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Continuity and Network Morphologies of Lamellar Nanostructures Self-assembled in Block Copolymer Thin Films: Comparison of Processing by Thermal and Solvent Annealing IAN CAMPBELL, CHUNLIN HE, MARK STOYKOVICH, University of Colorado — Self-assembled block copolymers in thin films have advantages for nanolithography including tunable and scalable feature sizes below 50 nm, parallel patterning over large areas, inexpensive material costs, and attractive processability. One process for inducing order in block copolymer thin films is solvent annealing, in which a film is swollen with solvent and domain ordering is induced as the solvent evaporates from the film. Solvent annealing is advantageous compared to thermal processing because it occurs rapidly and enables the use of polymer constituents that may be thermally unstable. Here the continuity of lamellar networks formed in thin films of poly(styrene-block-methyl methacrylate) with volume fractions of PMMA ranging from 0.45 to 0.55 will be shown to be favored in the block with a higher volume fraction. Network characteristics such as branch point density and end point density correlate with continuity, but at lower densities in solvent annealed than thermally annealed thin films of identical composition. Further comparison between thermal and solvent annealed morphologies sheds light on the mechanism through which ordering is achieved in solvent annealing and allows for additional control over the nanoscale features formed by block copolymers in thin films.

Ian Campbell
University of Colorado

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