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Biomimetic Scaffolds with Three-dimensional Undulated Microtopographies

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Abstract

Many human and animal tissues naturally possess three-dimensional (3D) micro-scale geometries enabling certain physiological functions. Absence of these microgeometries in engineered tissues may undermine the effectiveness of corresponding tissue repair and regeneration. This paper introduces a novel approach to create tissue scaffolds with biomimetic 3D undulated microtopographies. The mechanical micromilling technology is used for precise and reproducible fabrication of poly(methyl methacrylate) (PMMA) master molds with 3D undulated microtopographies. Poly(dimethylsiloxane) (PDMS) production molds are then created using the master molds through elastomer molding. Next, gelatin-chondroitin-6-sulfate-hyaluronic acid (Gel-C6S-HA) is filled into the PDMS molds in its gel form, lyophilized to obtain solid porous scaffolds, and covalently cross-linked to control biodegradability. The utility of the final porous scaffolds with undulated microtopographies mimicking dermal papillae of skin is demonstrated *in vitro* by culturing

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