

85d Particle-Rod Hybrids: Constructing Hybrid Nanoparticle/Nanorod Architectures Using Seed-Mediated Nucleation

Ruomiao Wang, Indika Arachchige, Stephanie L. Brock, and Guangzhao Mao

Nano-component integration is recognized as the ultimate step for manufacture of nano-devices. An alternative method for nanoparticle and nanorod integration is described here based on seed-mediated nucleation. Inorganic nanoparticles are used as seeds to nucleate organic crystals in the shape-restrained nanorod form in order to create hybrid nanoparticle/nanorod architectures. The shape-restrained nucleation stems from the high curvature of the nanoparticle surface, which imposes unsustainable strain for tangential crystal growth. The hybrid architecture is made by spin coating a mixed solution of amphiphile arachidic acid (AA) and cadmium selenide nanoparticles capped by 11-mercaptoundecanoic acid (MUA-CdSe) on graphite. Nanorods of AA with unit cell dimensions in cross section are nucleated directly from MUA-CdSe nanoparticles. The number of nanorods per nanoparticle varies with MUA surface coverage. The average rod length, in tens of nanometers, increases with increasing AA to MUA-CdSe molar ratio. The hybrid nanostructure is characterized by AFM, TEM, and EDAX elemental analysis.