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The role of triplet excitons in enhancing polymer solar cell efficiency: a photo-induced absorption study[1] KAI YANG, SUCHI GUHA, Department of Physics and Astronomy, University of Missouri-Columbia, MO 65211 — Inclusion of heavy metal atoms in a polymer backbone allows transitions between the singlet and triplet manifolds. Interfacial dissociation of triplet excitons constitutes a viable mechanism for enhancing photovoltaic (PV) efficiencies in polymer heterojunction-based solar cells, which are now becoming feasible options for solar panels. The PV efficiency from polymer solar cells utilizing a ladder-type poly para phenylene polymer (PhLPPP) with trace quantity of Pd atoms and a fullerene derivative (PCBM) is almost 10 times more than its counterpart (MeLPPP) with no Pd atom. Evidence is presented for the formation of a weak ground-state charge-transfer complex (CTC) in the blended films of PhLPPP and PCBM, using photo-induced absorption (PIA) spectroscopy. Such complexes are not seen in the PIA spectrum of MeLPPP: PCBM blends. Possible mechanisms for the CTC state formation as well as the significance of this to the understanding and optimization of polymer blended solar cells will be discussed.

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