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Structural Fibrin Plastics

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Abstract

The goal is to develop a process to manufacture 'hard' fibrin plastic scaffolds with: i. controlled porosities; and, ii. capability to bind growth factors for tissue engineering applications. In contrast to existing fibrin hydrogel scaffolds, the new 'hard scaffolds' will have desired mechanical properties to facilitate surgical handling, and their degradation *in vivo* will be tailorable from weeks to months. Three prototype fabrication processes will be developed, including 1) compression molding of the slurries with sacrificial porogens added to the slurry mixtures; 2) solid freeform fabrication by selective extrusion of fibrin-based slurries; and, 3) assembly of pre-molded layered with textured features. These processes will be extensible to: a. making plastics with other extracellular matrix (ECM) molecules, such as chitosan and hyaluronic acid; b. adding fillers, such as bioactive calcium phosphates or demineralized bone matrix (DBM); and, c. making composites thereof. Material testing will include characterization of tensile properties, microstructures, and *in vitro* models for growth factor binding and bioactivity, and a simulated *in vivo* model for a first order measure of degradation.