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Nanopatterned Biomimetic Surfaces to Probe the Role of cytoskeletal Proteins in cell Adhesion JUSTIN ABRAMSON, MATTEO PALMA, Department of Mechanical Engineering, Columbia University, MARK SCHVARTZMAN, Department of Chemical Engineering, Columbia University, SHALOM WIND, Deptartment of Applied Physics and Applied Mathematics, Columbia University, MICHAEL SHEETZ, Department of Biological Sciences, Columbia university, JAMES HONE, Department of Mechanical Engineering, Columbia University — Nanometer level spatial organization has been shown to play a crucial role in cell mechanics, in particular in cell adhesion to the extracellular matrix. Combining nanolithography and biomolecular self-assembly strategies, we report on the fabrication of nanopatterned biomimetic surfaces to probe the importance of both the spatial ordering of transmembrane proteins as well as the role played by peptide sequences as cell binding domains in the formation of cell focal adhesions. We have fabricated arrays of Au/Pd nano-dots using electron-beam and nanoimprint lithography. Different chemical strategies have been pursued to biofunctionalize such nanostructures, both through the formation of mixed Self Assembled Monolayers as well as via chemical reactions at surfaces. Fluorescence microscopy allowed us to monitor single-molecule chemisorption of cell-adhesion proteins in vitro, as well as to follow cell spreading on the nanopatterned bio-arrays, in order to investigate cytoskeletal protein binding interactions in vivo.

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