Abstract Submitted
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Direct Immersion Annealing of Block Copolymer Thin Films ALAMGIR KARIM[1], University of Akron — We demonstrate ordering of thin block copolymer (BCP) films via direct immersion annealing (DIA) at enhanced rate leading to stable morphologies. The BCP films are immersed in carefully selected mixtures of good and marginal solvents that can impart enhanced polymer mobility, while inhibiting film dissolution. DIA is compatible with roll-to-roll assembly manufacturing and has distinct advantages over conventional thermal annealing and batch processing solvent-vapor annealing methods. We identify three solvent composition-dependent BCP film ordering regimes in DIA for the weakly interacting polystyrene−poly(methyl methacrylate) (PS−PMMA) system: rapid short range order, optimal long-range order, and a film instability regime. Kinetic studies in the "optimal long-range order" processing regime as a function of temperature indicate a significant reduction of activation energy for BCP grain growth compared to oven annealing at conventional temperatures. An attractive feature of DIA is its robustness to ordering other BCP (e.g. PS-P2VP) and PS-PMMA systems exhibiting spherical, lamellar and cylindrical ordering. Inclusion of nanoparticles in these films at high concentrations and fast ordering kinetics study with neutron reflectivity and SANS will be discussed.

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