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A novel continuous flow route for the synthesis of phase pure brushite calcium phosphate nanoparticles

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Dicalcium phosphate dehydrate: CaHPO4.2H2O (brushite) nanoparticles (~ 35 nm) were rapidly synthesised using a rapid novel two pump continuous plastic flow synthesis (CPFS) at room temperature (22 °C) in 3 minutes residence time at the conditions of pH 5.5 from aqueous solution of calcium nitrate tetrahydrate and diammonium hydrogen phosphate. The product was collected as a phase pure material with Ca:P molar ratio of 0.8 , without the need for an ageing step. Highly crystalline brushite nanoparticles exhibiting spherical chain like morphology were observed, which had high surface area of 160 m2 g-1. These brushite nanoparticles were also transformed to monetite and calcium pyrophosphates by additional steps such as heat treatments. The final product was physically characterized by using different techniques such as transmission electron microscopy (TEM), BET surface area analysis, X-ray diffraction analysis (XRD), and FTIR spectroscopy. In addition, X-ray photoelectron spectroscopy (XPS) was also used to analyze the chemical structure. The employed system shows promise for the rapid production of high surface area, smaller nanoparticles for use in bone regeneration strategies.

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