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Solvent Studies for Solution Processing of Polymer-Fullerene Bulk Heterojunctions MARGARET J. SOBKOWICZ, University of Massachusetts Lowell Plastics Engineering Department, RONALD L. JONES, R. JOSEPH KLINE, DEAN M. DELONGCHAMP, National Institute of Standards and Technology Polymers Division — A major advantage of polymer solar cells over higher-efficiency photovoltaic alternatives is the low cost of printing technologies. Solution-based film preparation relies on the self-assembly of the polymer and fullerene phases as the layer dries from the casting ink into a bulk heterojunction morphology. The nanoscale morphology must facilitate optimal charge separation and transport; thus solution processing parameters heavily influence the device performance. Current technology uses chlorinated aromatic solvents and small processing windows with stringent requirements on ink properties. In this study, the stability of various ink formulations is investigated to develop more reliable, sustainable alternatives. Model solutions of poly(3-hexylthiophene) (P3HT) and phenyl-C61-butyric acid methyl ester (PCBM) are prepared using a range of solvents and solvent mixtures. P3HT solution crystallization behavior is investigated using differential scanning calorimetry, UV-visible absorbance measurements and neutron and light scattering. The behavior of the solutions under shear is investigated in order to predict the success of disparate printing and coating techniques.

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