategic significance to our gas resources. Supplying gas requirements, proper and timely production and operation of joint reservoirs such as the south pars with the intention of supplying gas requirements and providing balance of supply and demand as well as maximum utilization of our share in these fields are other development requirements of this significant industry. For planning and policy making regarding the development of gas industry, it is essential to manage all aspects of gas from exploration and production to consumption, injection and exports and etc. through a sole administrative institution so that prearranged plans could be implemented without becoming subjected to such problems as lack of coordination parallel activities and organization al problems.

Gas fuels consumption occupies one half of Iran's energy consumption, and to increment this share, the government should increase investment in the gas sector.

Natural gas while being utilized as a clean fuel in domestic markets can become a device to implement gas injection to oil production from the countries reserves as well as gas exports towards presence in international venues and commercializing gas globally.

Prediction indicates that natural gas being the favorable fuel of the present century, will enjoy the largest growth among items within the energy basket and during the next twenty years as well, the growth of natural gas demand in the world will exceed other conventional energy sources. In the future, due to various factors such as vaster accessible sources and reserves, developed technologies which in effect reduce project expenditure and construction periods and consequently improve the economy of developing gas transmission projects, as well as global endeavors to curtail emission of green house gases, are the major reasons for gas consumption growth

ID-557

Power Efficienty Improvement of Circulation Pumps in Buildings by Application of Different Control Methods

L. Laurinavičius

Department of Electrical Engineering, Vilnius Gediminas Technical University, Saulėtekio al. 11, LT-10223 Vilnius Lithuania Tel. +37061812349
E-mail lagnel4@gmail.com

Abstract

Buildings contain large number of pumps and fans for heating, cooling and ventilation and are responsible for 40% of energy consumption and 36% of CO2 emissions. Circulators in single or double family homes are responsible for about 2% to 3% of the overall electricity consumption. The potential for increased energy efficiency of buildings hydronic systems is investigated. Different motor technologies, frequency control and switching are analysed. The possibility to use new generation small synchronous motor for circulators and applied variable-speed circulating pumps improve regulation characteristics of hydronic systems and decrease electricity consumption in buildings.

Keywords: pumps and fans, buildings hydronic systems, circulating pumps, control, variable-speed, electricity consumption.

ID-558

Post-deposition Hydrogen treatment effect on surface roughness and hydrophobicity of amorphous silicon films

Y.Brahmi[a], L.Filali[a], J.D.Sib[a], Y.Bouizem[a], D.Benlakehal[a], N.Hamzaoui[b], A.Kebab[a], L.Chahed[a]

[a]Laboratoire de Physique des Couches Minces et Matériaux pour l'Electronique, Université d'Oran, BP 1524, El M'naouar, 31000 Oran, Algeria.

[b]Laboratoire des Sciences de la Matière Condensée, Université d'Oran, 31000 Oran, Algeria.

E-mail : larbifilali5@gmail.com

Abstract

Amorphous silicon films were deposited by radiofrequency (rf) magnetron sputtering. Then, the films were treated by pure hydrogen gas at different pressures (1, 2 and 3 Pa) for 20 min, to investigate its effect on surface hydrophobicity (or un-wettability) and roughness. Fourier transform infrared-attenuated total reflection (FTIR-ATR) spectroscopy was used to evaluate presence of Si-H bonds at the surface. Results obtained by the atomic force microscopy (AFM) showed a sharp decrease (the non-treated film had a root mean square value of 81.74 nm, which then dropped significantly to 13.02 nm for the 1 Pa hydrogenated film) in surface roughness as a result of hydrogenation. Optical transmission results revealed that optical properties were not affected. Contact angle measurements showed an enhanced hydrophobicity by 15 degrees for the 1 Pa hydrogenated film, and then it decreased for the 2 Pa and 3 Pa hydrogenated films. This result indicates that the decrease in roughness compromised the hydrophobization process.

