Abstract Submitted
for the 4CF10 Meeting of
The American Physical Society

Measuring and Controlling Spatial Fluctuations in Organic Photovoltaic Devices ALEX DIXON, SEAN SHAHEEN, University of Denver, JAN-CARLOS KUHLMANN, J.C. HUMMELEN, University of Groningen — The power conversion efficiency of organic photovoltaic (OPV) devices is controlled by processes and structures at many length scales. The nanoscale morphology of a blend of electron-donating and electron-accepting molecules plays a critical role in determining exciton dissociation and charge transport properties. On a larger length scale of tens of nanometers to several microns, there can exist spatial fluctuations in the photocurrent of the devices that act to degrade the overall diode properties and efficiency. In this work, we investigated fluctuations in photoconductivity of the poly(phenylene vinylene) derivative MDMO-PPV blended with a fluorene-derivatized fullerene, FCBM, with alkyl side-chains of various lengths. Measurements of the local photocurrent in the polymer-fullerene blends performed with conductive tip Atomic Force Microscopy showed fluctuations on the scale of $\sim$100 nm. In all cases the fluctuations were large enough (10%-30%) to likely cause decreased macroscopic performance in OPV devices, but the size and structure of the fluctuations depended on the length of the alkyl tail on the fluorene group, with the shortest tail giving the largest lateral features and the smoothest films. Here we present analysis of the topology of the fluctuations and the role of molecular structure and material processing conditions leading to their formation.

Alex Dixon
University of Denver

Date submitted: 10 Sep 2010 Electronic form version 1.4