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Role of Molecular Linker on Charge Separation and Photovoltaic Performance in All-Conjugated Block Copolymers JORGE WU MOK, YEN-HAO LIN, KENDALL SMITH, RAFAEL VERDUZCO, Rice Univ — Recent studies have demonstrated the potential of all-conjugated donor-acceptor block copolymer for organic photovoltaics, but it remains unclear how molecular structure, morphology, and electronic properties of conjugated block copolymers influence performance. Here, we study the role of chemical linker between donor and acceptor polymers on photovoltaic performance and optoelectronic properties. Two poly(3-hexylthiophene)-poly(2,7-diyl-alt-[4,7-bis(thiophen-5-yl)-2,1,3-benzothiadiazole]-2',2"-diyl-(9,9-dioctylfluorene)) (P3HT-PTBTF) donor-acceptor block copolymers which differ only in the chemistry of linking group are studied through device measurements, GIXS, and steady-state and time-resolved absorbance and photoluminescence. Device studies show that power conversion efficiencies decrease by one order of magnitude by changing the linking group. X-ray analysis shows that the morphology is virtually identical in both samples, as expected. Transient absorption measurements reveal charge separation in block copolymers which contain a wide bandgap monomer at the donor-acceptor interface, but charge separation is suppressed when donor and acceptor blocks are directly linked without this spacer present. This work demonstrates that the linking group chemistry influences charge separation in all-conjugated block copolymer systems, and also suggests that all-conjugated block copolymers can be used as model systems for the donor-acceptor interface in bulk heterojunction blends.

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