Chemical Engineering Science 144 (2016) 17–29

Contents lists available at ScienceDirect

Chemical Engineering Science

journal homepage: www.elsevier.com/locate/ces

Fabrication, characterization and in vitro biocompatibility of electrospun hydroxyethyl cellulose/poly (vinyl) alcohol nanofibrous composite biomaterial for bone tissue engineering

Sugandha Chahal [a,*], Fathima Shahitha Jahir Hussain [a], Anuj Kumar [b], Mohammad Syaiful Bahari Abdull Rasad [c], Mashitah Mohd Yusoff [a]

[a] Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang, Lebuhraya Tun Razak, Gambang, 26070 Kuantan, Pahang, Malaysia
[b] Czech Technical University in Prague, Faculty of Civil Engineering, Department of Building Structures, Thákurova 7, 16629 Praha 6, Czech Republic

HIGHLIGHTS

- Fabrication of hydroxyethyl cellulose and polyvinyl alcohol nanofibers with different weight concentrations.
- Thermo-mechanical and chemical properties of electrospun nanofibers.
- Biocompatibility of fabricated nanofibers using human osteosarcoma cells (U2OS).

ARTICLE INFO

Article history:
Received 26 July 2015
Received in revised form
28 November 2015
Accepted 31 December 2015
Available online 21 January 2016

Keywords:
Hydroxyethyl cellulose
Electrospinning
Thermo-mechanical properties
Bone tissue engineering

ABSTRACT

Development of novel scaffold materials that mimic the extracellular matrix, architecturally and functionally, is becoming highly important to meet the demands of the advances in bone tissue engineering. This paper reports, the fabrication of natural polymer cellulose derived hydroxyethyl cellulose (HEC) based nanostructured scaffolds with uniform fiber morphology through electrospinning. Poly (vinyl alcohol) (PVA) was used as an ionic solvent for supporting the electrospinning of HEC. Scanning electron microscopy and *ImageJ* analysis revealed the formation of non-woven nanofibers with well-defined porous architecture. The interactions between HEC and PVA in the electrospun nanofibers were studied by differential scanning calorimetry, X-ray diffraction, dynamic mechanical analysis thermo-gravimetric analysis; Fourier transform-infrared spectroscopy, X-ray photoelectron spectroscopy and tensile test. The mechanical properties of scaffolds were significantly altered with different ratios of HEC/PVA. Further, the biocompatibility of HEC/PVA scaffolds was evaluated using human osteosarcoma cells. The SEM images revealed favorable cells attachment and spreading on the nanofibrous scaffolds and MTS assay showed increased cell proliferation after different time periods. Thus, these results indicate that HEC based nanofibrous scaffolds will be a promising candidate for bone tissue engineering.