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The influence of Morphology on Charge Transport Properties in P3HT ALEX DIXON, University of Denver, NIKOS KOPIDAKIS, NREL, SEAN SHAHEEN, CU Boulder, Rasei. — The field of Organic Photovoltaic (OPV) has been growing quickly, yet there are still several questions about the underlying physics that remain poorly understood. One question is the nature of the relationship between active layer microstructure and charge transport. To investigate this, we fabricated devices using a range of molecular weights (from 13kDa to 331kDa) of poly 3-hexothyophene (P3HT). Varying the molecular weight of P3HT causes the films to exhibit changes in microstructure, with low molecular weights forming a paraffinic-like structure and higher molecular weights forming a semi-crystalline structure. Using the Charge Extraction by Linearly Increasing Voltage (CELIV) technique, we determined the hole mobility and recombination factor for theses devices. We found that the mobility in the devices peaked at 47kDa and the recombination rate decreased with increasing molecular weight. We hypothesize that the decrease in recombination is due to spacial separation of charge carrier in the semi-crystalline regions, with the holes populating the crystalline regions and the electrons populating the amorphous areas. This improves mobility for mid rage molecular weights but defects cause it to dip at higher molecular weights.

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