Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

The Effect of Humidity on the Ordering of Block Copolymer Thin Films JOONA BANG, BUMJOON J. KIM, UCSB, THOMAS P. RUSSELL, UMass, EDWARD J. KRAMER, CRAIG J. HAWKER, UCSB — Solvent cast diblock/triblock copolymer films of poly(styrene-*b*-ethylene oxide) (PS-PEO) and poly(styrene-*b*-methyl methacrylate-*b*-ethylene oxide) (PS-PMMA-PEO), with cylindrical microdomains of PEO or PMMA-PEO, have a high degree of long-range lateral order after solvent annealing. Relative humidity of the vapor during the solvent annealing has been shown to play an important role in achieving this order yet the origin of the humidity effect is has been the subject of debate. This work focuses on understanding the role of humidity on the ordering of block copolymer thin films. We find that PS-PMMA-PEO triblock copolymers that show a lamellar morphology in bulk develop a hexagonal array of PMMA-PEO domains on the film surface after solvent annealing in a humid environment. To study the effect of humidity further, hydrophilic nanoparticles, such as PEO-coated gold nanoparticles and PEO-star polymers, were incorporated into nonhydrophilic block copolymers, i.e., poly(styrene-*b*-methyl methacrylate) (PS-PMMA) diblock copolymers that exhibit PMMA cylinders. By controlling the relative humidity and the volume fraction of hydrophilic nanoparticles, it was found that lateral ordering of these PS-PMMA diblock copolymers can also be achieved. The thin film morphologies were investigated in detail using AFM, GISAXS, and TEM.

Joona Bang
UCSB

Date submitted: 05 Jan 2006 Electronic form version 1.4