Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

All-polymer photovoltaics: Correlating Efficiency and Morphology[1] YAN JIN, University of Cincinnati, JONG K. KEUM, KUNLUN HONG, JAMES F. BROWNING, GREGORY S. SMITH, Oak Ridge National Laboratory, VIKRAM K. KUPPA, University of Cincinnati, OAK RIDGE NATIONAL LABORATORY COLLABORATION — We have recently demonstrated how the efficiency of devices fabricated from a blend of the polymers P3HT and F8BT increases three-fold by incorporating pristine graphene into the active layer. The fundamental mechanisms underlying this enhancement are investigated, and are shown to arise from improvements in both charge transport and morphology. We investigate the structure via small angle neutron scattering (SANS) studies of the deuterated-P3HT/F8BT system with and without graphene. SANS reveals the existence of disk-like P3HT crystallites distributed in an amorphous miscible blend of P3HT and F8BT. P3HT crystallinity was enhanced upon graphene addition, resulting in larger crystallites and a higher degree of ordering. These structural changes are accompanied by better charge transport, resulting in a peak improvement of over 200% in the short-circuit current of the devices. Results on cell characteristics and recombination mechanisms are also reported, and indicate means of addressing fundamental problems in OPV systems.

[1]Oak Ridge National Laboratory

Yan Jin
University of Cincinnati

Date submitted: 14 Nov 2014 Electronic form version 1.4