RECOVERY OF CALCIUM PHOSPHATES FROM EGGSHELLS FOR USE IN SUSTAINABLE BIOMATERIALS

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ABSTRACT

Calcium phosphate compounds (CPs) offer a great alternative as bone tissue materials in medical applications due to their similarity in chemical structure and significant biocombatibility. Three of the most widely used types of calcium phosphates in the last years are Hydroxyapatite ($Ca_{10}(PO_4)6(OH)_2$), β-CPP phase ($Ca_3(PO_4)_2$) and Monetite ($CaHPO_4$), which are usually produced using high purity calcium sources (calcium nitrate, calcium hydroxide etc) [1]. Due to the fact that those raw materials are considerably costly, in the current research the valorization of chicken eggshells as a secondary calcium precursor resource in the economic and environment-friendly development of biomaterials was attempted taking advantage of the plethora of $CaCO_3$ in eggshells [2].

For that purpose, in the first reaction step, the transformation of the calcium carbonate included in the eggshells into inorganic salts was carried out with hydrochloric acid through a precipitation method. The second step required the addition of disodium phosphate to turn this salt into desired calcium phosphates [3].

X-ray diffraction (XRD) and scanning electron microscopy coupled with energy dispersive spectroscopy analysis (SEM/EDS) verified that calcium phosphate powder was successfully obtained. Subsequently, it was subjected to uniaxial cold pressing to form disc-shaped green compacts that were then sintered at three different temperatures (600, 900, 1000°C) for 2 hours for optimal consolidation, to be considered for potential use in sustainable biomaterials. The final step of the examination was the comparison of the outcome that the three different sintering temperatures offered to the transition of the calcium phosphate powder to desired biomaterial compositions [4].

KEYWORDS: Calcium phosphates, Eggshells, Recovery, Sintering, Sustainable Biomaterials

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