

Study of the Microstructural and Mechanical Properties of a Phosphocalcic Bone Substitute

L. Alimi, L. Bahloul, A. Azzi, S. Guerf, F. Ismail

Abstract : The choice of calcium phosphate materials in reconstructive surgery is justified by the surprising similarities between the composition of these materials and that of the bone. Among a multitude of bone substitutes, hydroxyapatite of chemical composition $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ is the material most similar to natural apatites. In this study, hydroxyapatite was developed using the wet precipitation method from hydrated calcium chloride ($\text{CaCl}_2 \cdot 12\text{H}_2\text{O}$) as a source of calcium and di-sodium hydrogen phosphate dihydrate ($\text{HNa}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$) as a source of phosphate. Vickers Microhardness tests and XRD analyzes were used for the characterization of the synthesized material. The mechanical properties namely HV, σ_e , and σ_r , KIC and microstructural like crystallite size D_{hkl} and degree of crystallinity X_c were discussed according to the temperatures of the heat treatments. Two temperatures were chosen 900 and 1200°C. From the results obtained, it is obvious that the variation of the different properties studied correlates with the temperature of the heat treatment.

Keywords : Phosphocalcic ceramic, hydroxyapatite, Wet precipitation, hardness, Toughness, Crystallinity