ID-559

Method of Assessing Energy Consumption in the Transport of Pallets in Logistics Supply Chain Management

P. Zając

Wrocław University of Technology
27 Wybrzeże Wyspiańskiego St 50-370 Wrocław-POLAND
Tel. +48 71 320 27 19
pawel.zajac@pwr.edu.pl

Abstract

The subject of energy consumption evaluation methods in the world literature occupies an important place and attract the interest of virtually all - both scholars of different fields of science as well as companies or individuals. It can be argued that it leads to a very broad scientific work in the field of energy consumption of technical systems whose main goal is to reduce the operating costs of these systems.

In the world currently operating on this topic ideas, qualitative assessment of use of the products or in a broader scope: technical systems at the design stage to be associated with such factors as:

• accepted model for operational quality assurance system,
• promotional strategy adopted the investor on the values of the operating system to be built,
• Qualification Group created the system, resulting from the adopted pragmatics of its operation.

Shelf life is mainly a technical problem the system designer to achieve the minimum cost of its construction, and lowering the technical level so that no repercussions on operating results and did not result in a complaint to the investor. In addition, the problem here emphasize the relevance of purpose influencing optimization of the logistics system and the satisfaction of an investor who will expect solutions according to the minimization of operational costs, increased safety and reliability.

Kind of reconciliation because of technical, economic, social (ergology, ecology, safety) are generally accepted technical standards in the world.

Nowadays, the design of logistics warehouse systems very often based on intuition or years of experience each producer in the creation of a system of "statistical investor."

The area of use of the results of energy consumption evaluation methods SCM can be logistics management systems, especially storage, in terms of:

• Allocation of loading units in stock - eg. intermediate storage box allocation of places where the current rate method is applied downloads,
• Execution of tasks in the process of completion, based so far on the scheduling of these tasks,
• Planning tasks for the handling,

and in the emergence of loading design solutions.

The logistics SCM can distinguish the following infrastructure:

• Permanent (buildings, civil engineering works, ramps, shelves, if you are a support structure warehouse building, roads, squares, etc..)
• no mechanical equipment (shelves, pallets, containers, scales, etc..)
• mechanical and mechanical equipment (forklifts, stackers stacker cranes, conveyors, palletizers, pallet unloaders, etc..)
• machine systems maintain temperature regimes
• equipment and means of process control storage and implementing processes of information flow,
• Human,

and four warehouse processes, ie .:

• admission to the magazine
• storage,
• completion,

• edition of the magazine.

Assessment of the energy balance can be found in the published work, where the potential energy obtained after loading the container (container for scrap type: ACTS) can be recovered in the process of unloading. This results in a change of selected power unit, whose power can be reduced by the potential energy of the container.

The overall structure or design concept store is the flow of goods in the warehouse, the specification of individual departments, the flow of information and goods and the relationship between them. Selection of individual components and their storage system sizing determines the size and dimensions of the storage and distribution of space (not just component) between different areas of the warehouse. Adoption of storage areas, a detailed configuration of storage areas, for example, the transition zone configuration download, pallet block-stacking and space allocation from the reserve vacancies in the storage area, as well as configure automatic storage / retrieval system (AS / RS).

The study of energy consumption SCM is very limited, but examples of solutions and computational tools used to design systems of transport and storage facilities, and activities will contribute to the elimination of significant differences between academic research and applied in practical solutions and, therefore, can help solve the key tasks in the future.

ID-560

Light Efficiency of Aluminate Phosphors under Photo- cathodo- and X-Ray Excitation

N.P.Soschin, V.N. Ulasyuk, V.A.Bolshukhin

RPC “Luminophor”, Corporation “ELTAN Ltd”

3, Zavoskoy proezd, Fryazino Moscow region, Russia 141190

+7(495) 702-9658

E-mail : soshin@mail.ru

Abstract

The paper provides experimental data on conversion effectiveness of quantum and corpuscular fields of different origin by rear-earth elements-based (REE) powder phosphors with general formula $(\Sigma Ln)_3Me_5O_{11}(Hal,N)_1$:Ce, where ΣLn=Y and Lu and Tb and Ce, Me=Al and/or Ga and/or In, Hal=F^{1-} or Cl^{1-}, or Br^{1-} or J^{1-}, and featuring crystalline structure of mineral garnet.

