Electronic Supporting Information for:

One-Step Coating Inverted Polymer Solar Cells Using a Conjugated Polymer as Electron Extraction Additive†

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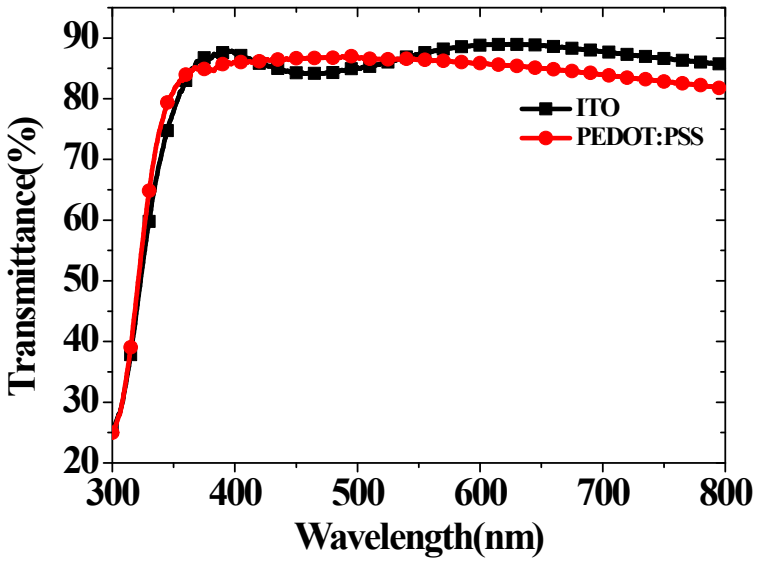

Fig. S1 Transmittance spectra of the ITO and PEDOT:PSS films used in PSCs.

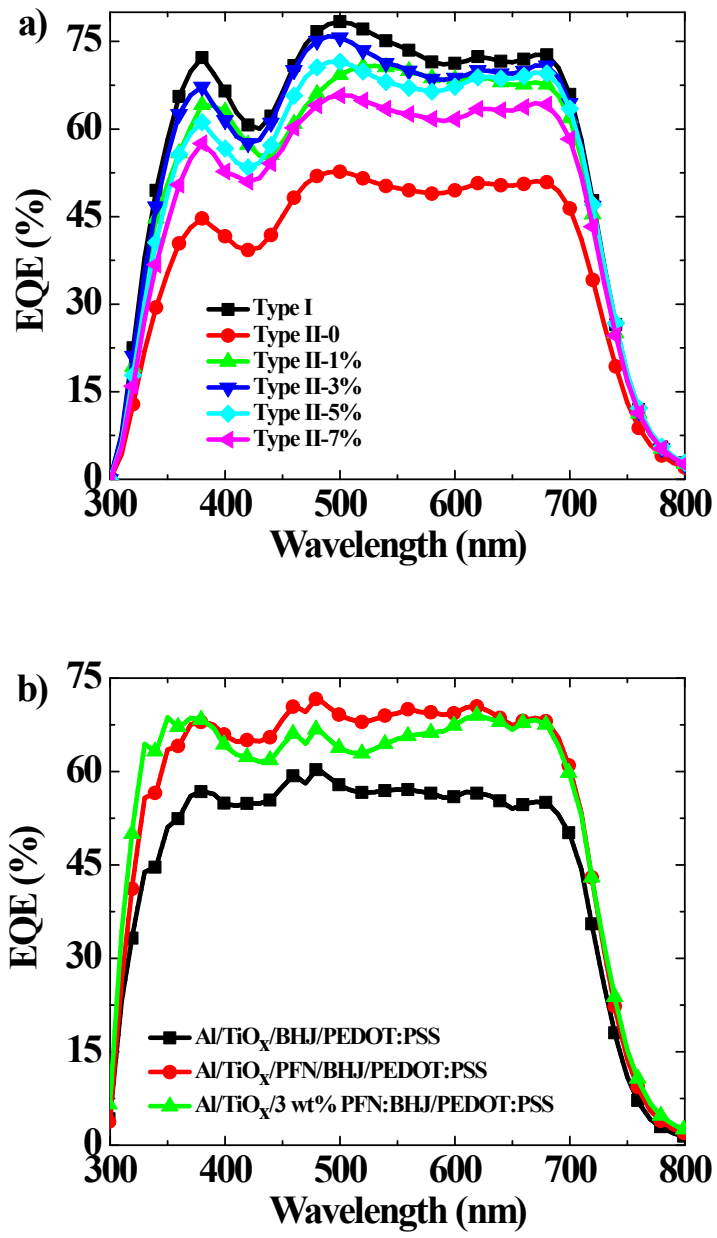

Fig. S2 EQE curves of a) Type I and Type II devices with various PFN doping ratios (0, 1, 3, 5 and 7 wt%) and b) ITO-free inverted devices with the structure of Al/TiO_x/BHJ/PEDOT:PSS, Al/TiO_x/PFN/BHJ/PEDOT:PSS and Al/TiO_x/3wt% PFN:BHJ/PEDOT:PSS.

