

Abstract

Project Code : TRG5780289

Project Title : Synthesis and cytotoxicity study of magnetic three-dimensionally ordered macroporous Fe-substituted hydroxyapatite (3DOM FeHAp)

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Project Period : 2 years

Abstract:

Three dimensionally ordered macroporous (3DOM) hydroxyapatite (HAp) and iron substituted 3DOM HAp was successfully synthesized by sol-gel method using PMMA colloidal crystal arrays. The highest HAp phase of 77.0% was found in the 3DOM HAp after aging time of 10 hours and the maxima of 78.4% HAp was obtained in the 3DOM FeHAp 7%mol after aging time of 8 hours. Both synthesized HAp was characterized using X-ray diffraction spectrometry (XRD), Fourier transformed infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). The 3DOM HAp and the 3DOM FeHAp 7%mol was paramagnetic whereas the 3DOM FeHAp 14-28% mol was superparamagnetic. The 3DOM FeHAp 28% mol exhibited the highest magnetization at 1.556 emu g^{-1} . Cytotoxicity study suggested that all samples were non-cytotoxic to osteoblasts. The study on drug delivery application of the 3DOM HAp and the 3DOM FeHAp were carried out using vancomycin as a drug model and the results were compared with that of the HAp derived from natural materials. Drug loading of vancomycin in the 3DOM HAp, the 3DOM FeHAp and the HAp from natural materials were 72.1%, 80.6%, and 33.1%, respectively. The percentage of cumulative vancomycin release were 72.1%, 80.6%, and 33.1% for the 3DOM HAp, the 3DOM FeHAp, and the HAp from natural materials, respectively.

Keywords: Iron, Hydroxyapatite, Three-dimensionally ordered macroporous material (3DOM)

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