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Investigation of Stimuli Responsive Block Copolymer Thin Film Morphology Using Gradient Libraries JENNIFER KELLY, CHRISTOPHER STAFFORD, NIST, THOMAS EPPS, University of Delaware, MICHAEL FASOLKA, NIST — We report the rapid characterization of block copolymer thin film morphology using gradient libraries. This approach allows the simultaneous exploration of a large parameter space thus reducing the need for multiple experiments and extensive data work-up to elucidate the critical parameters controlling nanoscale structure and domain size. We examined a stimuli-responsive block copolymer that undergoes a chemical deprotection and corresponding morphology change above a thermal threshold. Temperature and film thickness were varied using orthogonal continuous gradients on a single substrate to monitor auto-catalytic propagation fronts, nanoscale morphology, and chemical structure. Additionally, a systematic library of block copolymers was investigated to determine the effect of molecular weight and volume fraction on film structure. The film morphologies were investigated using optical microscopy and atomic force microscopy, while chemical structure changes were analyzed using polarization modulation IR reflection absorption spectroscopy. By using these characterization techniques we are able to map morphological and chemical structural changes in a rapid fashion, as well as demonstrate that surface functionality affects the kinetics of the chemical deprotection reaction.

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