CONTROL ID: 2955367

TITLE: Properties of Bioactive 45S5 Glass-ceramics by Calcium Substitution With Strontium/Fluoride

PREFERRED PRESENTATION TYPE: Poster

CURRENT SCIENTIFIC GROUPS & NETWORKS: Dental Materials 5: Biocompatibility, Bioengineering and Biologic Effects of Materials

PRESENTER: Tabassom Hooshmand

PRESENTER (INSTITUTION ONLY): School of Dentistry/Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences

AUTHORS (FIRST NAME INITIAL LAST NAME): S. Heidari[1], T. Hooshmand[2]

AUTHORS/INSTITUTIONS: S. Heidari, Department of Dental Biomaterials, School of Dentistry, Tehran University of Medical Sciences, Tehran, IRAN (THE ISLAMIC REPUBLIC OF)|T. Hooshmand, Department of Dental Biomaterials, School of Dentistry/Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences, Tehran, IRAN (THE ISLAMIC REPUBLIC OF)|

ABSTRACT BODY:

Objectives: Bioactive glass-ceramics are of great importance in bone tissue engineering due to their higher mechanical strength while maintaining their bioactivity. Since the sol-gel method allows the insertion of different elements into the glass structure easier, achieving the bioactive glass-ceramics with different compositions is possible. The bioactive materials containing fluoride and strontium has always been prominent in dentistry and medicine due to their unique properties. The purpose of the present study was to synthesize and characterize the 45S5 glass-ceramics containing 5 and 10 mol% SrO or CaF_2 substituted for CaO.The biological properties of the synthesized glass ceramics were also evaluated.

Methods: The 45S5 glass ceramics were synthesized by replacing Calcium (Ca) with 5 and 10 mol% Strontium (Sr) or Fluoride (F). The crystalline phases and chemical bonds of the glass ceramics were evaluated by X-ray diffraction (XRD) and Fourier-transform infrared spectroscopy (FTIR). Field-emission scanning electron microscopy (FE-SEM) with energy dispersive X-ray spectroscopy (EDX) analysis were used to observe the morphology and microanalyses of the particles. The thermal behavior of the bioactive glasses were evaluated by simultaneous thermal analysis. The bioactivity of glass-ceramics by hydroxyapatite formation was determined by XRD, FTIR and FE-SEM/EDX following the immersion of samples in simulated body fluid for 1, 7 and 14 days. The effects of the glass-ceramics extracts on the cell toxicity and alkaline phosphatase (ALP) activity of osteoblast-like cells were also evaluated for the mentioned time periods.

Results: From the obtained results, sodium calcium silicate was detected as the main crystalline phase in all glass-ceramics. The crystallinity of 45S5 glass-ceramic was clearly improved by replacing Ca with F. Although the formation of hydroxyapatite was retarded by adding F ions, it was not completely inhibited and the results were approximately similar after 14 days. The Sr-containing 45S5 glass-ceramics also showed a significant increase in the cell viability and ALP activity.

Conclusions: It can be concluded that the properties of 45S5 glass-ceramic can be improved by adding proper amounts of therapeutic ions into the glass structure.

TABLE TITLE: (No Tables)

(no table selected)

TABLE FOOTER: (No Tables)

(No Image Selected)

KEYWORDS: glass ceramic, 45S5 , fluoride, calcium, strontium.

AWARDS:

Student Status - Abstracts: No

Support Funding Agency/Grant Number - Abstracts: (none)

Financial Interest Disclosure: None

Group Author Abstracts - Abstract: (none)