When excited with blue spectrum $\lambda_{exc.}$=460 nm quanta these phosphors intensively emanate green and yellow illumination at λ_{em}.=540-560 nm and quantum efficiency η>0.92-0.95. If the Stokes shift is Δ=80 nm then the high quantum yield demonstrates energy transformation efficiency over 73%. Such energy efficiency provides for extremely luminous efficacy of binary light emitting diodes of θ=210 lm/W (power of excitation W=0.15 W) to θ=160 lm/W (W=1 Wt).

Aluminate cathodophosphor with Ce+Tb activation is used in the projection screen CRTs used to optically project composed image onto aircraft windshield so that the brightness of the image is comparable with illumination from the Sun. The screen brightness is extremely high, about $80 \cdot 10^3$-$100 \cdot 10^3$ cd/m^2. Total light outflow from the CRT screen is F=3,000 lm, thus allowing luminous efficacy of η=56-60 lm/W, which is outstandingly high for cathodophosphors instrument.

Examined garnet-structured phosphors feature rapid K-leap in X-ray and gamma adsorption at 20 to 50 keV. Variation of chemical composition in the garnet materials and substitution of light Al^{3+} ion in their structure with heavier gallium Ga^{3+} and indium In^{3+} results in significantly increased adsorption of excitation radiation, the effect currently used in multi-elemental tomographic screens for mammography. Low power of X-ray excitation (below 0.001 W) allows brightness of micro-pixels in the tomographic screen E=0.8 lux, which is sufficient for CMOS matrix operation in the silicon-based LEDs for composing multi-elemental cross-section images of pathologic tissues. Enrichment of a garnet phosphor with such heavy elements as Sc or Hf and substitution of a part of O^{2-} oxygen ions with heavy bromine Br^{1-} and iodine J^{1-} ions increases molecular weight of the material to 250-450 amu with effective number of 60 units. At the same time the efficacy reaches $50\text{-}65 \cdot 10^3$ quanta/1 meV, which is the top value if compared against conventional halide scintillators. Use of these heavy multi-ligand phosphors makes it possible to increase defectoscopy resolution in thick metalware (above 200 mm) considerably.

Materials provided in the study report lead to the conclusion that garnet luminous materials are unique featuring extremely high lumen equivalents in transformation of electromagnetic excitation of different origin.

ID-561

The potential of Water and Energy Efficiency in the Textile sector with Best Water Management Practices (BWMPs) in Pakistan

S. A. Naqvi, A. H. Sayed, S. Dar

WWF-Pakistan

Abstract

Textile processing sector is one of the major water intensive sector in Pakistan. It consumes more water than spinning, weaving and garment manufacturing, so processing is the major contributor of the industrial pollution in Pakistan. There are total 1545 Textile processing units in Pakistan out of which 1395 lies in Punjab[1]. The effluents from the textile processing sector are directly discharged into the water bodies without any treatment. Each Individual industry couldn't afford the treatment plant. The pollution of the industrial processes can be controlled in house or off house by some treatment. WWF-Pakistan in partnership with WWF-UK and Cleaner Production Institute (CPI) launched a project funded by European Union (EU) for the water efficiency and pollution reduction in the 4 industrial sectors[2]. This paper will share the potential of the textile processing SMEs for the reduction of water consumption, pollution reduction and energy efficiency by the adoption of Best water management practices (BWMPs) in Pakistan.

1 Pakistan EPA, "Draft Textile Sector Report", prepared by Activity Based Capacity Development Project.

2 Press Releases , WWF-Pakistan monthly news letter March 2013

The authors are working in WWF-Pakistan

ID-562

Cobalt doped Ni-Mn layered double hydroxide nanosheets grown on nickel foam as advanced pseudocapacitor materials

S. Singh[a,b], K.N. Hui[a], K. H. Kim[a,b,c]

aDepartment of Materials Science and Engineering, Pusan National University, Busan, South Korea
bGlobal Frontier Center for Hybrid Interface Materials, Pusan National University, Busan, South Korea
cSchool of Convergence Science, Pusan National University, Busan, South Korea
E-mail : kwhokim@pusan.ac.kr, E-mail : bizhui@pusan.ac.kr

