Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Towards ultra-fast solvent evaporation, the development of a computer controlled solvent vapor annealing chamber GUNNAR NELSON, J. WONG, C. DRAPES, M. GRANT, A. BARUTH, Creighton Univ, Omaha, NE — Despite the promise of cheap and fast nanoscale ordering of block polymer thin films *via* solvent vapor annealing, a standardized, scalable production scheme remains elusive. Solvent vapor annealing exposes a nano-thin film to the vapors of one or more solvents with the goal of forming a swollen and mobile state to direct the self-assembly process by tuning surface energies and mediating unfavorable chain interactions. We have shown that optimized annealing conditions, where kinetic and thermal properties for crystal growth are extremely fast (<1s), exist at solvent concentrations just below the order-disorder transition of the film. However, when investigating the propagation of a given morphology into the bulk of a film during drying, the role of solvent evaporation comes under great scrutiny. During this process, the film undergoes a competition between two fronts; phase separation and kinetic trapping. Recent results in both theory and experiment point toward this critical element in controlling the resultant morphologies; however, no current method includes a controllable solvent evaporation rate at ultra-fast time scales. We report on a computer-controlled, pneumatically actuated chamber that provides control over solvent evaporation down to 15 ms. Furthermore, *in situ* spectral reflectance monitors solvent concentration with 10 ms temporal resolution and reveals several possible evaporation trajectories, ranging from linear to exponential to logarithmic. Funded by Dr. Randolph Ferlic Summer Research Scholarship and NASA Nebraska Space Grant.

Gunnar Nelson
Creighton Univ, Omaha, NE

Date submitted: 06 Nov 2015 Electronic form version 1.4