

Electronic Supplementary Information (ESI)

**Organic-Inorganic Hybrid Electron Transport Interlayer
for High-Performance Inverted Polymer Solar Cells**

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Fig. S5. J - V characteristics of inverted devices with various PFN concentrations

Table. S1. Electron mobility of the interlayers and photoactive layer determined using the electron-only devices ITO/ZnO or ZnO-PFN/Al and ITO/ZnO or ZnO-PFN/PTB7:PCBM/Al along with the use of space charge current equation in the calculation.

Table. S2. Photovoltaic performances of inverted PSCs with various PFN concentrations

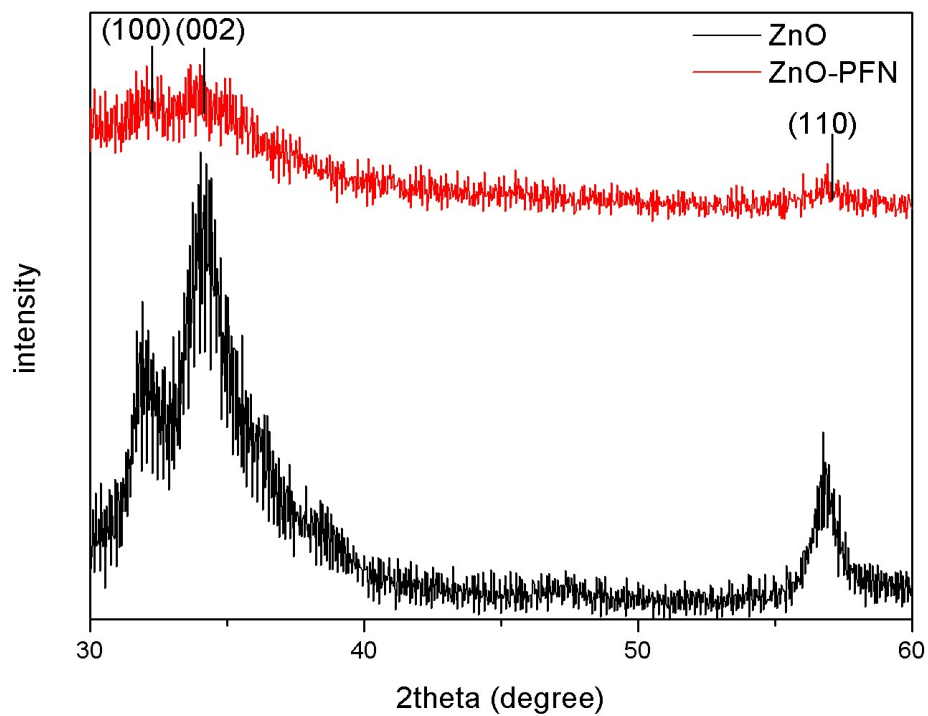
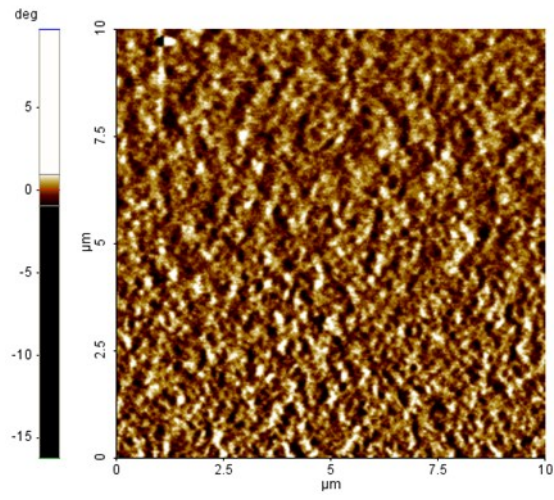


Fig. S1 X-ray diffraction patterns of ZnO and ZnO-PFN interlayers.

