Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Effect of Solvent Removal Rate on the Morphology of Solvent Vapor Annealed ABA Triblock Copolymer Thin Films JULIE N. L. ALBERT, WEN-SHIUE YOUNG, RONALD L. LEWIS, III, TIMOTHY D. BOGART[1], JASMINE R. SMITH[2], THOMAS H. EPPS, III, University of Delaware — Solvent vapor annealing (SVA) treatments can be used to kinetically trap unique self-assembled nanostructures in block copolymer thin films that are not achievable by traditional thermal annealing methods. In this work, we kinetically trapped the thin film morphologies of a cylinder-forming ABA triblock copolymer at key points during the solvent removal process following SVA in order to gain insight into the re-ordering mechanisms associated with solvent removal. Specifically, we identified morphology transformations as a function of solvent removal rate, showed that the mechanism for cylinder reorientation involved the propagation of changes at the free surface through the film as a front, and validated a film etching scheme to image the through-film morphology using successive ultra-violet ozone (UVO) etching steps followed by atomic force microscopy (AFM). This facile real-space analysis of the thin film internal structure is more easily implemented in comparison to cross-sectional imaging. The results and methodology of our work are significant not only for improving our understanding of block copolymer thin film self-assembly, but also for tailoring solution processing methods to fabricate nanostructured materials (e.g., for nanotemplate and membrane applications) in general.

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Date submitted: 11 Nov 2011 Electronic form version 1.4