

Preparation of novel bioactive nano-calcium phosphate–hydrogel composites

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Abstract Nano-sized hydroxyapatite (nHA) and carbonate-substituted hydroxyapatite (nCHA) particles were incorporated into a poly-2-hydroxyethylmethacrylate/polycaprolactone (PHEMA/PCL) hydrogel at a filler content of 10 wt%. Fourier transform infrared absorption, transmission electron microscopy, x-ray diffraction and scanning electron microscopy were used to analyse the physical and chemical characteristics of the calcium phosphate fillers and resultant composites. Nano-sized calcium phosphate particles were produced with a needle-like morphology, average length of 50 nm and an aspect ratio of 3. The nanoparticles were uniformly distributed in the polymer matrix. The addition of both HA and CHA in nano-form enhanced the bioactivity and biocompatibility of the PHEMA/PCL matrix. The carbonate-substitution has allowed for improved bioactivity and biocompatibility of the resultant composite, indicating the potential of this material for use in bone tissue engineering.

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