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Simultaneous Vapor Deposition and Phase Separation of Polymer Films RAN TAO, MITCHELL ANTHAMATTEN, University of Rochester — Initiated chemical vapor deposition (iCVD) is a solventless, free radical technique used predominately to deposit homogeneous films of linear and crosslinked polymers directly from gas phase feeds. The major goal of this research is to force and arrest phase separation of deposited species by co-depositing non-reactive molecules (porogens) with reactive monomers and crosslinkers. We introduce these species during iCVD to force and quench polymer induced phase separation (PIPS) during film growth as a step toward tunable pore-size, density, and morphology. Polymerization, crosslinking and PIPS are intended to occur simultaneously on the substrate, resulting in a vitrified microstructure. Cahn-Hilliard theory predicts that the length scale of phase separation depends on the polymer-porogen interaction energy, the polymerization rate and the species' mobility. A series of films were grown by varying deposition rate, porogen type, and reagent flowrates. Crosslinkers were introduced to limit the growth of phase separated domains and to provide mechanical support during porogen removal. To elucidate how phase separation competes with polymerization and film growth, deposited films were studied using a combination of electron microscopy, profilometry and spectroscopic techniques.

Ran Tao
University of Rochester

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