Abstract

A 3D hierarchical nickel-manganese layered double hydroxide (NiMn-LDH) nanosheet grown on nickel foam was fabricated by facile one-step hydrothermal method. Instead of using any adscititious alkali sources or oxidants, cetyltrimethylammonium bromide (CTAB) is used as a growth assisting agent to maintain the uniformity of the nanosheets. The as-fabricated nanosheets aligned vertically on the nickel foam exhibited high specific capacitance of 1142 F/g at 2 A/g with excellent rate capability up to 15 A/g. Moreover, the sample demonstrated excellent cycling performance with capacitance retention of 82% at 8 A/g and 97 % of columbic efficiency after 1500 cycles. Furthermore, systematic study of cobalt doping in place of nickel has been done on the optimized NiMn-LDH nanostructure. Results revealed that cobalt doping has a significant impact on pseudocapacitive performance of NiMn-LDH nanostructure due to synergy of ternary component.

Keywords: Nickel-Manganese layered double hydroxide, Pseudocapacitor, CTAB

ID-563

Calculating the Optimum Operational Conditions of a Combined Cycle Power Plant Using Three Objective Function: Environmental Based on LCA, Economical and Exergetic

A. M. K.Vandani[a], F. Joda, Ramin[b], B. Boozarjomehry[c]

[a]Energy Engineering, Shahid Beheshti University, A.C., Tehran, Iran
Mailing address: No. 5548, Shahid Moradi alley, Vahid Ave., Astane Ashrafieh, Guilan, Iran
[b]Faculty of Mechanical & Energy Engineering, Shahid Beheshti University, A.C., Tehran, Iran
[c]Professor, Faculty of Chemical Engineering, Sharif University of Technology, A.C., Tehran, Iran
Tel: +98-912-2416188, E-mail: a.mohammadi_68@yahoo.com

Abstract

Increasing the consumption of fossil fuels and also raising the price of them in recent years have drawn more attention to the optimization of power plants. In this lecture, exergetic, economic and environmental analyses are performed for a combined cycle system which uses two different types of fuel, natural gas and diesel fuel. Also the effect of supplementary firing is investigated. To analyze the environmental effects, life cycle assessment was used. The results showed that the largest exergy destructions occur in the combustion chamber and using diesel, instead of natural gas, will increase the annual cost of the power plant.

The optimization results show that using natural gas, the exergy efficiency and annual cost were improved by 2.34 and 4.99 percent, respectively, while in case of using diesel fuel, these improvements will be 2.36 and 1.97 percent. Also using diesel fuel instead of natural gas, in addition of increasing the quantity of carbon dioxide and carbon monoxide, will lead to produce sulfur dioxide, which increases the environmental effects.

Keyword: Exergy, Economic, Environment, Optimization

ID-565

Energy and Exergy Analysis and Energy Conversion of a Cement Plant in India - A Case Study

D. Sen[a], D. Das[b]

[a]Department of Mechanical Engineering, National Institute of Technology, Agartala, Tripura, 799055 India
[b]Department of Mechanical Engineering, National Institute of Technology, Silchar, Assam, 788010 India
Email: dipak_sen@ymail.com

Abstract

The thermodynamic analysis and exergy consumption of the calcination process in kiln have been performed in order to identify the irreversibility and the exergetic performance of a process. The various performance parameters of the different components have been evaluated by making use of data collected over a year and the First law and Second law efficiency of kiln system has been estimated as 52.04% and 44.64% respectively. The irreversibility of the system has been estimated as 36.69%. Results also showed that the most irreversibility in the processes which are taking place in the kiln, are the exergy obliteration due to fuel combustion and the exergy loss due to internal heat transfer which accounting about 44% and 10% of the efficiency loss respectively. A heat recovery steam power plant has been proposed for the generation of electricity, which utilizes the waste heat of this plant. The capacity of the steam power plant has been estimated 987 kW.

Keywords: Energy, Exergy, Waste heat recovery steam power plant, Cogeneration.

