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Organic crystal needle formation via solvent-annealing: coarsening, wetting, and crystallization in a thin liquid film TONY S. YU, A. E. HOSOI, MIT — Single-crystal, organic semiconductors are attractive because of their highly-nonlinear optical properties and, relative to their amorphous counterparts, they exhibit higher charge mobilities and improved morphological stability. But for such materials to be practical, researchers must develop methods for controlled growth of organic single-crystals. Here we investigate the growth of high-aspect-ratio "needles" of single-crystal Alq_3—tris(8-hydroxyquinoline) aluminum—from amorphous Alq_3 films. During deposition, thin films of amorphous Alq_3 are locked in an energetically-unfavorable state. When exposed to solvent, these films evolve into three distinct states: Alq_3-rich droplet regions, solvent-rich wetting regions, and Alq_3 needles. To understand the experimental results, we model the dynamics of a thin fluid film driven by capillary pressure and intermolecular forces. The resulting flow, coupled with diffusion, transports Alq_3 to a growing needle, which is represented by a moving, absorbing interface bounding the fluid.

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