Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

**Real-time charge carrier motion in P3HT studied with Kelvin Probe Microscopy**[1] CHLOE CASTANEDA, ALYINA ZAIDI, JASON MOSCATELLO, KATHERINE AIDALA, Mount Holyoke College — We have developed a technique that uses scanning probe microscopy (SPM) to study the real-time injection and extraction of charge carriers in organic semiconductor devices. We investigate P3HT (full name) in an inverted field effect transistor geometry with gold electrodes. By positioning the SPM tip at an individual location and using Kelvin probe microscopy to record the potential over time, we can record how the charge carriers respond to changing the backgate voltage while the source and drain electrodes are grounded. We see relatively fast screening for negative backgate voltages because holes are quickly injected into the P3HT film. The screening is slower for positive gate voltages, because some of these holes are trapped and therefore less mobile. We compare P3HT transistors with different fabrication procedures that are expected to change the trap distribution: no silanization of the oxide and no annealing, silanization and no annealing, and both silanization and annealing. By incrementally stepping the gate voltage, we probe different trap depths. The recorded change in potential over time is best fit by a double exponential, suggesting two physical mechanisms involved in screening.

[1]This work is supported by NSF grant DMR-0955348, and the Center for Heirarchical Manufacturing at the University of Massachusetts, Amherst (NSF CMMI-1025020).

Chloe Castaneda
Mount Holyoke College

Date submitted: 06 Nov 2015 Electronic form version 1.4