



## Effect of Nano-ZrO<sub>2</sub> addition on the Synthesis, Crystallization, Mechanical and Biological Properties of bioactive glass ceramics

Tamal Kanti Ghosh and Sudip Kumar Das\*

Department of Chemical Engineering and Centre for Research in Nano Science and Nano Technology (CRNN),  
University of Calcutta, India

\*Corresponding author, E-mail: skdchemengg@caluniv.ac.in

### Abstract

In 1969, L. Hench first developed bioactive glasses that have the ability to bond with living bone and tissue by formation of the apatite layer when exposed to physiological solutions. Bioactive glasses with different compositions have been studied to estimate and improve their mechanical strength without disturbing its bioactivity. The three batches (TKG-1, TKG-2 and TKG-3) of bio-glass were prepared using high-purity chemicals by the conventional melt-quench technique. On increasing the amount of nano-ZrO<sub>2</sub> the glass transition temperature increases from sample TKG-1 to TKG-2 and then decreases slightly from TKG-2 to TKG-3 and the density, chemical resistance and Vickers hardness increases as the amount of nano ZrO<sub>2</sub> increased. TEM images showed that the prepared bioactive glass ceramics found in nano scale. The XRD analysis indicated the fluorapatite (FA) phase as a major phase with high intensity of sintered glass. The FTIR spectra confirmed the presence of Si-O-Si, C-O, P-O, O-H stretching band of samples before and after the immersion in simulated body fluid (SBF). The analysis of SEM with EDS confirmed the formation of hydroxycarbonate apatite (HCA) layer on the sample after 14 days' immersion in SBF solution due its bioactive nature. This was also confirmed by XRD analysis.

**Keywords:** *Bioactive glass, Fluorapatite, SBF, SEM with EDS*