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**The role of ultra-fast solvent evaporation on the directed self-assembly of block polymer thin films** CHLOE DRAPES, G. NELSON, M. GRANT, J. WONG, A. BARUTH, Creighton University — The directed self-assembly of nano-structures in block polymer thin films *via* solvent vapor annealing is complicated by several factors, including evaporation rate. Solvent vapor annealing exposes a disordered film to solvent(s) in the vapor phase, increasing mobility and tuning surface energy, with the intention of producing an ordered structure. Recent theoretical predictions reveal the solvent evaporation affects the resultant nano-structuring. In a competition between phase separation and kinetic trapping during drying, faster solvent removal can enhance the propagation of a given morphology into the bulk of the thin film down to the substrate. Recent construction of a purpose-built, computer controlled solvent vapor annealing chamber provides control over forced solvent evaporation down to 15 ms. This is accomplished using pneumatically actuated nitrogen flow into and out of the chamber. Furthermore, *in situ* spectral reflectance, with 10 ms temporal resolution, monitors the swelling and evaporation. Presently, cylinder-forming polystyrene-*block*-polylactide thin films were swollen with 40% (by volume) tetrahydrofuran, followed by immediate evaporation under a variety of designed conditions. This includes various evaporation times, ranging from 15 ms to several seconds, and four unique rate trajectories, including linear, exponential, and combinations. Atomic force microscopy reveals specific surface, free and substrate, morphologies of the resultant films, dependent on specific evaporation conditions. Funded by the Clare Boothe Luce Foundation and Nebraska EPSCoR.

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