

Block Copolymers: Templates for New Functional Nanomaterials

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Block copolymers with well-defined nanoscopic structures have recently gained much attention for their potential uses as functional nanostructures. In this presentation, I first review the phase behaviors of block copolymers with various kinds of order-to-disorder transitions. Interestingly, block copolymers with lower disorder-to-order transition and closed-loop phase behavior exhibit the baroplastic property, enabling processing them at low temperatures with a modest pressure.

Then, I discuss future applications of nanoporous templates based on block copolymer thin films, for instance, anti-reflective coating, the preparation of conducting polymer nanowires of poly(pyrrole), poly(3,4-ethylenedioxythiophene), and poly(3-hexyl thiophene) onto a glass coated with indium-tin-oxide, and the separation membranes for biomaterials. To obtain nanoporous templates, we used thin films of mixtures of polystyrene-*block*-poly(methyl methacrylate) (PS-*b*-PMMA) and PMMA homopolymer, followed by UV irradiation. These templates have cylindrical nanoholes spanning the entire thickness of the film, confirmed by grazing incidence X-ray scattering and 3-D transmission electron microscopy.