Synthesis and Characterisation of Machineable Bio-Active Glass Ceramics in the SiO_2-Na_2O-CaO-P_2O_5-MgO System

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Abstract

Bioactive glass-ceramics are a class of materials which elicit a special response on their surface when in contacts with biological fluids, leading to strong bonding to living tissue. The bio-active glass and glass-ceramics materials are used in the medical field. The present study is to synthesize SiO_2-Na_2O-CaO-P_2O_5-MgO system and characterize the properties of the prepared glass ceramics. The glass-ceramics samples were characterized by differential thermal analysis (DTA) for thermal behavior, X-ray diffraction analysis (XRD), and the change in surface morphology was determined by scanning electron microscopy with energy dispersive spectroscopy (SEM with EDS) along with Fourier transform infrared spectroscopic (FTIR) techniques. Results showed that by increasing MgO content, the crystallization peak temperature (T_p) increases. The Avrami parameter (n) showed that the crystallization mechanism changed from surface crystallization to become one-dimensional. The FTIR study identified the different bonds present in the crystal structure. The short and long rod-like crystals which were identified by SEM and crystalline phases were fluorapatite and wollastonite for all three ceramic specimens by XRD. All the samples showed good machinability.

Keywords**:** *Bioactive glass ceramics, Magnesium, Crystallization, Fluorapatite, Wollastonite, Machineable*