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Self-Assembly of Polystyrene Tethered Hydrophilic POSS/C60 Nanoparticles XINFEI YU, STEPHEN Z.D. CHENG, Department of Polymer Science, The University of Akron — Self-assembly of nanobuilding block provides unique opportunities to arrange nanoparticles into larger, functional ensembles. Anisotropy or symmetry breaking will lead to the formation of specific hierarchical structures with novel properties. Polymer tethered particle is one of the approaches to break the symmetry of nanobuilding blocks, which are promise to become the elementary building blocks for self-assembled materials. Shape and interactions are two important factors to determine the self-assembly of these molecules. Although a few examples have been reported during the last decade, little is known about ordered self-assembly structures from these anisotropic building blocks in bulk or solution by experiments. To solve this problem, hydrophilic POSS and C60 have been designed and synthesized, to which hydrophobic polystyrene tail(s) was tethered with controlled topology. The designed molecules could form micelles and colloidal particles in solutions. The effects of PS tail length, solvent properties, and molecular topology on self-assembly morphologies have been studied. The designed molecules could form ordered nanophase separation structures in bulk state with the feature sizes of sub-22 nm, which has great potential applications in advanced lithography technologies.

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