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WELCOME

The aim of the conference is to overview and share information about the latest achievements in bioceramic nanotechnologies with the scientific community. Over the duration of the conference, scientists from the fields of chemistry, physics, technology, medicine and implantology will be able to acquaint themselves with synthesis methods, unique properties, and applications of bioceramic nanomaterials.

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Effect of Mn Doping on Hydrolysis of Low-Temperature Synthesized Metastable Alpha-Tricalcium Phosphate

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ABSTRACT

Calcium phosphates (CPs) are the main constituents of human hard tissues like bone and teeth. They are getting a lot of attention in medicine and dentistry as bone regenerating materials because of their positive *in vivo* responses like biocompatibility, bioactivity, osteoconductivity and relatively low cost [1]. α-Tricalcium phosphate ($Ca_3(PO_4)_2$, α-TCP) belongs to biomaterials and used in regenerative medicine in cement form due to its excellent resorbability and osteoconductivity. The solubility of α-TCP is intermediate between orthophosphates, however α-TCP hydrolyze to calcium deficient hydroxyapatite ($Ca_{10-x}(PO_4)_{6-x}(HPO_4)_x(OH)_{2-x}$, CDHA), which is similar to bone hydroxyapatite [2].

It is well known that partial substitution by other bioactive ions into the CP lattice can influence not only structural changes and morphology, but also important biological properties like bioactivity, biocompatibility, solubility and kinetics of ion release [3]. Manganese has proven to be important element in promoting various vital processes such as metabolism and formation of bones. Research has also showed that Mn^{2+} enhances the ligand binding affinity on integrin, activates cell adhesion and increases osteoblast adhesion [4, 5].

In this study, effect of Mn doping on hydrolysis rate of low-temperature synthesized metastable α-TCP was investigated. Pristine and α-TCP powders containing 0.5 and 1 mol% of Mn^{2+} ions were synthesized by wet co-precipitation process. The crystal structure of synthesized compounds were evaluated by X-ray diffraction (XRD) analysis and Fourier-transform infrared spectroscopy (FTIR). Morphology of the initial and after fully hydrolyzed products was investigated using scanning electron microscopy (SEM). Chemical composition of the initial and after fully hydrolyzed products were analyzed by inductively coupled plasma optical emission spectrometry (ICP-OES).

It was demonstrated that presence of Mn^{2+} ions significantly retards hydrolysis of α-TCP. Pristine, 0.5 and 1 mol% Mn doped α-TCP fully hydrolyzed with a conversion to CDHA in 10 h, 20 h and 35 h, respectively. The results of elemental analysis confirmed that chemical composition of starting and fully hydrolyzed powders was identical, indicating that there is no selective ion release during hydrolysis process.

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