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Direct determination of energy level alignment of organic-organic bulk heterojunction: cases of the P3HT:PCBM and P3HT:FLN-i blend
ZELEI GUAN, ANTOINE KAHN, Department of Electrical Engineering, Princeton University, JONG BOK KIM, HE WANG, YUEH-LIN LOO, Department of Chemical Engineering, Princeton University — Using photoemission spectroscopy (UPS&IPES) combined near edge X-ray absorption fine structure method, we have determined the surface compositions and electronic alignments of the blend films comprising poly(3-hexylthiophene) (P3HT) and [6,6]-phenyl-C61-butyric acid methyl ester. Given the fact that the surface of the blend film is a nearly pure P3HT wetting layer, we use a lift-off method to access the originally buried surface, which is rich in both P3HT and PCBM and thus representative of the BHJ. We show that the donor/acceptor LUMO-HOMO gap is 1.46 eV, implying a 0.5-0.6 eV interface dipole barrier between the two materials. As far as we know, this is the first report of the direct determination of electronic structure of the blend. The combined measurement and lift-off method are standard and can be applied to other organic blend films, like P3HT and FLN-i.

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