Abstract Submitted
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Morphology and performance of organic photovoltaics containing a small-molecule acceptor KATHRYN O'HARA, University of California, Santa Barbara, DAVID OSTROWSKI, University of Colorado Boulder, CHRISTOPHER TAKACS, University of California, Santa Barbara, UNSAL KOLDEMIR, Colorado School of Mines, SEAN SHAHEEN, University of Colorado Boulder, ALAN SELLINGER, Colorado School of Mines, MICHAEL CHABINYC, University of California, Santa Barbara — Fullerene derivatives are widely used as acceptor materials in organic photovoltaics (OPVs). However, they have a high cost, low absorption in the visible range and limited synthetic variability compared to small molecule alternatives, which generally underperform PCBM, but it is unclear if the reason is morphological or due to the electronic structure of the acceptor. A promising fullerene alternative, HPI-BT, is blended with P3HT to achieve a power conversion efficiency (PCE) of 2.1%, which is lower than for fullerene OPVs (10%), but an understanding of the morphology could improve the efficiency of future small-molecule based devices. The active layer microstructure is probed complimentary techniques of atomic force microscopy (AFM), grazing incidence wide angle x-ray scattering (GIWAXS), and scanning transmission electron microscopy (STEM). STEM indicates that HPI-BT crystals are buried in the film upon casting and AFM shows they grow to the film surface upon annealing. GIWAXS reveals the acceptor is crystalline, which should improve charge transport, but film texturing suggests that crystals nucleate off the substrate, cover the anode and ultimately limit cell performance.

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