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Solvent Annealing in Selective Solvents: A Novel Method to Tune the Morphology of Low Band Gap Polymer:Bis-Fullerene Heterojunctions MARK DADMUN, HUIPENG CHEN, YU-CHE HSIAO, BIN HU, University of Tennessee — One of the most important challenges facing our society is the development of technologies for renewable energy conversion. Polymeric bulk-heterojunction (BHJ) photovoltaics, based on conjugated polymers and fullerenes, are an economically viable option for low cost renewable power generation. The most promising conjugated polymer:fullerene active layers in organic photovoltaics now utilize low band-gap (LBG) copolymers. Unfortunately, for most of these LBG devices, the as-cast film is not usually optimal, and there are few further treatment available after film deposition to optimize the morphology. To address this problem, we have exploited the selective solubility of the LBG:fullerene nanocomposite components to direct the assembly of these mixtures by annealing in the vapor of a selective solvent. Our recent work demonstrates that annealing in a solvent that is selective to the fullerene forms a sample with fullerene aggregation, while annealing in a solvent vapor that is selective to the polymer forms a thin film with polymer precipitation. There is also a direct correlation between the resultant morphology and OPV performance, increasing PCE by 190%. These results indicate that solvent annealing and solvent choice provides a unique tool to precisely tune the morphology of CP:Fullerene BHJ systems, optimizing the morphology and performance of the active layer.

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