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**Design, construction, and testing a purpose-built climate-controlled solvent vapor annealing chamber for guided self-assembly of block polymer thin films** RYAN GNABASIK, RUSTIN HAASE, ANDREW BARUTH, Creighton Univ — Despite its efficacy to produce well-ordered, periodic nanostructures, the intricate role multiple parameters play in solvent vapor annealing has not been fully established. In solvent vapor annealing a thin polymer film is exposed to the vapors of a solvent(s) thus forming a swollen and mobile layer to direct the self-assembly process at the nanoscale. Recent developments in both theory and experiment have directly identified critical parameters, but controlling them in any systematic way has proven non-trivial. These identified parameters include vapor pressure, solvent concentration in the film, and, critically, the solvent evaporation rate. To explore their role, a purpose-built solvent vapor annealing chamber was designed and constructed. The all-metal chamber is inert to solvent exposure and pneumatically actuated valves allow for precision timing in the introduction and withdrawal of solvent vapor. Furthermore, the mass flow controlled inlet, chamber pressure gauges, *in situ* spectral reflectance-based thickness monitoring, and high precision micrometer relief valve, give real-time monitoring and control during the annealing and evaporation phases. Using atomic force microscopy to image the annealed films, we are able to map out the parameter space for a series of polystyrene-*b*-polylactide ($M_n = 75$ kg/mol and $f_{PLA} = 0.28$) block polymer thin films with an intrinsic cylindrical morphology and identify their role in directed assembly. Funded by Creighton University Summer Research Grant.

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