

Development of Mg-Containing Hydroxyapatite-Based Bioceramics From Phosphate Rock for Bone Applications

Authors : Sara Mercedes Barroso Pinzón, Álvaro Jesús Caicedo Castro, Antonio Javier Sánchez Herencia

Abstract : In recent years there has been increased academic and industrial research into the development of orthopaedic implants with structural properties and functionality similar to mechanical strength, osseointegration, thermal stability and antibacterial capacity similar to bone structure. Hydroxyapatite has been considered for decades as an ideal biomaterial for bone regeneration due to its chemical and crystallographic similarity to the mineral structure bioapatites. However, the lack of trace elements in the hydroxyapatite structure confers very low mechanical and biological properties. Under this scenario, the objective of the research is the synthesis of hydroxyapatite with Mg from the francolite mineral present in phosphate rock from the central-eastern region of Colombia, taking advantage of the extraction of mineral species as natural precursors of Ca, P and Mg. The minerals present were studied, fluorapatite as the mineral of interest associated with magnesium carbonates and quartz. The chemical and mineralogical composition was determined by X-ray fluorescence (XRF) and X-ray diffraction (XRD), scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDX); the optimum conditions were established using the acid leaching mechanism in the wet concentration process. From the products obtained and characterised by XRD, XRF, SEM, FTIR, RAMAN, HAp-Mg biocomposite scaffolds are fabricated and the influence of Mg on morphometric parameters, mechanical and biological properties in the formed materials is evaluated.

Keywords : phosphate rock, hydroxyapatite, magnesium, biomaterials

Conference Title : ICMME 2024 : International Conference on Metallurgical and Materials Engineering

Conference Location : Lisbon, Portugal

Conference Dates : October 28-29, 2024