J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-012

Fabrication of core-shell structured nanofibers of poly (lactic acid) and poly (vinyl alcohol) by coaxial electrospinning for tissue engineering

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Electrospun nanofiber scaffolds of Poly (lactic acid) PLA acknowledged as a predominant material in the field of medicine due to its non-toxic nature and naturally available in the human body. However, its water-repellent, low strength, and brittle nature limit its practical applications. In order to these drawbacks, a shell layer of poly (vinyl alcohol) PVA was incorporated with PLA using coaxial electrospinning technique. The results of the fabricated core-shell PLA/PVA nanofiber scaffolds showed significant improvement in hydrophilicity, and mechanical properties when compared with pristine PLA and PVA mats. More specifically, the water contact angle of coaxial electrospun mats of PLA/PVA was compromised to 26° compared with 120° for PLA mat due to the presence of hydrophilic PVA whose contact angle is 10°. Furthermore, the mechanical response of the coaxial PLA/PVA nanofiber mats displayed nearly 254 % and 175 % increase in tensile strength and strain at failure, respectively, compared to pristine PLA. Moreover, the coaxial electrospun nanofibers of PLA/PVA showed good biological activities on HEK cells. These excellent combined mechanical, surface wetting, and cytocompatibility properties clearly demonstrate the potential applications of the synthetic core-shell PLA/PVA composite nanofibers in biomedical and tissue regeneration.

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