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Phenomenology of Polymer Thin Film Dewetting during Vapor Deposition Polymerization[1] MITCHELL ANTHAMATTEN, XICHONG CHEN, University of Rochester, DEPARTMENT OF CHEMICAL ENGINEERING TEAM — Initiated chemical vapor deposition (iCVD) is a solventless technique to grow polymer thin films directly from gas phase feeds. The free radical technique involves the dissociation of gaseous initiator followed by adsorption onto a surface and subsequent polymerization with monomer to produce linear or crosslinked polymer films. We have designed and built an axisymmetric hot-zone iCVD vacuum reactor. Using this reactor, smooth poly (methyl methacrylate) films are grown from methyl methacrylate and t-butyl peroxide gas feeds. When solvent vapors are added to the process, we observe dewetting of vapor deposited polymer films. The objective of the current study is to understand the phenomenology of the observed solvent-induced dewetting. White light interferometery was used to investigate the surface topography of dewetted structures. The observed length scale depends on several process parameters including the deposition rate, the type of solvent used, and the surface free energy. Higher deposition rates suppress dewetting, and higher solvent content leads to dewetted structures with larger length scales. A dynamic model is applied to explain how droplet size and droplet aerial density depend on time and process parameters.

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