Supplementary Information

Enhancement in Performance of Ternary Blend-Polymer Solar Cells using PEDOT:PSS-Graphene Oxide Hole Transport Layer via Förster Resonance Energy Transfer and Balanced Charge Transport

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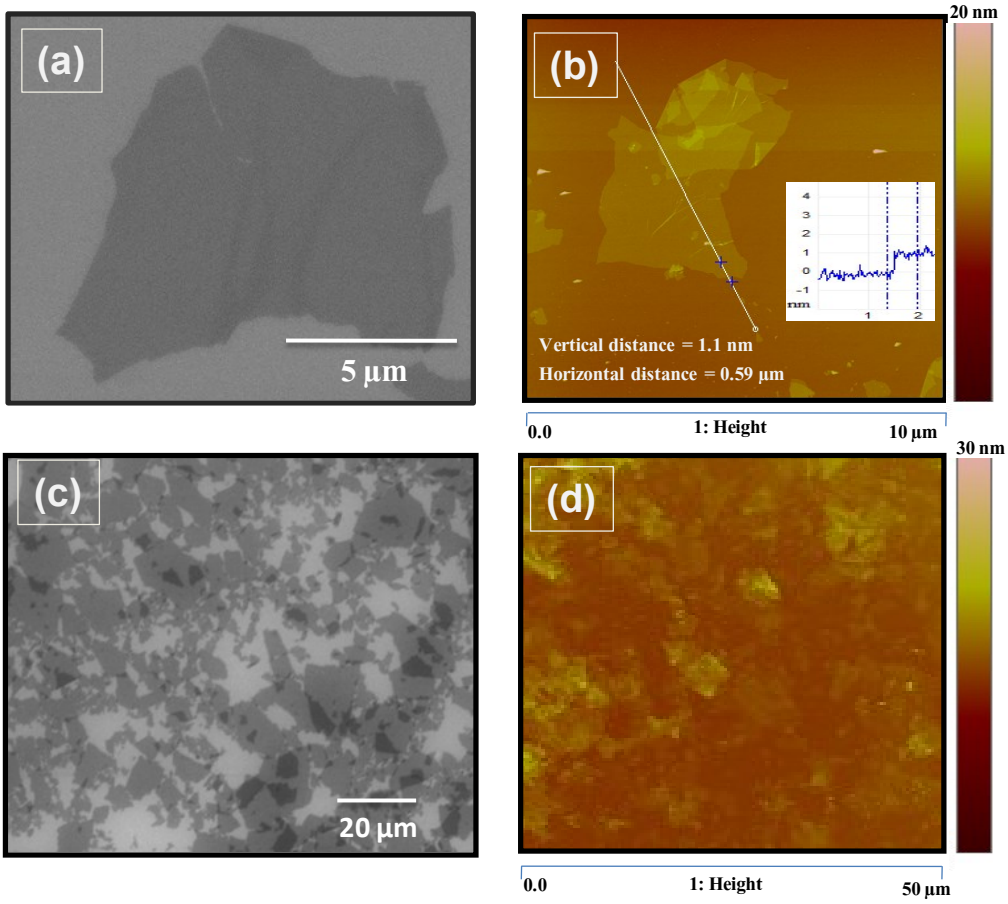

Fig. S1. (a, b) FESEM and AFM image of GO Nanosheets on ITO substrate. The white line shows the height scan of the single GO nanosheets resulting in vertical distance ~ 1.1 nm within the marked portion. (c, d) FESEM and AFM image of PEDOT:PSS-GO (1:1) Nanosheets on ITO substrate.

