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P3HT-based copolymers as interfacial compatibilizers in P3HT/PCBM system S. MICHAEL KILBEY II, JIHUA CHEN, XIANG YU, KAI XIAO, MARK DADMUN, DEANNA PICKEL, BOBBY SUMPTER, CENTER FOR NANOPHASE MATERIALS SCIENCES, OAK RIDGE NATL LAB; DEPT. OF CHEMISTRY, UNIV. OF TENNESSEE COLLABORATION — To lower the interfacial tension and control the donor-acceptor phase separation in organic photovoltaic devices, a poly(3-hexylthiophene)-*block*-poly(ethylene oxide) (P3HT-*b*-PEO) diblock copolymer compatibilizer was added to a binary blend of regioregular P3HT and the fullerene derivative 6,6-phenyl C_{61} butyric acid methyl ester (PCBM). We systematically examined the ternary phase behavior of spin-coated films of P3HT/ P3HT-*b*-PEO/ PCBM before and after annealing with selected area electron diffraction, grazing-incidence X-ray diffraction, AFM, optical and transmission electron microscopy. Neutron reflectivity experiments were also carried out to study thermodynamic behaviors of P3HT/P3HT-*b*-PEO/PCBM trilayer films. The addition of 5% P3HT-*b*-PEO (block molecular weights of 10kDa and 3kDa, respectively) to a 1:1 P3HT/PCBM blend reduces the size of P3HT-rich domains in P3HT/PCBM films by up to 40% while the $\pi - \pi$ stacking of P3HT (i.e. (020) crystallinity) remains nearly unchanged. In addition we will discuss the effect of compatibilizer type, additive concentration, and thermal annealing conditions on power conversion efficiencies of compatibilized organic photovoltaic cells.

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