

## **Parallel evolution of microstructure and mechanical properties of bioglass/hydroxyapatite composites**

### **ABSTRACT**

The purpose of this research work is to establish the parallel evolution stages of microstructure and mechanical properties development as well as their relationship. This kind of observation is not present in the literature of this research area and studies of the relationship between microstructure and mechanical properties have been directing towards the product of final sintering temperature, largely neglecting the parallel evolution of microstructure and mechanical properties and their relationship at various selected sintering temperature. Commercial bioglass (BG) of  $\text{SiO}_2\text{6CaCO}_3\text{6Na}_2\text{O}_3\text{6P}_2\text{O}_5\text{6CaF}_2$  were prepared by conventional melt quenching technique and mixed with hydroxyapatite (HA) via solid state reaction. To complete the evolving series of temperature, the pellet samples were subjected to sinter from 500 to 1000°C with 50°C increments. Sintered sample were characterized by Differential Scanning Calorimetry (DSC), X-ray Diffractometry (XRD), Field Emission Scanning Electron Microscope (FESEM) and Archimedes Principle. Hardness and compressive strength was determined using Vickers Microhardness Tester and Universal Testing Machine (UTM) respectively. Results are implying that a high densification and mechanical regime is reached after sintering at low temperature (500 to 800°C) while low densification and mechanical regime is reached after sintering at higher temperature (850 to 1000°C). BG-HA sintered at 800°C presented the best results, with high relative density, hardness and compressive strength of 250 HV and 103 MPa, respectively.

**Keyword:** Bioglass; Hydroxyapatite; Microstructure; Mechanical properties