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High molecular weight insulating polymers can improve the performance of molecular solar cells YE HUANG, WEN WEN, EDWARD KRAMER, GUILLERMO BAZAN, University of California, Santa Barbara —
Solution-processed molecular semiconductors for the fabrication of solar cells have emerged as a competitive alternative to their conjugated polymer counterparts, primarily because such materials systems exhibit no batch-to-batch variability, can be purified to a greater extent and offer precisely defined chemical structures. Highest power conversion efficiencies (PCEs) have been achieved through a combination of molecular design and the application of processing methods that optimize the bulk heterojunction (BHJ) morphology. However, one finds that the methods used for controlling structural order, for example the use of high boiling point solvent additives, have been inspired by examination of the conjugated polymer literature. It stands to reason that a different class of morphology modifiers should be sought that address challenges unique to molecular films, including difficulties in obtaining thicker films and avoiding the dewetting of active photovoltaic layers. Here we show that the addition of small quantities of high molecular weight polystyrene (PS) is a very simple to use and economically viable additive that improves PCE. Remarkably, the PS spontaneously accumulates away from the electrodes as separate domains that do not interfere with charge extraction and collection or with the arrangement of the donor and acceptor domains in the BHJ blend.

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