ID-566

Kinetic Adsorption of Water Vapour in Zeolite13X

F. Mhiri[a], K. Hajji[b], A. Jemni[c]

[a] Institut Préparatoire aux Etudes d'Ingénieurs de Monastir, Rue Inb El Jazzar, 5019 Monastir, Tunisie (university of Monastir)
[b] Faculté des sciences de Monastir, Avenue de l'environnement, 5000 Monastir, Tunisie (university of Monastir)
[c] Ecole Nationale d'Ingénieurs de Monastir, Rue Inb El Jazzar, 5019 Monastir, Tunisie (university of Monastir)
Tel.: +216 73500273. Fax : +216 73 500512.
E-mail : ribat005@Yahoo.fr

Abstract

The adsorption of a gas in a microporous solid is a matter transfer with a movement quantity from one environment to another. This property is the feature of a transportation phenomenon. In the ideal case, the main physical aspects of these phenomena are described by Fick's law. Generally, these phenomena obey some equations which are more complicated than Fick's law. In the proposed model, the system is neither homogenous nor isotropic. As to the speed of the diffusion accumulation, it depends on the concentration gradient, the direct adsorption and the coupling of the adsorbed quantity-energy.We confirmed the existence of a characteristic temperature and its effect on the relaxation time relative to the adsorbed matter quantity, the underscoring of the adsorbed matter fluctuation in which the interval is active. This model shows the importance and the possibilities that allow us to study thoroughly the mechanism of a gas adsorption by a microporous solid.

In a microscopic way, the adsorption process in elementary volume results from the succession of three phenomena which occur during the time: the direct adsorption of the exterior to the adsorbent (transportation phenomenon), the matter diffusion inside the adsorbent and the exchange of the adsorbed matter due to fluctuation

The differential equation describing the adsorbed quantity during the time results from a matter balance in an adsorbent elementary volume:

The adsorbat accumulation is equal to the gain per diffusion inside the adsorbent plus the quantity directly adsorbed from outside plus the matter exchange due to fluctuations:

$$\frac{\partial n(r,t)}{\partial t} = D\,\Delta n(r,t) + A(r,t) + B(r,t) \qquad (1)$$

In a spherical symmetry case and from, this equation is written as:

$$\frac{\partial n(r,t)}{\partial t} = D\,\Delta n(r,t) + b\,n(r,t) + Z(t)R(r) \qquad (2)$$

Where A(r,t) = b n(r,t) with b a constant in the isobar case as it depends only on the pressure and on the adsorbent's active surface. Equation (2) has been solved using the variable separation method, the model chosen for B(r,t) is Z(t) R (r) where Z(t) is the function describing the deep link between the fluctuations and the dissipations of the matter and energy and R(r) is the function that describes the matter distribution with respect to coordinates. The solution of equation (2) with the following limit conditions $n(r,0) = n_0$; $n(r_c,\infty) = n_\infty$ and $\left(\frac{\partial n}{\partial r}\right)_{r=0} = 0$.

In this work, we confirmed the theoretical approach of simulation of the adsorbat quantity with respect to time and to the radius of the adsorbat grains. This approach takes into account the non homogeneity of adsorbat surfaces and the fluctuations detected experimentally. The advantage of such a study is that it takes into consideration the major internal parameters of the system. This is due to the use of random functions in the resolution of the differential equation imposed by fluctuation.

Keywords: kinetic, adsorption, fluctuation, dissipation

ID-567

Numerical Analysis of $CuInS_2$ Based Solar cell by using SCAPS

H. Ullah [a,b], B. M. Soucase [a]

[a]Departament de Física Aplicada-IDF, UniversitatPolitècnica de València, València, Spain,
[b]Electrical Engineering Department, Federal Urdu University Islamabad Pakistan.
E-mail:hanifuet@yahoo.com