(a)



(b)

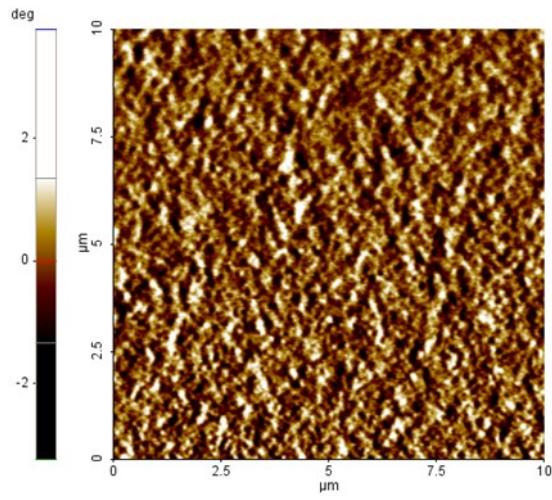


Fig. S2. AFM phase images (a) ZnO/PTB7:PCBM and (b) ZnO-PFN/PTB7:PCBM

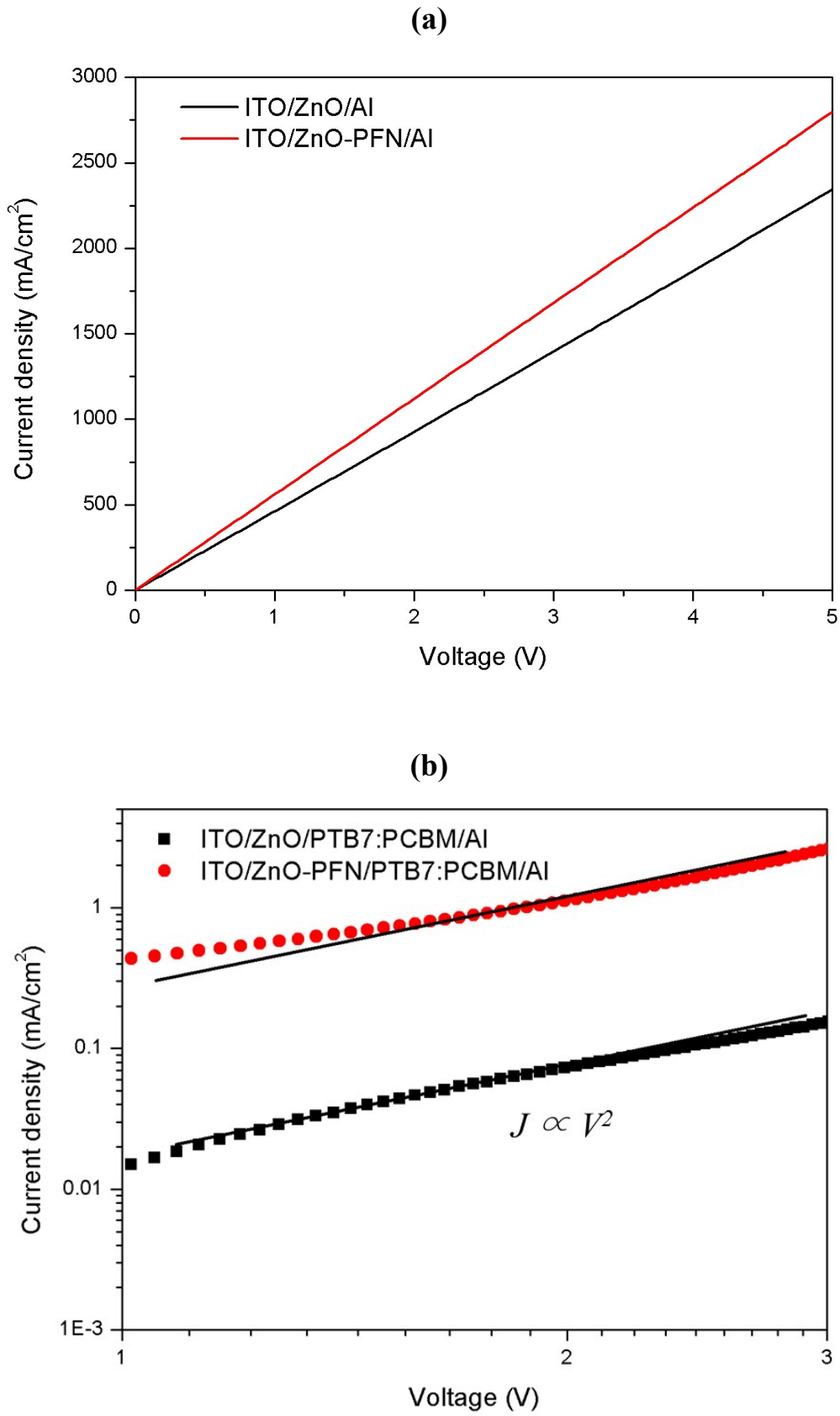


Fig. S3 J - V characteristics of the electron-only devices (a) ITO/ZnO or ZnO-PFN/Al, and (b) ITO/ZnO or ZnO-PFN/PTB7: PCBM /Al.

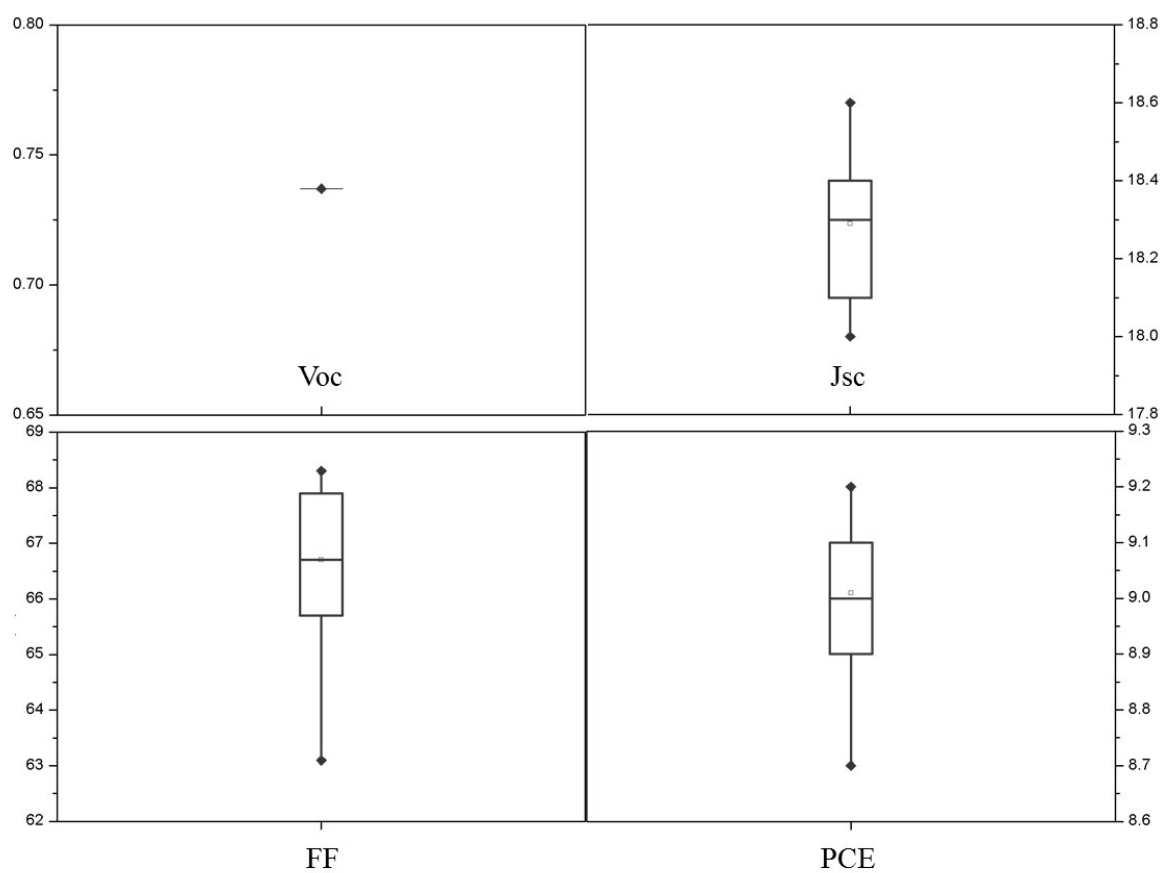


Fig. S4 Open circuit voltage (Voc), current density (Jsc), fill factor (FF), power conversion efficiency (PCE) variation of 10 samples of ITO/ZnO-PFN/PTB7:PCBM/MoO₃/Ag.

