Abstract Submitted
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Self-Assembly of Ordered Hybrid Materials with over 100 nm Domain Spacings and up to 15 nm Nanoparticles using Bottle Brush Block Copolymers[1] DONGPO SONG, YING LIN, GANG QIAN, XINYU WANG, XIAOHUI LIU, CHENG LI, JAMES WATKINS, Univ of Mass - Amherst — The preparation of well-ordered nanocomposites using block copolymers and nanoparticles (NPs) with precise control over their spatial organization at different length scales remains challenging, especially for NP cores up to 10 nm in diameter and for domain spacings greater than 100 nm. In this work, these challenges have been overcome using amphiphilic bottle brush block copolymers as templates for the self-assembly of ordered, periodic hybrid materials with domain spacings more than 130 nm using functionalized NPs with core diameters up to 15 nm. CdSe NPs of 10 nm or gold NPs of 15 nm bearing 11-mercaptoundecyl-hydroquinone or poly(4-vinylphenol) ligands were selectively incorporated within (polynorbornene-g-polystyrene)-b- (polynorbornene-g-polyethylene oxide) copolymers by taking advantage of hydrogen bonding between the ligand and PEO domain. Well-ordered composites with cylindrical and lamellar morphologies and NP loadings of up to 30 wt% in the target domains were achieved. This strategy provides a simple and robust means to create ordered hybrid materials of large domain spacings allowing for relatively large functional nanoparticles.

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