

Abstract Submitted
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Exciton and charge carrier dynamics in high-performance small-molecule bulk heterojunctions KESHAB PAUDEL, BRIAN JOHNSON, Oregon State Univ, BRADLEY ROSE, MICHAEL HALEY, Univ. of Oregon, JOHN ANTHONY, Univ. of Kentucky, OKSANA OSTROVERKHOVA, Oregon State Univ — Organic donor-acceptor (D/A) bulk heterojunctions (BHJs) are of interest due to their applications in low-cost (opto)electronic devices relying on charge carrier photogeneration. However, understanding of charge photogeneration in small-molecule-based BHJs is lacking. We present studies of photoluminescence (PL) and transient photocurrent on spin-cast films of small-molecule D/A composites with a high-performance functionalized anthradithiophene derivative (ADT-TES-F) as the donor (D) and three different acceptor (A) molecules: (i) a functionalized pentacene derivative (Pn-TIPS-F8) (ii) an indenofluorene derivative (IF-Mes) and (iii) a fullerene derivative (PCBM). In each case, charge transfer from D to A was observed. In the D/A composites with Pn-TIPS-F8, it resulted in a formation of emissive charge transfer exciton, which did not significantly contribute to the photocurrent, so that the photocurrent decreased as the concentration of Pn-TIPS-F8 increased. The latter trend was also observed in films with IF-Mes acceptors. In contrast, in D/A composites with PCBM, the photocurrent increased by a factor of ~ 7 at PCBM concentrations of 10 wt%, as compared to that in the pristine ADT-TES-F donor film, due to efficient charge separation at the ADT-TES-F and PCBM interface.

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