Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Alignment of spherical block copolymer microdomains with substrate features: effects of step edge height and film thickness NATHANIEL T. LAWRENCE, MATTHEW L. TRAWICK, University of Richmond, JOHN M. YARBROUGH, GARY M. ATKINSON, Virginia Commonwealth University, MICHAEL J. FASOLKA, NIST Polymers Division, DOUGLAS H. ADAMSON, RICHARD A. REGISTER, Princeton University — Diblock copolymers can be used as templates for nanolithography, but some applications would require at least local alignment and registration of copolymer microdomains with other features on a particular device. We present here the results of a systematic study of the alignment of spherical microdomains with step edges on a substrate as a function of both step edge height and polymer film thickness. The investigation used a combinatorial approach: we prepared a wafer with a series of step edges of a continuous range of heights along one direction, and applied a polymer film with a thickness gradient along the orthogonal direction. At polymer film thicknesses that are incommensurate with a single layer of microdomains, for which we expect the spontaneous formation of "islands" or "holes" of one commensurate thickness surrounded by another, the step edge acts as a nucleation site for boundaries between such regions, with the film on the high side of the step edge having fewer layers of spheres than the low side. We find that at some step heights, such a discontinuity in film morphology across the step edge is closely associated with the alignment of microdomains.

Matthew Trawick
University of Richmond

Date submitted: 20 Nov 2006 Electronic form version 1.4