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Conditions for the Formation of P3HT Organogels During Spin-Coating: Tuning Electrical Properties in Thin Films CAMERON S. LEE, WEN YEN, Department of Chemistry, University of Tennessee, ADAM HOLT, JOSHUA SANGORO, Department of Physics and Astronomy, University of Tennessee, ALEXEI SOKOLOV, MARK D. DADMUN, Department of Chemistry, University of Tennessee; Chemical Sciences Division, Oak Ridge National Laboratory — Poly(3-hexyl thiophene) (P3HT) is widely studied as a model conjugated polymer in many electrical and photovoltaic applications, and has become the benchmark polymer when studying the physics of these devices. The assembly and growth of P3HT as organogels offers a structure that can bridge the electrodes, providing more efficient transport throughout the active layer. In this work, we identify and discuss a novel set of conditions for P3HT organogel network formation by controlling the spin-coating process from various solvents. The onset of organogel formation was monitored by in situ static light scattering, which measured both the thinning rate and off-specular scattering during film formation. Optical microscopy and thermal annealing experiments provide ex situ confirmation of organogel fabrication. The role of solution characteristics, including solvent boiling point, P3HT solubility, and initial P3HT solution concentration are examined to correlate these parameters to the rate of film formation, organogel-onset concentration, and overall network size. The properties of the film and their correlation to the fabrication parameters were also analyzed within the context of the hole mobility and density-of-states of the organogel, as measured from impedance spectroscopy.

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