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Effect of Interacting Nanoparticles on the Ordered Morphology of Block Copolymer / Nanoparticle Mixtures MOON JEONG PARK, YU JIN KANG, KOOKHEON CHAR, Seoul National University — We investigate the effect of hard additives, i.e., magnetic nanoparticles (NPs), on the ordered morphology of block copolymers by varying NP concentration. In order to characterize the structural change of block copolymer associated with different NP loadings, small-angle x-ray scattering and transmission electron microscopy were performed. Monodisperse maghemite NPs with surfaces modified with oleic acids have been synthesized and PS-b-PI diblock copolymers showing cylindrical morphology were used as structure-directing matrices for the NPs. With the increase in NP concentration, domains of NP aggregates were observed. It is surprising to note that regular lattice-like aggregates with maghemite NPs induce an intriguing morphological transformation from the hexagonal cylinders to the body-centered cubic spheres via undulated cylinders of block copolymers, which does not show such order-order transition without NPs. The interplay between magnetic NPs and block copolymers was also tested with different size of magnetic NPs and also with different molecular weight of PS-b-PIs. We also demonstrate the preferred orientation of anisotropic microdomains of PS-b-PI, which is known to be difficult to orient by applying electric or magnetic field. This result could add more flexibility in structural control and orientation of block templates opening up new applications in the future.

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