

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Diffusion rates and crystallization of phenyl-C61-butyric acid methyl ester in poly(3-hexylthiophene)¹ L. GUIGNARD, B. COLLINS, J. SEOK, H. ADE, North Carolina State University — Bulk heterojunction (BHJ) solar cells based on poly(3-hexylthiophene) (P3HT) and phenyl-C61-butyric acid methyl ester (PCBM) are an important model system for studying organic solar cell operation. Recent experiments reveal that PCBM is partially miscible in the amorphous regions of P3HT [1-3], implying that P3HT:PCBM devices have three phases. The miscibility depends on temperature and regioregularity of the P3HT. To better understand the influence of P3HT regioregularity and molecular weight on the the P3HT:PCBM system, diffusion rates of PCBM are determined as a function of regioregularity of P3HT and temperature with visible light microscopy by analyzing the growth of the PCBM depletion region near PCBM crystals or agglomerates. Lower diffusion constants are found for less crystalline regiorandom P3HT than highly regioregular P3HT. The shape and growth behavior of PCBM crystal or agglomerate is also found to vary greatly.

[1] B. Watts *et al.*, *Macromolecules* **42**, 8392 (2009)

[2] B. A. Collins *et al.*, *J. Phys. Chem. Lett* **1**, 3160 (2010)

[3] J. W. Kiel *et al.*, *Phys. Rev. Lett.* **105**, 168701 (2010) and N. D. Treat *et al.*, *Adv Funct Mater*

¹DOE DE-FG02-98ER45737

Lewis Guignard
North Carolina State University

Date submitted: 30 Dec 2010

Electronic form version 1.4