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Nanoparticle Assemblies via Self-Assembling Peptide Molecules
NIKHIL SHARMA, MATTHEW LAMM, JOEL SCHNEIDER, KRISTI KIICK, University of Delaware, DARRIN POCHAN — The bottom up approach towards nano-scale patterning presents the possibility of creating hierarchical architectures through simple self-assembly strategies. Herein, we elucidate the self-assembly of different types of peptide molecules into unique nano-scale morphologies and demonstrate their application in the construction of linear arrays of inorganic nanoparticles. A 20 amino acid peptide, consisting of alternating hydrophilic (lysine) and hydrophobic (valine) residues flanking a central diproline turn sequence (VKVKVKVKVPPTKVKVKVKV-NH_2) was employed as a nano-scale template for the organization of 2nm gold particles. This peptide self assembles into a laminated morphology in solution and has a periodic nanostructure consisting of alternating hydrophobic and hydrophilic layers with a lateral periodicity of 2.5 nm. Negatively charged gold nanoparticles are templated into the positively charged lysine layer through electrostatic interaction and are aligned within the template to form laterally spaced (2D) linear arrays. Also, a long chain alanine-rich polypeptide was used to create 1D nanoparticle assemblies. This peptide assembles into fibrils with monodisperse widths and presents its charged functional groups periodically along the length of the fibril. These functional groups bind nanoparticles that results in their spatially modulated linear arrangement.

Nikhil Sharma
University of Delaware

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