

Abstract Submitted
for the 4CF13 Meeting of
The American Physical Society

The Effect of Morphology on Charge Transport Properties in OPVs ALEX DIXON, University of Denver, NIKOS KOPIDAKIS, NREL, SEAN SHAHEEN, CU Boulder, RASEI — The Organic Photovoltaic (OPV) field is rapidly advancing, however several important issues regarding the device physics in these systems remain unresolved. We investigated the relationship between morphology and charge transport properties in OPV materials. To do this, we created devices with poly 3-hexothiyophene (P3HT) of a range of molecular weights (from 13kDa to 331kDa). These various molecular weights cause the films to have different morphologies. The low molecular weight P3HT forms semi-crystalline domains, as the molecular weight increases, amorphous regions appear connecting and surrounding the semi-crystalline domains. The devices were measured using the Charge Extraction by Linearly Increasing Voltage (CELIV) technique in order to determine the charge carrier mobility and recombination rate of the various P3HTs. We found that while the recombination rate decreases with increasing molecular weight, the mobility peaked at around 47kDa. We believe that the decrease in recombination is due to charge dissociation of electrons and holes into separate regions of the film. While the lower recombination rate from the separate amorphous and semi-crystalline domains raises the mobility, the increasing amount of amorphous material at larger molecular weights causes a decrease in mobility, resulting in the observed mobility peak.

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Date submitted: 20 Sep 2013

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