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Obtaining Bioactive Mg-hydroxyapatite Composite Ceramics From Phosphate Rock For Medical Applications

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Abstract : The current need for durable implants and bone substitutes characterised by biocompatibility, bioactivity and mechanical properties, without immunological rejection, is a major challenge for scientists. Hydroxyapatite (HAp) 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 gives it very low mechanical and biological properties. In this sense, the objective of the research is to address the synthesis of hydroxyapatite with Mg from phosphate rock from sedimentary deposits in the central-eastern region of Colombia, taking advantage of the release of the species contained as natural precursors of Ca, P and Mg. The minerals present were studied, fluorapatite as the mineral of interest associated with mineralogical species of 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); as well as the evaluation of the surface physicochemical properties of zeta potential (PZC), with the aim of studying the surface behaviour of the microconstituents present in the phosphate rock and to elucidate the synergistic mechanism between the minerals and establish the optimum conditions for 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 the morphometric parameters, mechanical and biological properties of the designed materials is evaluated.

Keywords : phosphate rock, hydroxyapatite, magnesium, biomaterials
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