Amphiphilic Janus Gold Nanoplates for Supramolecular Assembly

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Abstract

Noble-metal nanoparticle coated polymer composite microspheres and beads have drawn significant attention due to their applications in electronics, photonics, medical imaging, drug delivery, and catalysis. Here we report the directional binding of amphiphilic and anisotropic Janus gold nanoplates (JGN) onto a model supramolecular target. With PEG | Thymine-rich DNA-JGN (where "|" implies the listed coatings are on opposite sides of the nanoplates) in hand, the JGN were coated onto carboxylate modified fluorescent latex beads, which were covalently linked with amine functionalized adenine-rich DNA thorough EDC chemistry. PEG | Thymine-JGN interacts latex beads through complementary DNAs. Upon mixing of the adenine-coated latex beads with PEG |Thymine JGN, the plates were found to form efficient and dense mono-layer coatings on the surface of the latex bead. Having PEG on one side of the JGN allows a specific DNA mediated interaction and prevented other entities from accumulating on the non-DNA side of the plate.

The preferential light scattering and fluorescence quenching properties of metal nanoparticles on polymer beads can find applications in fluorescent based sensors, medical imaging immunoassays, and other optical and electronic devices. Although the incorporation of metal spherical particles on the polymer bead surface has been previously reported, the directional binding of anisotropic building blocks such as gold nanoplates on the polymer bead surface is yet to be explored.

Biography of Presenter

Md. Emtias Chowdhury was born in Chittagong, Bangladesh. He was bought up and finished his schooling in Chittagong. He attended the University of Chittagong and graduated in 2010 with a bachelor degree in chemistry. He came to the United States to pursue his MS at the university of Maine in the spring of 2012 and finished his MS in the summer of 2014. Currently he is a PhD candidate in the department of chemistry at UofL.