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Block Copolymers for Polymer Photovoltaic Applications GUOQIANG REN, PEI-TZU WU, SAMSON JENEKHE, Department of Chemical Engineering and Department of Chemistry, University of Washington — Block copolymers have been recently proposed as a promising candidate for polymer photovoltaic applications, due to their unique properties to form microphase separated domains and ability to self-assemble into nanoscale domains compatible with excitonic solar cells. We recently studied the photovoltaic properties of a series of block copolythiophenes with different block compositions. By blending these block copolymer donors with fullerene acceptors, bulk heterojunction (BHJ) solar cells are fabricated and tested. Our results show that solar cells from block copolymers show preeminent photovoltaic properties compared with their parent homopolymers. We find that in all the block copolymer blend thin films, nanoscale donor/acceptor phase separation is achieved. Enhanced hole transport is achieved in block copolymer blends, as shown in space-charge limited current (SCLC) devices. Factors of one- and two-order of magnitude increase in SCLC hole mobility have been achieved compared with homopolymers. The enhanced power conversion efficiency (PCE) in block copolymers is primarily attributed to the enhanced charge transport. The block composition dependence of both photovoltaic properties and charge transport provides insight into future design of block copolymers for photovoltaic applications.

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