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Tailoring the morphology of polymer blend particles: 3D simulations and linear stability analysis B.S. SARATH POKURI, BASKAR GANAPATHYSUBRAMANIAN, Iowa State University — Polymer blend micro-/nanoparticles find a variety of uses in novel applications including electronics, luminescent devices, and drug delivery. Solvent evaporation driven phase separation is one of the easiest way to fabricate these particles. However, tailoring morphology of these particles is still challenging. This has resulted in complex methods to tailor morphology. Understanding how morphology evolves and in particular how phase separation is initiated will provide valuable insight to tune morphologies. We characterize the evolution of morphology during evaporation based phase separation into a finite set of fundamental modes. We approach the problem at two levels of complexity. A full 3D modeling framework describing evaporation induced phase separation is used to model the emulsification process as a function of processing parameters: droplet radius, blend ratio, and evaporation rate. Subsequently, high throughput analysis is enabled by using ideas from linear stability analysis to classify the parameter space by morphology. These complementary analysis allows us to identify a fundamental set of morphology evolution modes and map the set of processing conditions to a unique mode. Ergo, one can gain control over the morphology by regulating the processing conditions.

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