Abstract

Efficiency and performance enhancement for solar cells is the hottest topic of today research in academia and industry. Availability of material, syntheses of the required cell devices and the processes required to complete and compete a renewable project is a competitive business. CdTe, CIGS based solar cells are more discussed areas for thin-film solar technologies. The use of $CuInS_2$ as a replacement absorber layer has been analysed by using a Solar Cell Capacitance Simulator software (SCAPS). The PV cell consist of $CuInS_2$ absorber layer with band gap 1.43eV and thickness of 4um, CdS buffer layer 70 nm and ZnO window layer 50 nm. After optimization of different parameters and layer thicknesses a maximum efficiency (eta) of 27.75%, V_{OC} of 0.99 Volts, J_{SC} of 0.033 A/cm^2 and Fill-Factor (FF) of 84.4% was reached. We carried out simulation studies by varying several solar cell parameters such as thickness of various layers, it has been revealed that increase of absorber layer thickness results in higher efficiency. The maximum efficiency was achieved for an absorber layer thickness of 5 µm. Thickness and concentration of shallow donors (N_D) for the ZnO window layer was also optimized. The best value obtained for 50-60 nm of thickness and 8.0×10^{20} /cm^2 of N_D value. The simulation result so obtained from SCAPS can be useful as a feedback for designers and producers of cheap and efficient thin film solar cells

ID-568

Effect of Rf-Power in the Deposition of Nanocrystalline Silicon Thin Films

F. Zeudmi Sahraoui, A.Kebab, J.D.Sib, Y.Bouizem, D.Benlakehal, L. Filali, L.Chahed

Laboratoire de Physique des Couches Minces et Matériaux pour l'Electronique, Université d'Oran, BP 1524, El M'naouar, 31000 Oran, Algeria.

Email: zeudmi_f@yahoo.com

Abstract

Hydrogenated nanocrystalline silicon films have become the subject of great attention due to their remarkable properties for microelectronics and solar cells technology. The structural changes in intrinsic silicon thin films deposited by radiofrequency (rf) magnetron sputtering at room temperature (Ts = 35°C) are investigated as a function of the rf-power. The aim of this work is to get more insight into the effect of the rf-power. By varying the rf-power from 200 W to 500 W, and keeping all other parameters of the plasma constant (the total pressure is fixed at 4 Pa, the plasma gas mixture of 30% Argon and 70% H_2 and the target-sample holder distance of 50 mm). The composition and the microstructure of the films were analysed by X-ray diffractometry (XRD), atomic force microscopy (AFM), optical transmission measurements (OT) and spectroscopic ellipsometry. The results indicate that the films have nanocrystalline structures and the grain size decreases (5 to 2 nm) with increasing rf-power (200 to 500 W). The crystals are oriented generally towards the (111) plane, parallel to the sample surface. Analysis of the surface layers reveal that the Root Mean Square (RMS) surface roughness for the samples increases (11 to 43nm) with increasing rf-power and the film thickness grows (1.4 to 3.7µm).

ID-570

Rapid Degradation of Azo Dyes Using Nano-Scale Zero Valent Iron

N. Rahman[a], Z. Abedin[b], M. A. Hossain[b]

[a] Department of Environmental Science, Independent University, Bangladesh, Dhaka, Bangladesh;

[b] Department of Environmental Science, Independent University, Bangladesh, Dhaka, Bangladesh.

Email: nabila.r19@gmail.com

Abstract

In the present work, nano-scale zero valent iron (NZVI) was synthesized in ethanol medium by the method of ferric ion reduction using sodium borohydride as a reducing agent under atmospheric conditions. The obtained iron nanoparticles are mainly in zero valent oxidation state and remain without significant oxidation for hours. A systematic characterization of NZVI was performed using XRD, SEM and TEM studies. The obtained iron nanoparticles consist of a zero valent core surrounding a rest oxide shell. The diameter of iron nanoparticles was predominantly within the range 20-110 nm.

Refractory azo dye compounds used in the textile industry are commonly detected in many industrial wastewater, especially in poor developing countries like Bangladesh. The wastewaters are often discharged with no or minimal treatment to avoid cost and maximize profit. In such a scenario, a treatment method which is both cheap and easy to handle could be a possible solution to protect the environment. In this study the removal efficiency of three azo dyes, namely, methyl orange, sunset yellow and acid blue a, with laboratory synthesized NZVI particles in relation to the NZVI dosage, dye concentration and pH was determined. Increasing the dose of NZVI particles enhanced the decolorization of the dyes. The degradation decreased with increasing solution pH and concentration of dyes.

