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Self-assembly on curved surfaces: a tool to generate novel Nano-Materials

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It is known that thiolated molecules spontaneously form poly-crystalline self-assembled monolayers (SAMs) on flat gold surfaces. Scanning tunneling microscopy (STM) studies have shown that, in SAMs composed of more than one type of molecule (mixed-SAMs), domains of random shape and size phase-separate. Here we will show that, when mixed SAMs are formed on gold nano-crystals with a radius of curvature < 20 nm, they spontaneously phase-separate into highly ordered domains of unprecedented size. In the case of binary mixture of thiolated ligands on gold particles, domains, only 0.5 nm wide, of alternating composition encircling or spiraling around the metallic core spontaneously assemble. This new family of nano-structured nano-materials[1] shows properties that are determined by this unique morphology, such as solubility. Also, due to the ordered alternation of hydrophobic and hydrophilic regions, surfaces coated with these particles show the ability of suppressing protein nonspecific adsorption. Recent results show that these particles can be forced to assemble into chains, rings and triangles. [1] Jackson A. M., Myerson J. W., Stellacci F. Nature Materials, 3, 330, 2004