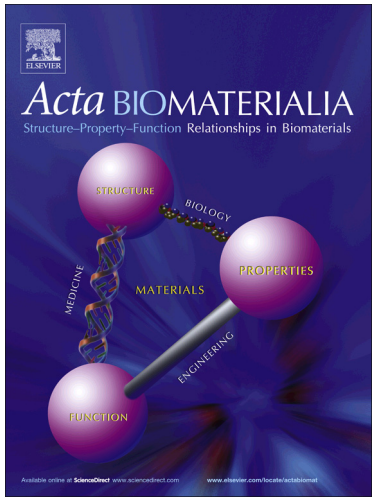

Full length article

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Fabrication of heterogeneous porous bilayered nanofibrous vascular grafts by two-step phase separation technique

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Abstract: Innterconnected porous architecture is critical for tissue engineering scaffold as well as biomimetic nanofibrous structure. In addition, a paradigm shift is recently taking place in the scaffold design from homogeneous porous scaffold to heterogeneous porous scaffold for the complex tissues. In this study, a versatile and simple one-pot method, dual phase separation, is developed to fabricate macroporous nanofibrous scaffold by phase separating the mixture solutions of immiscible polymer blends without using porogens. The macropores in the scaffold are interconnected, and their size can be tuned by the polymer blend ratio. Moreover, benefiting from the easy operation of dual phase separation technique, an innovative, versatile and facile two-step phase separation method is developed to fabricate heterogeneous porous layered nanofibrous scaffolds with different shapes, such as bilayered tubular scaffold and tri-layered cylindrical scaffold. The bilayered tubular nanofibrous scaffold composed of poly(L-lactic acid) (PLLA)/poly(L-lactide-co-ε-caprolactone) (PLCL) microporous inner layer and PLLA/poly(ε-caprolactone) (PCL) macroporous outer layer matches simultaneously the functional growth of endothelial cells (ECs) and smooth muscle cells (SMCs), and shows the favorable performance for potential small diameter blood vessel application. Therefore, this study provides the novel and facile strategies to fabricate