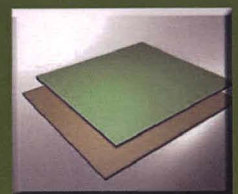


ADVANCES IN COMPOSITE MATERIALS

Iskandar Idris Yaacob
Md Abdul Maleque
Zahurin Halim



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Manganese Doped Hydroxyapatite Powder through Hydrothermal Method

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Keywords: Hydroxyapatite; β -Tricalcium phosphate; manganese; Ca-Deficient hydroxyapatite; β -TCP Promoter; hydrothermal; synthesis.

Abstract: Hydroxyapatite ceramic is good in biocompatibility and bioactivity. Manganese dope is defective for hydroxyapatite. By 1% of MnO_2 mol Ca-deficient hydroxyapatite can be better in crystallinity by heating up to 700°C however the heating beyond of this transformed it to β -tricalcium phosphate. Increasing in manganese, Ca-deficient hydroxyapatite did not withstand appearing under heating and transformed to more amorphous feature and to β -tricalcium phosphate. Mn was favor for β -tricalcium phosphate.

Introduction

Hydroxyapatite, HA ($\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$), is a calcium phosphate-based compound classified as a bioceramics. Various studies showed evidence that HHA has good biocompatibility and bioactivity. It generally accepted that the human bone is composed of 70% mineral and 30 % organic compound, where 95% of the mineral phase is HA. This greatly contributes to the performance in HA in biological studies. HA can be used either as a bone graft or a coating material. As bone graft, it is being used either as dense or porous grafts. However, HA have some mechanical limitations because it is brittle. Therefore for load bearing application, HA coatings on metals for example have been developed to enhance the mechanical properties of HA. Biological and physicochemical properties of HA can be improved by the substitution with ions usually present in natural apatites of bone. Most natural apatites are non-stoichiometric because of the presence of minor constituents such as cations (Mg^{2+} , Mn^{2+} , Zn^{2+} , Na^+ , Sr^{2+}) or anions (HPO_4^{2-} or CO_3^{2-}). Trace ions substituted in apatites can have effect on the lattice parameters, the crystallinity, the dissolution kinetics and other physical properties of apatites [1, 2].

Hydrothermal processing can be defined as any homogeneous (nanoparticles) or heterogeneous (bulk material) reaction in the presence of aqueous solvents or mineralizers under high pressure and temperature conditions to dissolve and recrystallize (recover) materials that are relatively insoluble under ordinary conditions in a closed system [2]. However other used this term for normal pressure even closer to 1 atm. The hydrothermal technique has a lot of advantages like it accelerates interactions between solid and fluid species, phase pure and homogeneous materials can be achieved, reaction kinetics can be enhanced, the hydrothermal fluids offer higher diffusivity, lower viscosity, facilitate mass transport and higher dissolving power. Most important is that the chemical environment can