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Enhancing the performance of BHJ solar cell via self-assembly templates in active layer YING LIU, Stony Brook University, HONGFEI LI, ZHENHUA YANG, Stony Brook University, CHANG-YONG NAM, Brookhaven National Lab, SUSHIL SATIJA, National Institute of Standards and Technology, MIRIAM RAFAILOVICH, Stony Brook University — The bulk heterojunction (BHJ) solar cell is an important example of a polymer solar cell technology that has been proposed in recent years. However, due to the disordered inner structures in the active layer, control of the inner structure within the active layer is required to enhance the efficiency. In our approach, a self-assembly of tertiary polymer blend film is confined between the air and solid interfaces. The principle has been proved using a blend of PMMA: P3HT: PCBM where we showed that the PMMA phase formed a column structure in the P3HT, which template the PCBM phase between the electrodes. Neutron reflectometry was used to demonstrate the confinement of PCBM at the interface between P3HT and PMMA in the active layer. The columnar structured template is investigated under atomic force microscopy (AFM) and transmission electron microscopy (TEM). SCLC mobility measurement indicated an obvious improvement on both hole and electron mobility. The different morphological structures formed via phase segregation are correlated with the performance of the PEV cells fabricated at the BNL-CFN and significant enhancement for the efficiency is observed.

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