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Study of the phase separation of organic molecules from solution on Si(111) substrates[1] MIRIAM CEZZA, COLIN QUALTERS, RAYMOND PHANEUF, Department of Materials Science and Engineering, University of Maryland, College Park, MD — Understanding the science behind assembly of small organic molecules into domains is important for numerous applications, among which organic solar cells are especially noteworthy. An important process on which organic solar cells depends is the phase separation of organic molecules. The formation of a morphology during phase separation from a solvent-based, bimolecular solution onto a substrate depends on several parameters: relative molecular concentrations, solubilities of each type of molecule in the solvent, solvent evaporation rate, and annealing conditions. We carry out studies on molecular mixtures consisting of tetranitro zinc-phthalocyanine (tn-ZnPc) and PCBM in chloroform, and native oxide-covered Si(111) substrates. We investigate the role that solvent evaporation rate during deposition, followed by solvent vapor annealing (SVA), plays on the formation of phase separated mixtures and their crystallization and phase transformation. We also investigated the relative concentration of individual molecules in mixtures. We found that PCBM molecules alone undergo several phase transformations as the solvent evaporation rate decreases, while tn-ZnPc is very stable. Moreover, the concentration of tn-ZnPc in mixtures highly affects the PCBM crystallization.

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