Surface Patterns of Peptides, Proteins and Neurotransmitters for Diagnostics, Enzymes Cascades, and Cell Adhesion

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Polymers with functionalized end groups were patterned at the micro- and nanometer scale utilizing electron beam (e-beam) lithography, which cross-linked the chains to the surface. Proteins were then immobilized on the resulting surface-bound hydrogels. Since conjugating proteins on surfaces in specific orientations is important for retention of bioactivity, initially, poly(ethylene glycol)s (PEGs) were synthesized with biotin, aminooxy, maleimide, and nitrilotriacetic acid (NTA) end groups. As a result, proteins conjugated to the surface features via ligand binding sites, N-terminal α-oxoamides, free cysteines, and histidine tags, respectively. Patterns of different proteins side by side and in three-dimensional arrangements were made. Subsequent studies focused on preparing patterns of extracellular matrix peptides and proteins, as well as neurotransmitters. These strategies are being explored to make materials for use in diagnostics, as enzyme cascades, and for cell adhesion. Fabrication, characterization, and application results will be presented.