

Abstract Submitted
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Bulk Heterojunction Polymer Solar Cells Based on Ternary Blend System¹ YU GU, FENG LIU, University of Massachusetts - Amherst, CHENG WANG, Advanced Light Source, Lawrence Berkeley National Laboratory, THOMAS RUSSELL, University of Massachusetts - Amherst — To enhance the absorption of the solar light, we mixed two hole-transporting polymers that are active in complementary wavelength ranges of the solar spectrum, e.g., P3HT and PCPDTBT, with one electron transporting material, PCBM, to fabricate the single active layer for bulk heterojunction solar cells. This simple one-step method has been shown to efficiently improve the device performance compared with the corresponding binary references. Multiple scattering techniques and transmission electron microscopy were used to determine the morphology for the ternary blend. It is shown that when keeping a low ratio of PCPDTBT in the ternary blend, P3HT could still crystallize and phase-separate from other amorphous components. A continuous network of P3HT fibril bundles was formed, PCPDTBT/ PCBM/ amorphous P3HT filled the interfibrillar region and PCPDTBT wrapped the P3HT fibrils. Such morphology is compatible with the well aligned HOMO-LUMO levels of the three components and the sensitization effect of PCPDTBT. As a result, PCPDTBT benefits the charge transfer; the two polymers act not only individually but also synergistically.

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