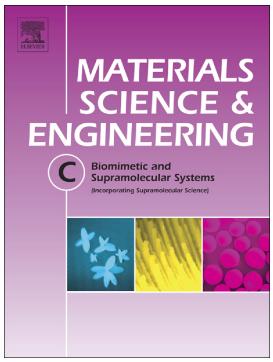

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3D porous collagen/functionalized multiwalled carbon nanotube/chitosan/hydroxyapatite composite scaffolds for bone tissue engineering

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Abstract

In this study, we describe new collagen / functionalized multiwalled carbon nanotube / chitosan / hydroxyapatite (Col/f-MWCNT/CS/HA) composite scaffolds which were fabricated by freezing (-40°C at 0.9°C/min) and lyophilization (48 h, 0°C and 200 mtorr). The compressive stresses (from 523 to 1112 kPa), swelling (from 513.9±27 to 481.05±25 %), porosity (from 98±0.15 to 95.7±0.1 %), contact angle (from 87.8 to 76.7°) properties examined before and after biomineralization for comparison 3D porous Col, CS, Col/f-MWCNT and Col/f-MWCNT/CS scaffolds. Biomineralization was performed by biomimetic method in concentrated SBF (10xSBF, at 37°C and 6.5pH). XRD, SEM, EDS, FTIR, TGA, Optical microscopy and BET results showed that compared to Col, CS and Col/f-MWCNT scaffolds, Col/f-MWCNT/CS scaffolds had higher in vitro bioactivity, large surface area (11.746 m^2/g) and a good pore volume (0.026 cc/g), interconnected porous microstructure (with 20-350 μm pore size) and incorporates the advantageous properties of both Col, f-MWCNT, CS and HA. Finally, the methyl thiazolyl tetrazolium (MTT) assay was performed to evaluate scaffolds cytotoxicity which showed that Col/f-MWCNT/CS scaffolds have the best biocompatibility.

Keywords: Scaffold; Hydroxyapatite; Biomimetic method; Bone tissue engineering

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