Wentao Peng, Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C4-023

Binary planet-satellite nanostructures using RAFT polymer

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The hierarchical self-assembly of distinct nanoelements into precisely ordered nanostructures requires efficient and flexible fabrication strategies. We established the precise and simple methods to synthesize bimetallic (gold-planet–silver-satellite) and metal-nonmetallic (silica-planet-gold-satellite) nanostructures using RAFT polymer as particle linker. For bimetallic systems, we employed RAFT star polymer to connect planet AuNP (~13 nm) and AgNP (~8 nm). For silica-planet–gold-satellite nanostructure, RAFT polymer is grown from SiO_2NP (~35 nm) using surface-initiated RAFT polymerization technique. The prepared nanoassemblies have well-defined structures in which a planet is encompassed by several satellites, thus simultaneously incorporating the properties of both planet and satellite nanoparticles. The strength of this approach includes the tunability of interparticle distance by tailoring the molecular weight of polymer molar mass. The precise arrangement of distinct nanocomponents provides a template for 2D binary chemical patterning on nanoscale. We demonstrate the self-assembly monolayer of planet-satellite nanostructures on substrate with subsequently plasma treatment removing polymer for further chemical modification on nanoparticles. Our results highlight the general applicability of RAFT polymerization as a nanosynthesis platform for fabricating hierarchical nanostructure.

Biography

Wentao Peng is currently a PhD Fellow in Macromolecular Chemistry at the Georg-August-Universität Göttingen, Germany. His research focuses on the development of nanohybrid material based on novel nanocomponents and functional polymer for various applications.

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