

Effect of B₂O₃ Addition on Sol-gel Synthesized 45S5 Bioglass

Authors : P. Dey, S. K. Pal

Abstract : Ceramics or glass ceramics with the property of bone bonding at the nearby tissues and producing possible bone in growth are known to be bioactive. The most extensively used glass in this context is 45S5 which is a silica based bioglass mostly explored in the field of tissue engineering as scaffolds for bone repair. Nowadays, the borate based bioglass are being utilized in orthopedic area largely due to its superior bioactivity with the formation of bone bonding. An attempt has been made, in the present study, to observe the effect of B₂O₃ addition in 45S5 glass and perceive its consequences on the thermal, mechanical and biological properties. The B₂O₃ was added in 1, 2.5, and 5 wt% with simultaneous reduction in the silica content of the 45S5 composition. The borate based bioglass has been synthesized by the means of sol-gel route. The synthesized powders were then thermally analyzed by DSC-TG. The as synthesized powders were then calcined at 600°C for 2hrs. The calcined powders were then pressed into pellets followed by sintering at 850°C with a holding time of 2hrs. The phase analysis and the microstructural analysis of the as synthesized and calcined powder glass samples and the sintered glass samples were being carried out using XRD and FESEM respectively. The formation of hydroxyapatite layer was performed by immersing the sintered samples in the simulated body fluid (SBF) and mechanical property has been tested for the sintered samples by universal testing machine (UTM). The sintered samples showed the presence of sodium calcium silicate phase while the formation of hydroxyapatite takes place for SBF immersed samples. The formation of hydroxyapatite is more pronounced in case of borated based glass samples instead of 45S5.

Keywords : 45S5 bioglass, bioactive, borate, hydroxyapatite, sol-gel synthesis

Conference Title : ICMSE 2016 : International Conference on Materials Science and Engineering

Conference Location : Paris, France

Conference Dates : January 21-22, 2016