

Effect of calcium phosphate synthesis conditions on its physico-chemical properties and evaluation of its antibacterial activity

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Abstract: The antibacterial activity of non-stoichiometric calcium phosphate particles prepared by precipitation under controlled experimental conditions at pH 9 and sintered at high temperature was studied against *Staphylococcus aureus* bacteria. The effects of operating parameters developed according to an experimental design of Plackett-Burman type on the physicochemical characteristics and the capacity to inhibit bacterial growth were identified using a thermal analysis (TGA-DTA-DSC), x-ray Diffraction (XRD), Raman Spectroscopy, Scanning Electron Microscope (SEM) and the Kirby Bauer Method. The XRD spectrum shows that the synthetic crystalline nanoparticles powders consist of multiphase calcium phosphate -TCP/ -CPP/OCP / HA and that the average particle size is between 56 and 123 nm calculated by the Debye-Scherrer equation. The Raman spectrum of sintered powder shows the main absorption bands that are assigned to the asymmetric / symmetric P-O stretching vibrations in PO_4^{3-} and the symmetric O-H stretching mode of the hydroxyl group in addition of Ca- PO_4 and Ca-OH modes. The samples were found to possess different morphologies consisting of nano-rods of different lengths, semi / spherical structures and fine granules, in addition to irregular clusters. The antibacterial tests results showed that the high concentration calcium phosphate powder exhibited better antibacterial activity against *Staphylococcus aureus* bacteria with inhibition zones ranging from 0.2 – 0.7 cm.

Keywords : Biomaterials, calcium phosphate, Antibacterial Activity, nanoparticles