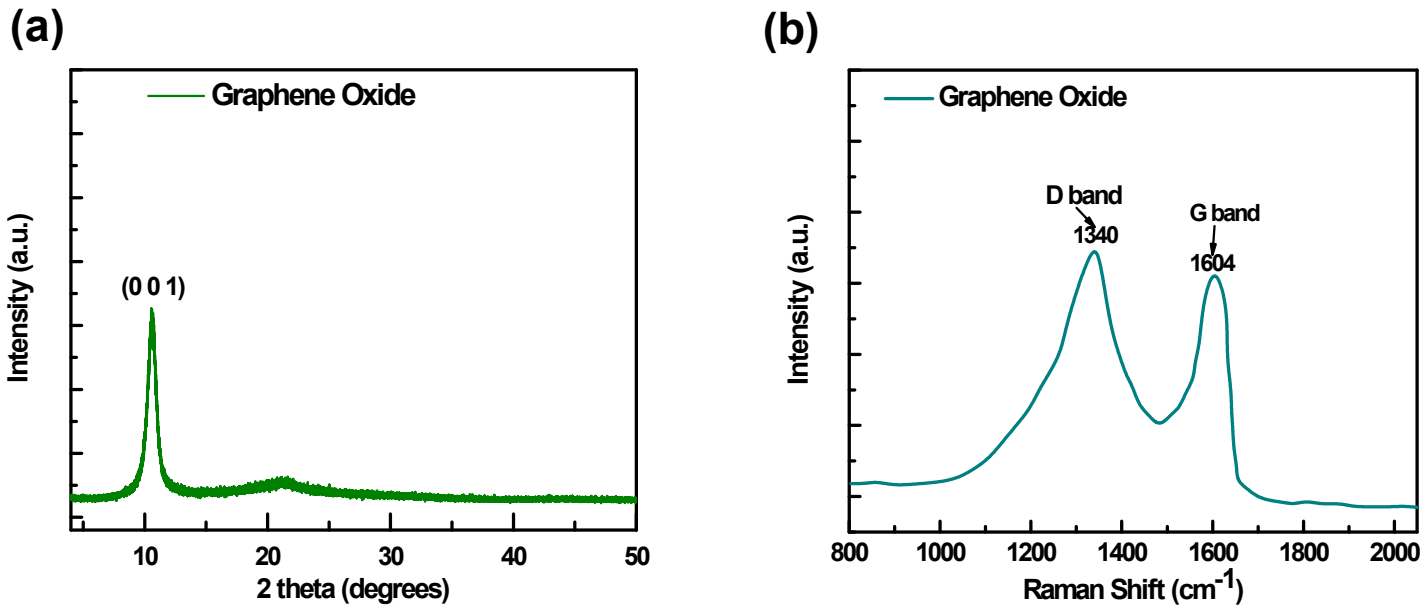

Fig. S2. (a) XRD spectra. (b) Raman Spectra of Graphene Oxide.

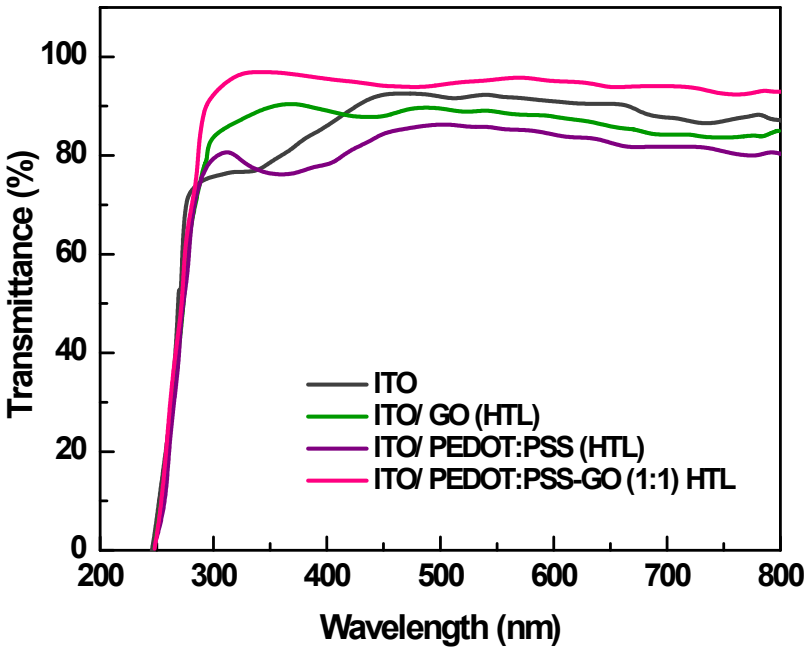

Fig. S3. (a) Transmittance spectra of GO,PEDOT:PSS, PEDOT:PSS-GO composite films in (1:1) weight ratio.

