

Abstract Submitted
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Optical and Magnetic Resonance Studies of Regio-Regular and Regio-Random Poly (3-hexylthiophene)/PCBM Blends¹ GOLDA HUKIC-MARKOSIAN, YE ZHANG, SANJEEV SINGH, VALY VARDENY, University of Utah — Regio-regular (RR) P3HT has been successfully used as donor polymer in organic bulk heterojunction photovoltaic cells based on blends with fullerene acceptors; with power conversion efficiencies of over 6%. However, when regio-random (RR-a) P3HT is used as donor polymer in the blend, the power conversion efficiency drops to less than 0.5%. We have used various optical and magnetic resonance techniques to elucidate the charge photogeneration in the two polymer/fullerene blends. Using tunneling electron microscopy we conclude that phase separation takes place in blends based on RR P3HT but not in blends based on RR-a P3HT. Photoluminescence spectrum shows a prominent band in RR-a P3HT blend at 1.32 eV, indicating the dominance of charge transfer exciton recombination. Photoinduced absorption shows higher localization of polarons in RRa-P3HT blend, with a distinct PA band due to negative polaron on PCBM molecules. Photoinduced absorption detected magnetic resonance resolves the contributions of RR-a P3HT and PCBM as two resonances indicating positive polarons on the polymer and negative polaron on the fullerene. A model based on our experimental results will be discussed.

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Golda Hukic-Markosian
University of Utah

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