

Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Experimental studies of symmetric block copolymer blends in thin films. EASAN SIVANIAH, Texas Technical University, SHINYA MATSUBARA, YUE ZHAO, TAKEJI HASHIMOTO, Kyoto University, TOM MATES, EDWARD J. KRAMER, University of California at Santa Barbara — Microdomain size control in thin films of blended symmetric poly(styrene-*block*-methyl methacrylate) [PS-*b*-PMMA] was examined. Rough substrates and high temperatures were used to prepare perpendicularly oriented PS-*b*-PMMA lamellae. A large block copolymer [BCP], (with N_{large} monomer units) and a small BCP (with N_{small} monomer units) were mixed in a range of composition using a set of symmetric PS-*b*-PMMA BCPs (where χN ranged from 20~100). Thus the blend was characterized by; blend composition, the ratio $\alpha = N_{\text{large}}/N_{\text{small}}$ and χN_{large} . AFM studies of the perpendicular surface structure determined the effect of blend composition on lamella periodicity, D_{mix} . Depth profile analysis and x-ray scattering studies determined the copolymer distribution in the film and the bulk lamellar period, respectively. The effect of composition on D_{mix} was compared to an analytic mean field theory in the strong segregation limit. Whilst good agreement was observed when both χN_{large} and χN_{small} were large (~ 70 -100), there were significant deviations from the theory when $\chi N_{\text{small}} \sim 20$ -60. However in agreement with bulk blend studies, block copolymer macrophase separation was observed at the polymer air surface when the relative size of the block copolymer pairs exceeded $\alpha \sim 5$.

Easan Sivaniah
Texas Technical University

Date submitted: 22 Nov 2004

Electronic form version 1.4