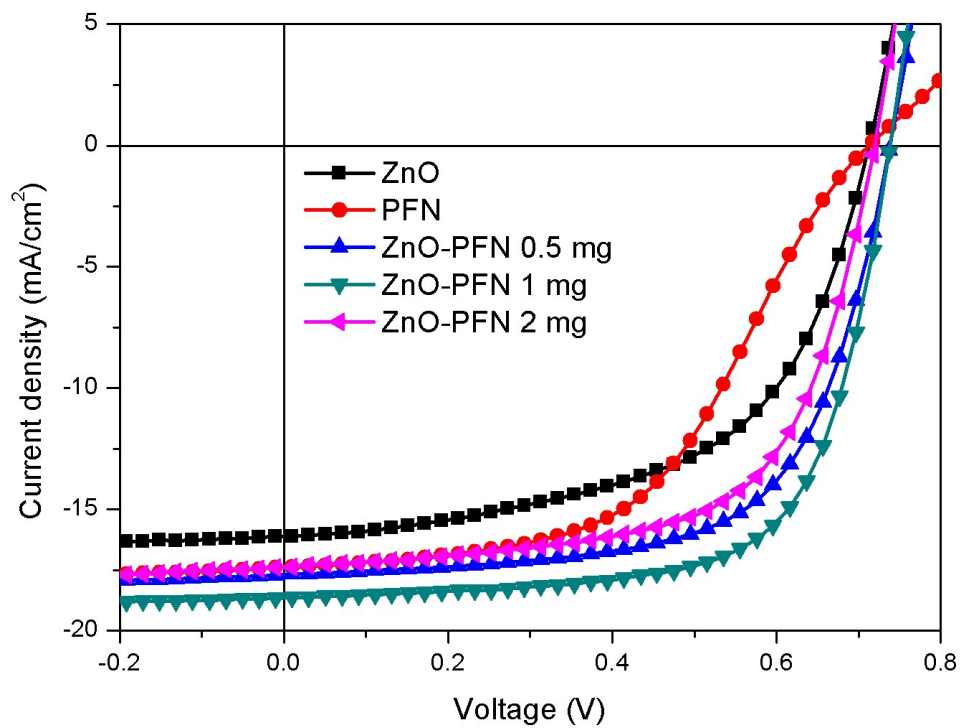


Fig. S5. J - V characteristics of inverted devices with various PFN concentrations

Table S1. Electron mobility of photoactive layer determined using the electron-only devices ITO/ZnO or ZnO-PFN/PTB7:PCBM/Al along with the use of space charge current equation in the calculation.

Devices	ITO/ZnO/ PTB7:PCBM/Al	ITO/ZnO-PFN/ PTB7:PCBM/Al
μ_e [cm ² /v·s]	1.71 x 10 ⁻⁴	6.60 x 10 ⁻⁴

Table. S2. Photovoltaic performances of inverted PSCs with various PFN concentrations

Cathode	PFN concentration	Jsc [mA/cm ²]	Voc [V]	FF [%]	PCE [%]
ITO/ZnO	-	16.3	0.717	61.7	7.2
ITO/PFN	2 mg/ml	17.4	0.717	50.5	6.3
ITO/ZnO-PFN	0.5 mg/ml	17.7	0.737	64.5	8.4
ITO/ZnO-PFN	1 mg/ml	18.3	0.737	67.8	9.2
ITO/ZnO-PFN	2 mg/ml	17.4	0.717	63.4	7.9