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X/1

DSC-TG-MS study of hydroxyapatite nanopowders

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Hydroxyapatite nanopowders have been widely studied for biomedical application due to excellent biocompatibility. It attaches chemically to bone tissue providing fixation of artificial implant materials. Main research objectives during last few decades is to obtain hydroxyapatite based material which can withstand mechanical loadings generated in physiological conditions. One of the possible pathway is fabrication of dense nanostructured hydroxyapatite through appropriate sintering process, which is strongly correlated with thermal behaviour of starting nanopowders.

In this study, extensive analyses of thermal behaviour of three hydroxyapatite nanopowders prepared with different methods will be presented. Differential Scanning Calorimetry (DSC), Thermo-Gravimetry (TG) with simultaneous Mass Spectrometry (MS) studies have been performed. The obtained results are discussed in the sense of energy-related events, mass loss and water and carbon dioxide molecules evolution to give better understanding of their thermal behaviour.

X/2

Hydroxylapatite synthesis and low temperature sintering methods

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Calcium phosphate (CaP) minerals are the most abundant biomineral group in the human body. Biologic hydroxylapatite differ in stoichiometry from the ideal formula. The main inorganic component of teeth and bones is poorly-ordered carbonate-rich hydroxylapatite (CO₃Ap). Moreover, they usually have Na, K, Mg, Sr, Cl, F and other trace amounts of different ions incorporated in their lattice. Due to their similarity synthesized CaP have excellent biocompatibility, therefore they are widely used as biomaterials for hard tissue repair as implants and bone scaffolds. Bio-hydroxylapatite Ca₅(PO₄)₃OH was synthesized by a simple precipitation method. Phase composition of the obtained powders was analyzed by X-ray powder diffraction (XRD), and the morphology was recorded by Scanning electron microscopy (SEM). In order to improve the properties of these biomaterials pressed powders were sintered at low temperatures in order to prevent the phase transitions and the alteration of their structures.