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Charge generation/dissociation mechanisms at the interface oxide/polymer hybrid heterojunctions studied by microwave conductivity measurements ALEXANDRE NARDES, University of Denver, MATTHEW WHITE, DANA OLSON, JOSEPH BERRY, NIKOS KOPIDAKIS, NREL, SEAN SHAHEEN, University of Denver, DAVID GINLEY, NREL — Pulse laser deposition (PLD) has been used to obtain thin films of ZnO and a-TiO_x to be employed as acceptor materials in hybrid oxide/polymer organic photovoltaic (h-OPV). Films with varying electrical and morphological properties can be obtained, offering a great advantage on optimizing materials and interfaces for h-OPV. P3HT is spin coated on top of the oxides to serve as donor material. A detailed insight of the charge generation mechanism at the interface oxide/polymer is provided by Time-Resolved Microwave Conductivity (TRMC) measurements and correlated to device performance. Single, bi- and tri-layers of these materials have been studied. By varying the carrier concentration of the oxide acceptor layer in the h-OPV devices, one can control the electric field at the planar donor-acceptor interface thereby enhancing charge separation at the interface. The effects of the interfacial electric field are reflected by an increase in the TRMC signal and consistent with the short-circuit current and fill factor improvements observed in devices. Moreover, we found that an interfacial layer of a-TiO_x between the ZnO and the P3HT reduces recombination with corresponding benefits to device performance.

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