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Processing Solvent Dependent Morphology of Diketopyrrolopyrrole (DPP) based Low Band Gap Polymer and PCBM Blends SUNZIDA FERDOUS, FENG LIU, THOMAS RUSSELL, Polymer Science and Engineering, University of Massachusetts-Amherst — Solution processing of polymer semiconductors is widely used for fabrication of low cost organic solar cells. Recently, mixed solvent systems or additive based systems for fabricating polymer solar cells have proven to be beneficial for obtaining high performance devices with multi-length scale morphologies. To control the morphology during the processing step, one needs to understand the effect of solvent as it evaporates to form the final thin film structure. In this study, we used diketopyrrolopyrrole (DPP) based low band gap polymer and phenyl-C71-butyric acid methyl ester (PCBM) blend in a series of mixed solvent systems consisting of a good solvent for both of the active material components, as well as different solvents that are good solvents for PCBM, but poor solvents for the polymer. Different evaporation times of the poor solvents during the drying process, and different solubility of the polymer in these poor solvents as well as their interaction with the substrate play an important role in the final morphology. In-situ GIWAXS studies were performed to observe the evolution of the structure as the solvent evaporates. The final morphologies of the thin film devices were also characterized by AFM, TEM, and various x-ray scattering techniques to correlate the morphology with the obtained device performances.

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