Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Charge motion in Poly(3-hexylthiophene-2,5-diyl) studied with Scanning Probe Microscopy[1] JASON MOSCATELLO, CHLOE CASTANEDA, KATHERINE AIDALA, Mount Holyoke College — Organic semiconductors like poly(3-hexylthiophene-2,5-diyl) offer the promise of solution-processable, flexible electronics, but the charge motion in these disordered films is not fully understood. We use Kelvin Probe Force Microscopy (KPFM) to study trapped charges in the channel of inverted field effect transistors and have developed a technique to measure real time screening. The tip of the AFM is placed at a specific location above the sample with grounded source and drain electrodes, and the potential of the surface is recorded using KPFM. When a voltage is applied to the back-gate, charges will move to screen this potential. For materials with relatively low charge density and mobility, it will take some amount of time to fully screen. The tip will initially measure the potential of the voltage applied to the back-gate, which will decrease as charges enter the film. The shape and timescales of this decrease reveal information about injection barriers and traps in the material. Our data suggest that we are observing holes entering and exiting trap states as the gate voltage is turned on and off. Other factors, such as aging, increase the timescale of the screening.

[1]Supported by NSF DMR-1207924

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Date submitted: 14 Nov 2014 Electronic form version 1.4