Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Effects of solvent evaporation conditions on solvent vapor annealed cylinder-forming block polymer thin films MEAGAN GRANT, WILLIAM JAKUBOWSKI, GUNNAR NELSON, CHLOE DRAPES, A BARUTH, Creighton University — Solvent vapor annealing is a less time and energy intensive method compared to thermal annealing, to direct the self-assembly of block polymer thin films. Periodic nanostructures have applications in ultrafiltration, magnetic arrays, or other structures with nanometer dimensions, driving its continued interest. Our goal is to create thin films with hexagonally packed, perpendicular aligned cylinders of poly(lactide) in a poly(styrene) matrix that span the thickness of the film with low anneal times and low defect densities, all with high reproducibility, where the latter is paramount. Through the use of our computer-controlled, pneumatically-actuated, purpose-built solvent vapor annealing chamber, we have the ability to monitor and control vapor pressure, solvent concentration within the film, and solvent evaporation rate with unprecedented precision and reliability. Focusing on evaporation, we report on two previously unexplored areas, chamber pressure during solvent evaporation and the flow rate of purging gas aiding the evaporation. We will report our exhaustive results following atomic force microscopy analysis of films exposed to a wide range of pressures and flow rates. Reliably achieving well-ordered films, while occurring within a large section of this parameter space, was correlated with high-flow evaporation rates and low chamber pressures. These results have significant implications on other methods of solvent annealing, including "jar" techniques.

Meagan Grant
Creighton University

Date submitted: 11 Nov 2016 Electronic form version 1.4