SYNTHESIS OF TRICALCIUM PHOSPHATE SUBSTITUTED WITH MAGNESIUM IONS FOR BONE REGENERATION

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Abstract— Ceramics based on calcium phosphates have lately increased attention for tissue engineering because they can be used as substitute bones or for bone regeneration since they mimic very well the nanostructure of tough bone tissue, but also because of other advantages such as a very good biocompatibility and osseointegration.
This study aims the preparation and characterization of ceramic materials on the basis of TCP ($Ca_3(PO_4)_2$), within which calcium ions are substituted by magnesium ions (Mg^{2+}) in order to improve the regenerative properties of these materials. TCP-Mg material was synthesized by chemical precipitation method using calcium oxide (CaO) and phosphoric acid (H_3PO_4) as precursors. The objective was to obtain powders with different concentrations of Mg in order to analyze the effect of magnesium ions on the physico-chemical properties of phosphate ceramics and in vitro degradation in simulated biological fluid (SBF). Ceramic powders were characterized in vitro but also from the compositional and microstructural point of view. TCP_Mg powders were prepared through wet chemical method from calcium oxide(CaO), magnesium oxide nanopowder(MgO<50 nm particle size (BET) Sigma Aldrich), phosphoric acid (H_3PO_4 - 85 wt.% in H_2O, 99.99% trace metals basis - Sigma Aldrich).
In order to determine the quantities of raw materials, calculations were performed to obtain HAp with Ca/P ratio of 1.5.

Index Terms—bone regeneration, magnesium substitution, tricalcium phosphate, tissue engineering