Supplementary Information

Improving efficiency of inverted organic solar cells by introducing ferrocenedicarboxylic acid between ITO/ZnO interlayer

Bairu Li[ab], Tonggang Jiu[b*], Chaoyang Kuang[b], Qiushan Chen[b], Sushuang Ma[b], Jiangsheng Li[b], Xueling Hou[a] and Junfeng Fang[b*]

a. School of Materials Science and Engineering, Shanghai University, Shanghai, 200072, P. R. China.

b. Institute of New Energy Technology, Ningbo Institute of Material Technology and Engineering (NIMTE), Chinese Academy of Science (CAS), Ningbo, 315201, P. R. China.

E-mail: jiutonggang@nimte.ac.cn, fangjf@nimte.ac.cn

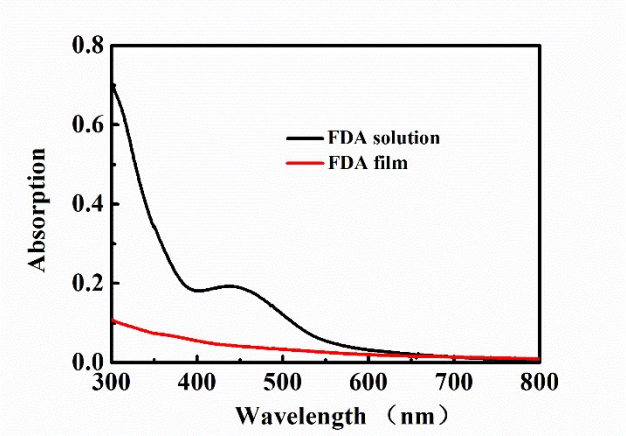

Fig S1 Optical absorption spectra of FDA film and FDA solution

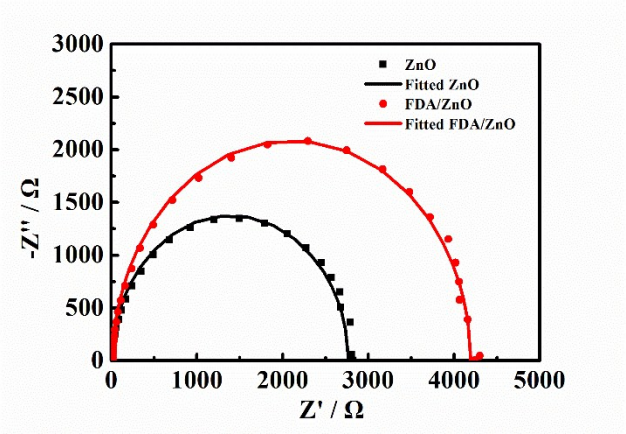

Fig. S2 Impedance spectra of the devices with ZnO and FDA/ZnO as the interfacial layer measured in the dark.

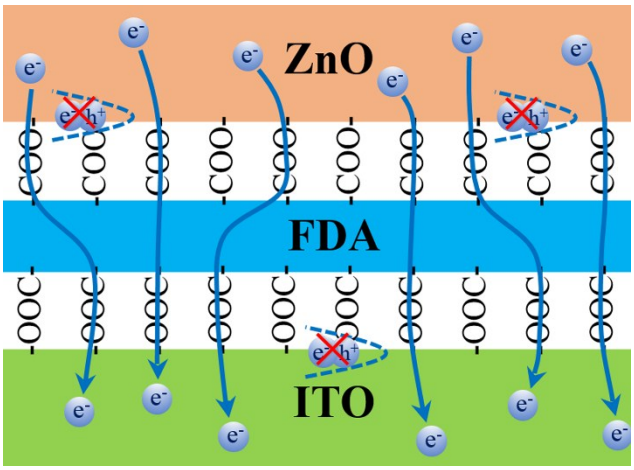

Fig S3 Schematic illustration of reduced charge recombination in FDA/ZnO based devices.

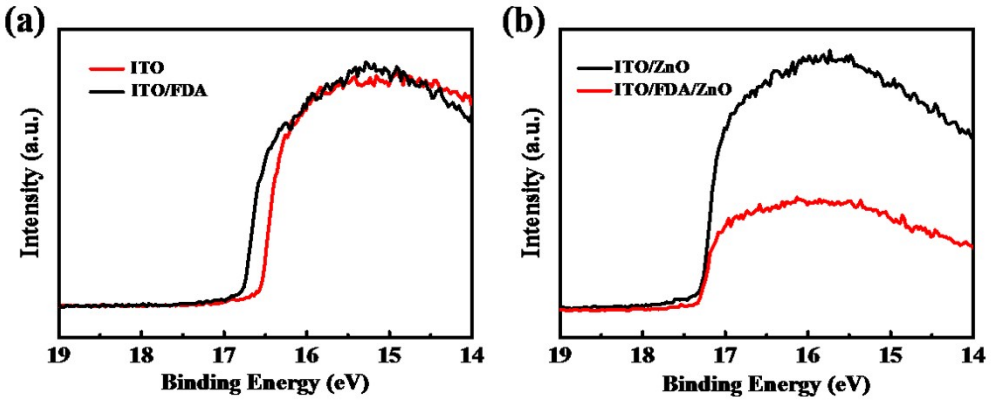

Fig. S4 UPS spectra of (a) ITO, ITO/FDA; (b) ITO/ZnO, ITO/FDA/ZnO

Table S1. Photovoltaic parameters of PTB7:$PC_{71}BM$ devices fabricated with different concentrations of FDA between the ITO electrode and ZnO interlayer under light intensity of 100 mW/cm^2.

Concentration	V_{oc}(V)	J_{sc}(mA/cm^2)	FF(%)	PCE(%)	R_s(Ω cm^2)	R_{sh}(Ω cm^2)
0.5mg/mL	0.742	17.0	67.7	8.57	5.7	800.0
1mg/mL	0.744	17.7	68.9	9.06	5.4	993.5
2mg/mL	0.744	17.1	68.5	8.69	5.1	892.1