Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Cross-sectional nanoscale morphology and interfacial band alignment of phase-separated polymer/fullerene by scanning tunneling microscopy and spectroscopy M.C. SHIH[1], Y.P. CHIU, B.C. HUANG, Department of Physics, National Sun Yat-sen University, Kaohsiung, 80424, Taiwan, C.C. LIN, S.S. LI, Department of Materials Science and Engineering, National Taiwan University, Taipei, 10617 Taiwan, C.S. CHANG, Institute of Physics, Academia Sinica, Taipei 11529, Taiwan, C.W. CHEN, Department of Materials Science and Engineering, National Taiwan University, Taipei, 10617 Taiwan — The efficiency of organic films based on poly(3-hexylthiophene) (P3HT) and methanofullerene derivative (PCBM) was shown to be strongly dependent on the crystalline order inside. Through the suitable annealing process, the well-crystallized organic P3HT:PCBM films can be fabricated to enhance their charge transport. To further improve the efficiency of photo-induced charge separation and transport as well as the corresponding photocurrent, more detailed electronic information at both interfaces of the donors/accepters and photoactive-layer/electrode will be essential. In this work, cross-sectional scanning tunneling microscopy and spectroscopy were employed to investigate the interfacial properties of P3HT:PCBM films. The vertical phase distribution and local electronic structures across the interfaces of substrate/organic film and P3HT/PCBM are obtained at the atomic resolution. These electronic structures also provide direct observations of the interfacial band alignments, suggesting the possible carrier transport mechanism of P3HT:PCBM organic films.

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Date submitted: 27 Dec 2012 Electronic form version 1.4