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Enhancing the Efficiency of Bulk Heterojunction Solar Cells via Templated Self Assembly CHENG PAN, HONGFEI LI, Materials Science and Engineering, Stony Brook University, BULENT AKGUN, SUSHIL SATIJIA, Center for Neutron Research, National Institute of Standards and Technology, DILIP GERSAPPE, Materials Science and Engineering, Stony Brook University, YIMEI ZHU, Center for Functional Nanomaterials, Brookhaven National Laboratory, MIRIAM RAFAILOVICH, Materials Science and Engineering, Stony Brook University —
Bulk Heterojunction (BHJ) polymer solar cells are an area of intense interest due to their flexibility and relatively low cost. The mixture of polythiophene derivatives (donor) and fullerenes (acceptor) is spin coated on substrate as the active layer, and are phase-separated into interconnected domains. However, due to the disordered inner structures in the active layer, donor or acceptor domains isolated from electrodes and long path conduction, the power conversion efficiency (PCE) of BHJ solar cell is low. Therefore, morphology control in bulk heterojunction (BHJ) solar cell is considered to be critical for the power conversion efficiency (PCE). Here, we present a novel approach that introduces non-photoactive polymer that organizes the poly(3-hexylthiophene) (P3HT) into columnar phases decorated by [6,6]-phenyl C61-butyric acid methyl ester (PCBM) at the interface. This structure represents a realization of an idealized morphology of an organic solar cell, in which, both exiciton dissociation and the carrier transport are optimized leading to increased power conversion efficiency.

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