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Novel continuous flow synthesis and analysis of calcium phosphate nanomaterials for biomedical applications

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Calcium phosphates (CaP) are well known for their use as bone graft substitutes, coatings on metallic implants, reinforcements in biomedical composites and in bone and dental cements. Continuous plastic flow synthesis is a novel, simple, low cost and efficient route to produce a range of phase pure, doped and surface grafted nano-sized group 2 metal phosphates (Patent Filed UK Patent Application No. 1317747.2). In this research, metal phosphate powders were synthesized via a continuous plastic flow synthesis reactor at 60°C in 5 minutes (residence time) at the conditions of pH 10-11 from aqueous solutions of metal (calcium, strontium, barium) nitrate and diammonium hydrogen phosphate. An in-vitro study evaluated the biocompatibility and osteoblast cell proliferation / attachment on the surface of these nanoparticles as pressed disk. The influence of reaction temperature for the as-prepared materials on the phase evolution, particle size and crystallinity of the nanopowder were systematically investigated. The obtained powders were physically characterized using transmission electron microscopy, BET surface area analysis, X-ray powder diffraction analysis, FTIR spectroscopy, Raman spectroscopy and X-ray photoelectron spectroscopy (XPS). Dynamic light scattering was used to evaluate the size of particles which were made at different concentrations. Particles synthesized at 60 °C in 5 minutes residence time possessed remarkably high surface area of 264 m²g⁻¹. The proposed synthesis strategy provides a facile and economical pathway to rapidly obtain nano-sized product with high purity, suitable size and ultra low level of impurities. The use of a continuous process also offers good potential for scale up manufacture in the future.

Biography

Aneela Anwar, an outstanding student throughout her academic career and extraordinary university teacher, has recently completed PhD from University College London, UK on IDB merit scholarship. She has been an exceptional student as she was conferred roll of honor in graduation, secured positions in her master and M Phil program and did exceedingly well in her PhD. Her work was lauded much and she successfully patented her PhD work. Besides good in academics, Aneela is well known for her teaching and research. She has taught at various levels in well reputed universities in Pakistan and many of her students in M Phil produced great research thesis. Aneela has presented her research work at various national and international conferences. Her sessions were much admired for the quality of subject matter and excellent presentation skills.

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