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Mott-Schottky Analysis of Normal and Inverted Organic Photovoltaic Devices XIN JIANG, Dept. of Physics and Astronomy, University of Denver, ALEXANDRE NARDES, National Renewable Energy Laboratory, ALEXANDER DIXON, Dept. of Physics and Astronomy, University of Denver, NIKOS KOPIDAKIS, National Renewable Energy Laboratory, SEAN SHAHEEN, Dept. of Electrical, Computer, and Energy Engineering, University of Colorado at Boulder — We use impedance spectroscopy to examine the electronic structure and energy band diagrams of Organic Photovoltaic (OPV) devices based on the standard donor-acceptor combination of P3HT-PCBM. Mott-Schottky analysis is performed to characterize the dark carrier densities, built-in voltages of Schottky junctions, and overall energy band diagrams in standard and inverted geometry devices with aluminum and silver top electrodes, respectively. Evidence for the decrease of dark carrier densities upon post-production thermal annealing is seen for devices in both geometries, illustrating the impact of thermal processing on the energetic band diagram. Furthermore, we find evidence for p-n junction formation at the ZnO/active layer interface in inverted devices, owing to the existence of dark carriers on both sides of the interface. We suggest that the resulting band bending at this interface helps explains the enhanced photocurrents often seen in inverted devices when compared to normal geometry devices for nominally identical active layer structures.

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