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Hybrid ZnO-organic semiconductor interfaces in photodetectors: a comparison of two near-infrared donor-acceptor copolymers ALEC PICKETT, University of Missouri - Columbia, ABHISEK MOHAPATRA, Indian Insitute of Science, AMRIT LAUDARI, University of Missouri - Columbia, SATISH PATIL, Indian Insitute of Science, SUCHISMITA GUHA, University of Missouri - Columbia — Hybrid organic-inorganic photodiode interfaces have gained significant interest due to their unique physical properties such as mechanical flexibility and high photosensitivity. In this work, two diketopyrrolopyrrole (DPP)-based donor-acceptor copolymers with different backbone conformations were characterized in an inverted photodiode architecture using ZnO nano-patterned films as the electron transport layer. The DPP copolymer with a thienothiophene unit (PTTDPP-TBDT) is more planar and rigid compared to the DPP system with a thiophene unit connecting the donor and acceptor moieties within the monomer (PTDPP-TBDT). The hybrid interfaces were optimized by using poly(3-hexylthiophene) (P3HT) as the p-type layer for monitoring the critical thickness and morphology of the ZnO layer. The maximum photo-responsivity from a P3HT:ZnO photodiode was found to be 42 mA/W. The photo-responsivity of PTTDPP-TBDT:ZnO photodiodes were found to be at least three orders of magnitude higher than PTDPP-TBDT:ZnO photodiodes, which is related to an enhanced transport of carriers due to the planar backbone conformation of the TTDPP-TBDT copolymer. Capacitance-voltage measurements from hybrid Schottky barrier interfaces further shed light into the nature of photo-carriers and device parameters.

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