389c Protein Adsorption Behavior and Control on Photopolymerized Scaffold Materials for Tissue Engineering

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The overall goal of our work is to develop new methods and materials for the fabrication of hierarchically structured, three-dimensional (3D) tissue scaffolds. Conventional 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. That is, there is no 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. The system under investigation utilizes an acid-catalyzed de-protection event to change the surface chemistry of an SL-made polymer. This is method is analogous to conventional chemically amplified photoresists. The chemical modification alters the surface properties, affecting how proteins interact with the surface and thereby affecting how cells interact with the surface. Protein adsorption has been characterized on various protected and de-protected surfaces using a quartz crystal microbalance with dissipation to demonstrate the capacity of this system to direct protein adsorption, leading to directed cell adhesion.