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Morphological studies on supramolecular hybrids comprising a block copolymer and semiconductor nanoparticles[1] ATSUSHI NORO, KOTA HIGUCHI, YOSHIO SAGESHIMA, YUSHU MATSUSHITA, Nagoya University —
Well-ordered periodic nanostructures have been attaining much attention due to their high potential for nano-applications. Nanophase-separated structures of block copolymer/inorganic nanoparticle hybrids are one of good candidates for such applications. Here we report a systematic study on preparation and morphological observation of hybrids composed of a block copolymer and hydroxy-capped cadmium selenide nanoparticles (h-CdSe) via hydrogen bonding. Three polystyrene-*b*-poly(4-vinylpyridine) (PS–P4VP) block copolymers with the same PS chain length but with different P4VP chain length were synthesized for hybrid preparation. Each PS–P4VP was mixed with h-CdSe by varying a weight ratio of PS–P4VP:h-CdSe. A hybrid composed of h-CdSe and PS–P4VP bearing long P4VP blocks represents a single nanophase-separated structure, where domain spacing expansion and morphology transition induced by addition of h-CdSe were observed. On the other hand, macrophase separation accompanied by overflow of h-CdSe from nanophase-separated domains was observed in hybrids which contain PS–P4VP bearing short P4VP blocks. These results are attributed to hydrogen-bonding formation and the stoichiometric balance of functional groups.

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