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Direct Immersion Annealing (DIA) of Block Copolymer Thin Film[1] ARVIND MODI, ALAMGIR KARIM, The University of Akron — Solvent Vapor Annealing (SVA) methodologies of block copolymer (BCP) films have demonstrated excellent potential for control of nanostructures and morphologies. However, SVA designs require sophisticated instrumentation, and fine control of system parameters in batch processing mode which is relatively complex and limits its feasibility. We developed a faster and robust solvent immersion strategy for microphase separation and nanostructure control of as-cast BCP thin films with minimal sophistication. Our Direct Immersion Annealing (DIA) method requires immersion in a mixture of non-solvent and good solvent (for BCP) for annealing. A non-solvent component prevents dissolution of the film resting on substrate while a good solvent percolates through the film, plasticizes it, and shifts glass-transition below room temperature leading to microphase separation and ordering. Our study of PS-PMMA system demonstrates that a robust control over thin film ordering and transient swelling could be achieved through a fine control of solubility parameter of solvent mixture and temperature with no dead-time. Further, we exhibit the utility of DIA for alignment of BCP domains on topographically patterned substrates.

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