

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Real-Time observation of PS-PDMS block copolymer self-assembly under solvent vapor annealing¹ WUBIN BAI, MIT, KEVIN YAGER, Brookhaven National Laboratory, CAROLINE ROSS, MIT — Solvent annealing provides a convenient way to produce microphase separation in films of block copolymers, but the morphology transition of the film during the solvent absorption, equilibrium solvent-BCP concentration and solvent desorption process are not well known. An in situ study of solvent annealing of polystyrene-block-polydimethylsiloxane (PS-PDMS, 16 kg/mol, fPDMS = 30%, period 17 nm) diblock copolymer was carried by synchrotron grazing-incidence small-angle X-ray scattering (GISAXS). The swollen film morphology was found to be strongly dependent on swelling ratio. A transition from the disordered state to a highly ordered state which contained multiple layers of in-plane cylinders was observed at a swelling ratio around 1.45 from samples with 100nm to 1000nm as-cast thickness. The rate of solvent absorption was found to be less important to the dried morphology, while the time of equilibrium solvent-BCP concentration stage was found to influence the orientation of self-assembled microdomains and the drying rate was found to affect the degree of structure deformation. The implications of the results to pattern generation for block copolymer directed self-assembly will be discussed.

¹Semiconductor Research Corporation, National Science Foundation

Wubin Bai
MIT

Date submitted: 11 Nov 2014

Electronic form version 1.4