

142bb Material and Process Approaches to the Fabrication of Hierarchically Structured Tissue Engineering Scaffolds

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The objective of this work is to develop a polymeric scaffold made by stereolithography (SL) that can be further modified by exposure to a second wavelength of light. Conventional tissue engineering scaffolds commonly lack substantial mechanical strength, and there is difficulty in controlling porosity, pore distribution, and pore interconnectivity. Additionally, the chemical nature of these scaffolds is typically homogenous; without a mechanism for creating additional chemical functionality, distinct from the bulk chemistry, in a specified geometry on the scaffold. The ability to chemically modify selected areas on a scaffold is one method to direct cell growth in deliberate patterns; which is necessary for the engineering of complex, functioning tissues. The general aim of this work is to address these issues through the application of stereolithography (SL) to the fabrication of hierarchically structured tissue engineering scaffolds. Chemical control requires photopolymerizable materials that can also be selectively chemically modified during the SL part building process. SL-made tissue engineering scaffolds using these materials is one way to provide hierarchical structure to the material. On one level, SL will allow for the building of complex 3D structures, with correct overall shape as well as the necessary interconnectivity and pore features. The second level of organization will be realized by a subsequent modification of chemical groups by catalyzing a de-protection event through exposure to another wavelength of light. This will allow selective areas to be more favorable towards cell adhesion, so that a patterned cell culture can be grown. This presentation provides an update of this work including cell growth studies on the engineered materials, and the assembly of a custom built stereolithography apparatus with the capability of exposure using two different wavelengths of light.