Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Precise Structural Development and its Correlation to Function in Conjugated Polymer: Fullerene Thin Films by Controlled Solvent Annealing HUIPENG CHEN, Department of Chemistry, University of Tennessee, SHENG HU, Department of Chemical and Biomolecular Engineering, University of Tennessee, HUIDONG ZANG, BIN HU, Department of Material Science and Engineering, University of Tennessee, MARK DADMUN, Department of Chemistry, University of Tennessee — The structural evolution and function of solvent processed poly(3-hexylthiophene):[6,6]-phenyl-C_{61}-butyric acid methyl ester (P3HT:PCBM) bilayers with controlled exposure to ortho-dichlorobenzene solvent vapor is examined. Different from thermal annealing, where the structure develops (P3HT crystallization and PCBM phase separation) in seconds, solvent vapor annealing provides more precise morphological control and a more detailed picture of the competing processes that drive the structural development. This work shows that P3HT crystallization and PCBM phase separation occur in different stages with solvent annealing. The interdiffusion of PCBM and P3HT and crystallization of P3HT occurs in the first stage, while in the second stage, the phase separation of PCBM from P3HT and agglomeration of PCBM occurs. Therefore, the sequential nature of these processes clearly documents that the phase separation of PCBM from P3HT *is not* driven by P3HT crystallinity, but by the thermodynamic driving force of mixing (the miscibility limit of PCBM in P3HT) Correlation of the morphology to device performance indicates that both sufficient P3HT crystallization and PCBM phase separation are crucial in the optimization of the morphology of the active layer.

Huipeng Chen
University of Tennessee

Date submitted: 26 Nov 2012 Electronic form version 1.4