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Evidence of Phase Separation during Vapor Deposition Polymerization RAN TAO, MITCHELL ANTHAMATTEN, University of Rochester — Initiated chemical vapor deposition (iCVD) is a solventless, free radical technique predominately used to deposit homogeneous films of linear and crosslinked polymers directly from gas phase feeds. We are developing multicomponent iCVD techniques to induce phase separation during film growth. Small molecule porogens and crosslinkers are introduced into the iCVD process during film growth of poly(glycidyl methacrylate). Analogous to well established polymerization induced phase separation (PIPS) processes, porogens, such as dimethyl phthalate, are well mixed at the growing gas-film interface but are immiscible with high molecular weight polymer. Polymerization, crosslinking and PIPS are intended to occur simultaneously on the substrate, resulting in a vitrified microstructure. A series of films were grown by varying deposition rate, porogen type, and reagent flowrates. Deposited films were studied by electron microscopy and spectroscopic techniques. Experiments are compared to Cahn-Hilliard theory predictions that relate the length and time scale of the phase separation to the polymer-porogen interaction energy, the rate of polymerization and the species mobility.

Ran Tao
University of Rochester

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