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Giant surfactants of poly(ethylene oxide)-*b*-polystyrene-(molecular nanoparticle): nanoparticle-driven self-assembly with sub-10-nm nanostructures in thin films CHIH-HAO HSU, ZHIWEI LIN, XUE-HUI DONG, I-FAN HSIEH, STEPHEN Z.D. CHENG, The University of Akron — Giant surfactants are built upon precisely attaching shape- and volume-persistent molecular nanoparticles (MNP) to polymeric flexible tails. The unique class of self-assembling materials, giant surfactants, has been demonstrated to form self-assembled ordered nanostructures, and their self-assembly behaviors are remarkably sensitive to primary chemical structures. In this work, two sets of giant surfactants with functionalized MNP attached to diblock copolymer tails were studied in thin films. Carboxylic acid-functionalized [60]fullerene (AC_{60}) tethered with PEO-*b*-PS (PEO-PS-AC_{60}) represents an ABA' (hydrophilic-hydrophobic-hydrophilic) giant surfactant, and fluoro-functionalized polyhedral oligomeric silsesquioxane (FPOSS) tethered with PEO-*b*-PS (PEO-PS-FPOSS) represents an ABC (hydrophilic-hydrophobic-omniphobic) one. The dissimilar chemical natures of the MNPs result in different arrangement of MNPs in self-assembled structures, the dispersion of AC_{60} in PEO domain and the single domain of FPOSS. Moreover, the chemically bonded MNPs could induce the originally disordered small molecular PEO-*b*-PS to form ordered cylindrical and lamellar structure, as evidenced by TEM and GISAXS, leading to sub-10-nm nanostructures of copolymer in the thin film state.

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