Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Band bending effect in P3HT: Role of morphology[1] J. K. WENDEROTT, BAN X. DONG, University of Michigan - Ann Arbor, PETER F. GREEN, National Renewable Energy Laboratory, University of Michigan - Ann Arbor — We utilized Kelvin probe force microscopy (KPFM) to investigate band bending of poly(3-hexylthiophene) (P3HT) films fabricated using both conventional spin-casting and the novel matrix assisted pulsed laser evaporation (MAPLE) technique on ITO:PEDOT substrates. Our findings show an association between band bending and out-of-plane transport characteristics of the films. A strong band bending effect is observed in MAPLE-deposited samples, whereas a weaker effect is seen in the spin-cast counterpart. With modeling, the charge transfer between the conductive ITO:PEDOT substrate and the MAPLE-deposited P3HT sample can be explained by a broadening of the density of states (DOS). This broadening likely originates from the highly disordered structure of MAPLE P3HT as reported in our previous study. Temperature dependence of the out-of-plane carrier mobility shows higher activation energy in the MAPLE-deposited sample as compared to spin-cast samples (180 meV versus 120 meV), which further corroborates the observed broadening of the DOS measured by KPFM. Our work indicates a strong connection between molecular structure, electronic states and bulk transport in conjugated polymer films.

[1]NSF

Jill Wenderott
Univ of Michigan - Ann Arbor

Date submitted: 11 Nov 2016 Electronic form version 1.4