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Diindenoperylene as donor and acceptor for organic photovoltaic cells ANDREAS WILKE, BEN BRÖKER, JOHANNES FRISCH, PATRICK AMSALEM, JENS NIEDERHAUSEN, Humboldt Universität zu Berlin, ANTJE VOLLMER, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, NORBERT KOCH, Humboldt Universität zu Berlin, HUMBOLDT UNIVERSITÄT ZU BERLIN TEAM, HELMHOLTZ-ZENTRUMM BERLIN FÜR MATERIALIEN UND ENERGIE GMBH TEAM — In organic photovoltaic cells (OPVCs) typically two organic materials with electron acceptor and donor character are sandwiched between anode and cathode, forming heterojunctions where charge separation occurs. To improve the efficiency of charge separation, understanding the mechanisms of the energy level alignment at these heterojunctions is crucial. We report on ultraviolet photoelectron spectroscopy (UPS) measurements on three different organic-diindenoperylene (DIP) heterojunctions formed on PEDT:PSS electrodes. The measurement reveal that the energy level alignment of C_{60} on DIP/PEDT:PSS corresponds to a type II heterojunction, with DIP acting as donor. The offset between the highest occupied molecular orbital (HOMO) of DIP and the lowest unoccupied molecular orbital (LUMO) of the acceptor C_{60} , an estimate for the maximum achievable open circuit voltage, is 1.35 eV. In contrast, the energy level alignment of DIP on sexithiophene (6T) and poly(3-hexylthiophene) (P3HT) is of type II as well, but DIP acting as acceptor. The offset between the HOMO of the donors 6T and P3HT and the LUMO of DIP is found to be 1.75 eV and 1.6 eV, respectively.

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