

Emerging Trends in Materials Science and Nanotechnology

FABRICATION OF COMPOSITE BIO-SCAFFOLDS BY USING 3D PRINTED PLA AND ELECTROSPUN PCL NANOFIBERS

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This paper introduces a novel approach to fabricate bio-scaffolds by using composite materials of 3D printed PLA and electro-spun PCL nanofibers. Polycaprolactone (PCL) is biodegradable polyester with a low melting point and it is one of the most common biodegradable materials in long-term implants and controlled drug release applications. Polylactic acid (PLA) is another biodegradable polymer in use for medical applications. PLA is a biodegradable and bioactive thermoplastic derived from renewable resources such as corn starch or sugarcane. PLA has five times higher tensile strength than PCL which provides better mechanical stability for the bio-scaffold applications. By combining the excellent bio-solvability of PCL and good

mechanical stability of PLA, a novel composite bio-scaffold was fabricated. For the higher cell adhesion or growth, PCL was formed as nanofibers by electro spinning technology while PLA was formed as a meshed matrix for higher mechanical strength. The PCL fibers fabricated by electrospinning technology ranged between 100s of nanometers and 10s of micrometers depending on concentration of solvents, applied voltage, flow rate and etc. The PLA mesh was fabricated by a state of the art fused deposition modeling (FDM) type 3D printer with 0.2 mm thickness. In results, the fabricated bio-scaffolds showed higher strength compared to a single PCL material and higher cell adhesion environment.

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