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Biomaterials from Agricultural Waste: Eggshell-based Hydroxyapatite

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Abstract Hydroxyapatite (HAp) was produced through the hydrothermal conversion of agro-industry byproducts (eggshells). Commercial calcium dibasic phosphate ($CaHPO_4.2H_2O$) and lime (CaO), obtained from direct calcining of the eggshells, were the reactants in the synthesis scheme employed. X-ray powder diffraction and scanning electron microscopy confirmed the HAp as the main phase present in the final products.

Keywords Agro-industry · Solid waste · Eggshell · Biomaterials

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1 Introduction

Hydroxyapatite [$Ca_{10}(PO_4)_6(OH)_2$, HAp], the main inorganic component of bone and teeth tissue, is one of the key materials for developing bone grafts with bioactive nature and also important for the understanding the biomaterialization process. Taking into account its similar chemical structure, as compared to actual bone (Akao et al. 1981; Bio eye Imagen Orbital Implants www ioi com 2999; Bucholz 1989; Cowin 1989; Daculsi 1998; Ewers & Simons 1992; Halouani et al. 1994), HAp has been extensively studied and used as a conventional replacement material in different medical applications (Hench & J. Am. Ceram. Soc. 81 1705). In addition to its use as a bioceramic material, it has been proposed as an environmental redial agent, since it can act as adsorbent of metal ions, due to its cation-exchange properties (Holmes 1986), a property which also opens other interesting applications.

A number of preparation routes for HAp, including the hydrothermal method, have been tested in order to obtain HAp with specific features. In particular, the hydrothermal method has important advantages over other methods for the synthesis of engineering ceramic powders due to the effect of the hydrothermal fluid on solid materials (Ioku et al. 1990). In general, in this particular case, the main advantage of hydrothermal methods is that the hydroxyapatite obtained has high crystallinity and excellent homogeneity. On the other hand, the high temperatures and pressures used for its

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