Owens Method

This method is used to calculate the solid surface energy and is based on the following model：

$$\gamma_s = \gamma_s^D + \gamma_s^P \text{ , } \gamma_l = \gamma_l^D + \gamma_l^P.$$

where γ_s is the surface energy of the solid, which is composed of the dispersion force γ_s^D and polarity force γ_s^P. Similarly, γ_l is the surface energy of the liquid and consists of a dispersion force γ_l^D and polarity force γ_l^P. Then,

$$\gamma_l (1 + \cos\theta) = 2 (\gamma_s^D \gamma_l^D)^{1/2} + 2 (\gamma_s^P \gamma_l^P)^{1/2}.$$

If the surface energies γ_l^D and γ_l^P of the testing liquid are known and its contact angle on solid surface is measured, there are still two unknown quantities (γ_s^D, γ_s^P) remaining in the formula. Therefore, to determine γ_s^D and γ_s^P, two known testing liquids are required.

$$\gamma_{l1} (1 + \cos\theta_1) = 2 (\gamma_s^D \gamma_{l1}^D)1/2 + 2 (\gamma_s^P \gamma_{l1}^P)^{1/2}.$$

$$\gamma_{l2} (1 + \cos\theta_2) = 2 (\gamma_s^D \gamma_{l2}^D)1/2 + 2 (\gamma_s^P \gamma_{l2}^P)^{1/2}.$$

After obtaining γ_s^D and γ_s^P, γ_s is determined using $\gamma_s = \gamma_s^D + \gamma_s^P$.

Table S1 Parameters of the testing liquids used in the surface energy measurement.

Liquid	Polar force (γ_l^P)	Dispersion force (γ_l^D)	Surface energy (γ_l)	γ_l^P/γ_l^D
Water	51	21.8	72.8	2.36
Formamide	18.7	39.5	58.2	0.47

Table S2 Contact angles of water and formamide on various materials films, which were converted into the surface energy values based on Owens method.

Solid surface	Water contact angle	Formamide contact angle	Solid surface energy (mN/m)
PFN	79°	11°	49.8
PCBM[70]	85°	70°	25.9
PTB7	97°	81°	18.7
BHJ	95°	80.5°	19.1
PFN(3 wt%):BHJ	95°	80°	19.0

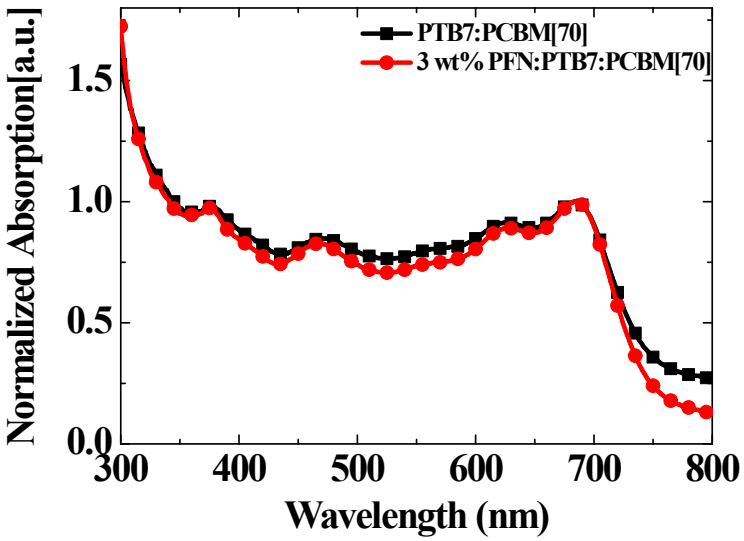

Fig. S3 Normalized absorption spectra of PTB7:PCBM[70] and PFN(3 wt%):PTB7:PCBM[70] films.