These findings demonstrated the fast removal of azo dye compounds with NZVI and the advantage of the synthesized NZVI particles to treat azo dye contaminated wastewater.

Keywords: Nano-scale zero valent iron; Removal efficiency; Decolorization; Degradation; Azo dyes.

ID-571

Computing Energy of Molecular Graph of Nanotubes

A. Bahrami

Department of Mathematics, college of Basic science, Mahshahr Branch, Islamic Azad University, Mahshahr , Iran

Abstract

In mathematics, the energy of a graph is the sum of the absolute values of the eigenvalues of the adjacency matrix of the graph. This quantity is studied in the context of spectral graph theory.In this paper Energy of singel walled carbon nanotubes is determined.

Keywords: Energy of graph, Adjacency matrix, Carbon nanotube

ID-573

Next-24 Hour Load Forecasting of Jordanian Power Grid using Radial Basis Function Neural Networks

E. Almaita[a], S. Al-daikh[b]

Power and Mechatronics Engineering Dept., Tafila Technical University, Tafila, Jordan

E-mail: e.maita@ttu.edu.jo

Department of Basic Sciences, Balqa Applied University, Ma'an, Jordan

E-mail: mahameedm@yahoo.com

Abstract

In this paper, the Radial Basis Function Neural Networks (RBFNN) algorithm is used to forecast the next-24 hour electrical load demand in Jordan. The total load consumption was forecasted based on small number of features. These features are; the load in the previous day, the load in the same day in the previous week, the temperature in the same hour, the hour number, the day number, and the day type. A small and effective RBFNN model is used to forecast the load demand. This model does not need clustering for the historical data, and the whole next day load curve only needs one RBFNN model The training algorithm for the RBFNN model is called hybrid learning algorithm, which is based on linear matrix inversion, is simple and fast training algorithm. The data used in this paper is real data measured by National Electrical Power co. (Jordan). The data for the period Jan./2012-April/2013 is used train the RBFNN models and the data for the period May/2013- Sep. /2013 is used to validate the models effectiveness.

Keywords: Load Forecasting; Neural Networks; Radial Basis Function; Short-Term; and Electricity Consumption.

ID-574

The Effect of the Different Gate Dielectric Layer on OFETs' Parameters

D.T. Gazioglu[a], F. Dumludag[b] , Y. Yerli[c]

[a]Gebze Institute of Technology, Department of Physics, Gebze, Kocaeli, Turkey

[b]Marmara University, Department of Physics,Göztepe, Istanbul, Turkey

[c]Yıldız Tecnical University, Department of Physics, Davutpasa, Istanbul, Turkey

Abstract

During the last several decades, solution-processible OFETs have received considerable attention due to their potential applications in low cost, flexible, low temperature and large area devices; such as active matrix organic displays, chemical sensors, logic circuits and flexible integrated circuits. For practical applications, high ON/OFF ratio, highspeed and low operation voltage are required. As a key component of OFETs, gate insulator has a significant influence on the performance of the devices. In this work, we aimed to investigate the effect of gate dielectric layer on the characteristics such as drain-source current, mobility and threshold voltage. OFETs were fabricated on indium tin oxide (ITO)-coated glass. Silver metal electrodes (source and drain) were deposited using thermal evaporation system in high vacuum ambient ($<10^{-6}$ mbar). The samples which were fabricated in top contact bottom gate structure were estimated using semiconductor characterization system (Keithley 4200 SCS) in air ambient. As a result, OFET parameter values were changed with the various types of gate dielectric.

