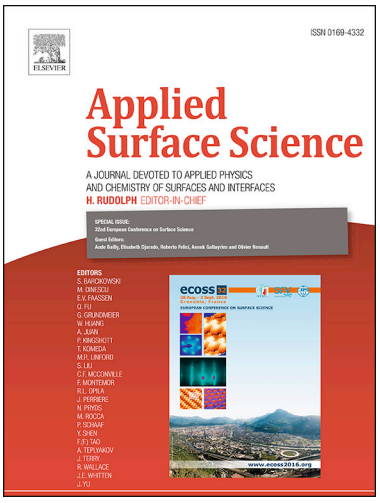

Full Length Article

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Potential applications of three-dimensional structure of silk fibroin/poly(ester-urethane) urea nanofibrous scaffold in heart valve tissue engineering

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ABSTRACT: Tissue engineering heart valves (TEHV) are thought to have many advantages in low immunogenicity, good histocompatibility, excellent mechanical properties. In this paper, we reported the fabrication and characterization of a novel composite nanofibrous scaffold consisting of silk fibroin (SF) and poly(ester-urethane) urea (LDI-PEUU) by using electrospinning. Chemical and physical properties of scaffolds were evaluated using scanning electron microscopy, attenuated total reflectance Fourier transform infrared, X-ray diffraction, contact angle measurement, thermogravimetric analysis, biodegradation test and tensile strength analysis. We determined that the composite scaffolds supported the growth of human umbilical vein endothelial cell (HUVEC). The results of cell proliferation and cell morphology indicate that SF/LDI-PEUU nanofibers promoted cell viability, which supporting the application in tissue engineering. All results clarified that SF/LDI-PEUU (40:60) nanofibrous scaffolds meet the required specifications for tissue engineering and could be used as a promising construct for heart valve tissue engineering.

KEYWORDS: Silk fibroin, Poly(ester-urethane) urea elastomer, Nanofiber, Electrospinning, Heart valve tissue engineering

1. Introduction

In spite of the major advances with regard to regenerative medicine approaches [1], valvular heart disease remains to be a significant global health problem. Several methods such as pharmacological therapy and heart transplantation are applied for regeneration of heart valve [2, 3]. However, xenogenic grafts are associated with the risk of immunogenic reactions and the availability of homografts is limited. Therefore, biodegradable natural materials have been studied

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