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Controlling Domain Orientation in Thin Films of Lamellar AB and ABA Block Copolymers NIKHILA MAHADEVAPURAM, THAI VU, GILA STEIN, University of Houston — Thin films of block copolymers are very popular for low cost, large area nanopatterning. To generate a nanoporous template, the domains must be oriented perpendicular to the substrate. This talk will discuss the effects of copolymer architecture on surface energetics and domain orientations. We consider lamellar copolymers based on polystyrene (PS) and poly(methyl methacrylate) (PMMA) blocks. All films are cast on "neutral" substrates, and the resulting structures are evaluated with microscopy and grazing-incidence small-angle X-ray scattering. For PS-PMMA diblock copolymers, domain orientations are very sensitive to process conditions. The desired perpendicular orientation is most reliably obtained at high annealing temperatures where PS and PMMA have similar melt surface tensions. For PMMA-PS-PMMA triblock copolymers, the perpendicular domain orientation is stable for all film thicknesses and annealing temperatures that were studied, consistent with recent works that consider architectural effects when calculating the copolymer surface tension. These data suggest that triblocks are easier to use for nanopatterning. However, we also find that diblock and triblock films contain a high density of tilted domains, and such defects should be minimized for most applications.

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