Keyword: Field effect transistor, ITO, Insulator, Polymers

ID-575

The preparation and electrochemical performance of Al-Si/C nanocomposite anode for lithium ion battery

Kelimu Tulugan*, SunChul Huh** and WonJo Park***

*Ocean System Engineering, Gyeongsang Naitonal University, TongYoung, Korea

**Department of Energy and Mechanical Engineering, Gyeongsang National University, TongYoung, Korea

***Ocean System Engineering, Institude of Marine Industry, Gyeongsang National University, TongYoung, Korea

Abstract

The microstructures and electrochemical performances of Al-Si and Al-Si/C nanocomposites were investigated as the anode of lithium ion battery. Al-Si nanoparticles were prepared by the arc-discharge method. Al-Si/C nanoparticles were obtained by coated Al-Si nanoparticles with the precursor of glucose ($C_6H_{12}O_6$) as carbon source. It was indicated that the carbon

Keywords: Nanoparticles, Arc-discharge method, Al-Si, Carbon coating, Lithium ion

ID-576

Current status and SWOT analysis of renewable energy sources in Jordan

J.O. Jaber

Faculty of Engineering, Philadelphia University, Amman, Jordan,
on sabbatical leave from the Faculty of Engineering Technology, Al-Balqa' Applied University, Jordan, Email: jojaber@gmail.com

Abstract

The aim of this investigation is to assess the current status of renewable energy sources and systems in Jordan and develop a matrix of strength (S), weakness (W) as internal issues and opportunities (O) and threats (T) as external factors. The conducted analysis was developed through a series of face-to-face meetings with all concerned stakeholders from the public as well as the private sectors, using a semi-structured questionnaire, taking into account the government plans to increase the contribution of renewable energy in the national energy mix to reach 10% of the total energy consumption in the year 2020. After collecting and analyzing the notes, strong points were grouped in a matrix together and same for weakness, opportunities and threats.

Among the most important weaknesses that may hinder efforts in developing renewable energy sources in Jordan are (i) the available financing schemes and (ii) the future price of electricity generated by renewable sources. It is still uncommon, in Jordan, to find banks' that have special financing programs, with reduced service charges, to support renewable energy and energy efficiency projects. Equally important is that the Jordan Renewable Energy & Energy Efficiency Fund (JREEEF) which was created, in 2012, to contribute to the development of renewable energy and energy efficiency in Jordan, is still not operational, yet. Without providing needed support for renewable energy through public awareness and training, project preparation, access to credit, cost of financing and access to equity financing, the national goals could not be achieved.

Keywords: renewable energy, SWOT analysis, indicative prices, emissions, Jordan

ID-577

THEORETICAL STUDY OF COMPLEX OF POLY(PYRAZOLYL)BORATES TYPE M(t-BuBTp$^{i\text{-}Pr}$) R(Where : M = Fe, Ru et R = Cl, Me)

Akila TAYEB-BENMACHICHE[1, 2] and Bachir ZOUCHOUNE [2]

[1]*Faculté de Médecines, Département de médecine, Université de Constantine 3, BP 126 Chalet des Pins, Constantine (25000)- ALGERIE.*
[2]*Unité de Recherche Chimie de l'Environnement Moléculaire et Structurale (URCHEMS), Université de Constantine 1, Route Ain El Bey, Constantine (25000)- ALGERIE.*

E-mail: saratayeb@yahoo.fr

Abstract

Since their discovery in 1967, the poly (pyrazolyl) borates have found wide application in chemistry of coordination and most of their complexes containing metals or metalloids were prepared. Our theoretical study, using ADF (Amsterdam Density Functional) and the data calculated are comparable with the experiment, carries on the complexes M (T-BuTpi-Pr) R (where: M = Fe, Ru and R = Cl, Me). The complexes were studied in C3v symmetry and show that M is in a tetrahedral environment d^8ML_4. The presence of Fe stabilizes the state quintuplet (high spin) which their confers interesting magnetic properties. On the other hand and under the same conditions, Ru stabilizes the state singulet (low spin). The replacement of R by CH_3 or Cl does not alter the structure, not the properties of the complex. Calculations of frequencies of the normal modes of vibration give no imaginary frequency confirming that the optimized geometries correspond at leasto the minimum energy. The UV-Vis spectra show that the transitions are mainly of type ML→ ML or M → M.

Keywords: DFT (density functional theory), iron complex, N-ligands, tris(pyrazolyl)borate, crystal structure, four-coordinate complex.

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