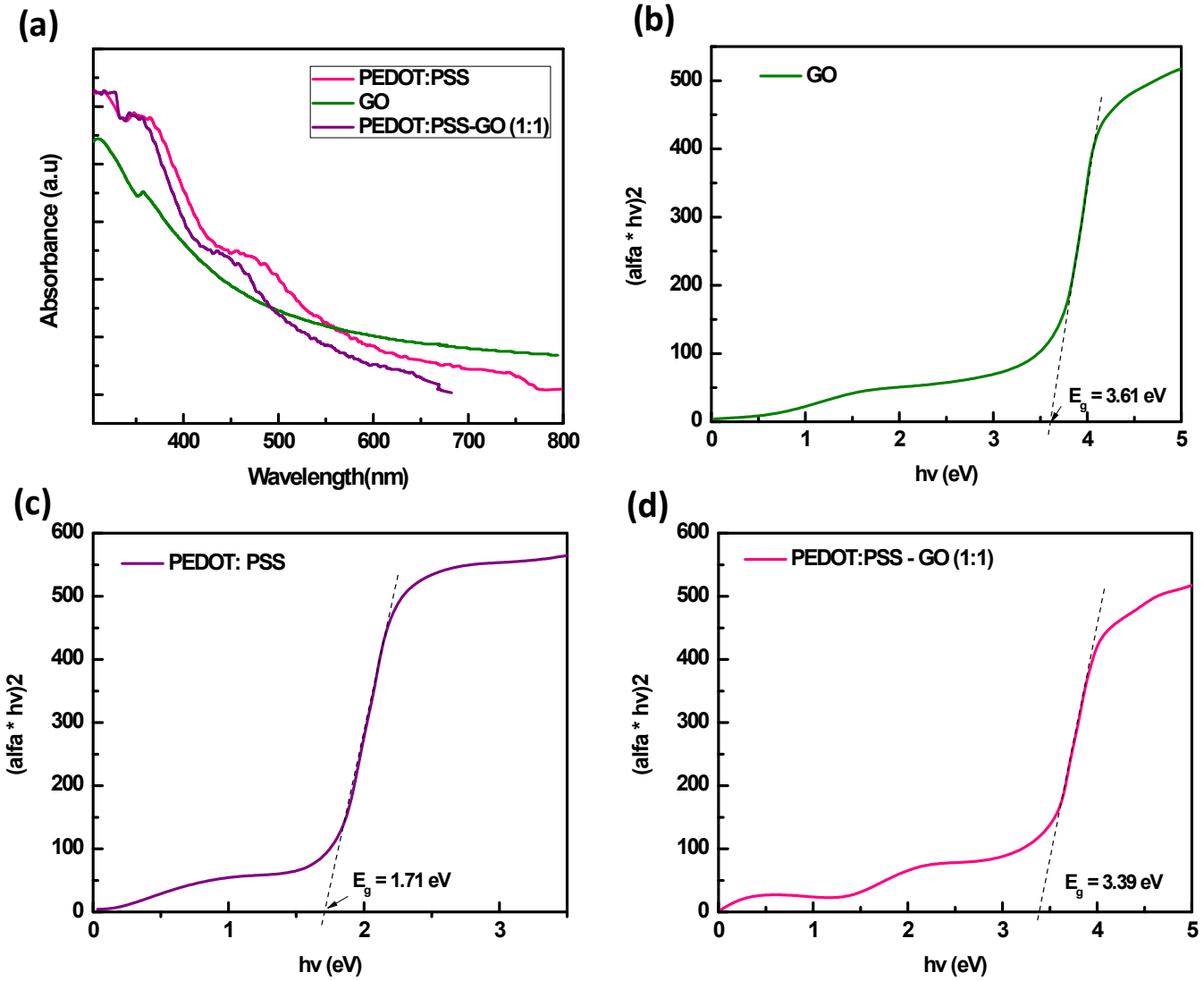

Fig. S4. (a) UV-Vis absorption spectra of GO,PEDOT:PSS, PEDOT:PSS-GO composite films in (1:1) weight ratio. (b-d) Tauc Plots to estimate the band gap (E_g) of GO,PEDOT:PSS, PEDOT:PSS-GO (1:1) composite films, respectively.

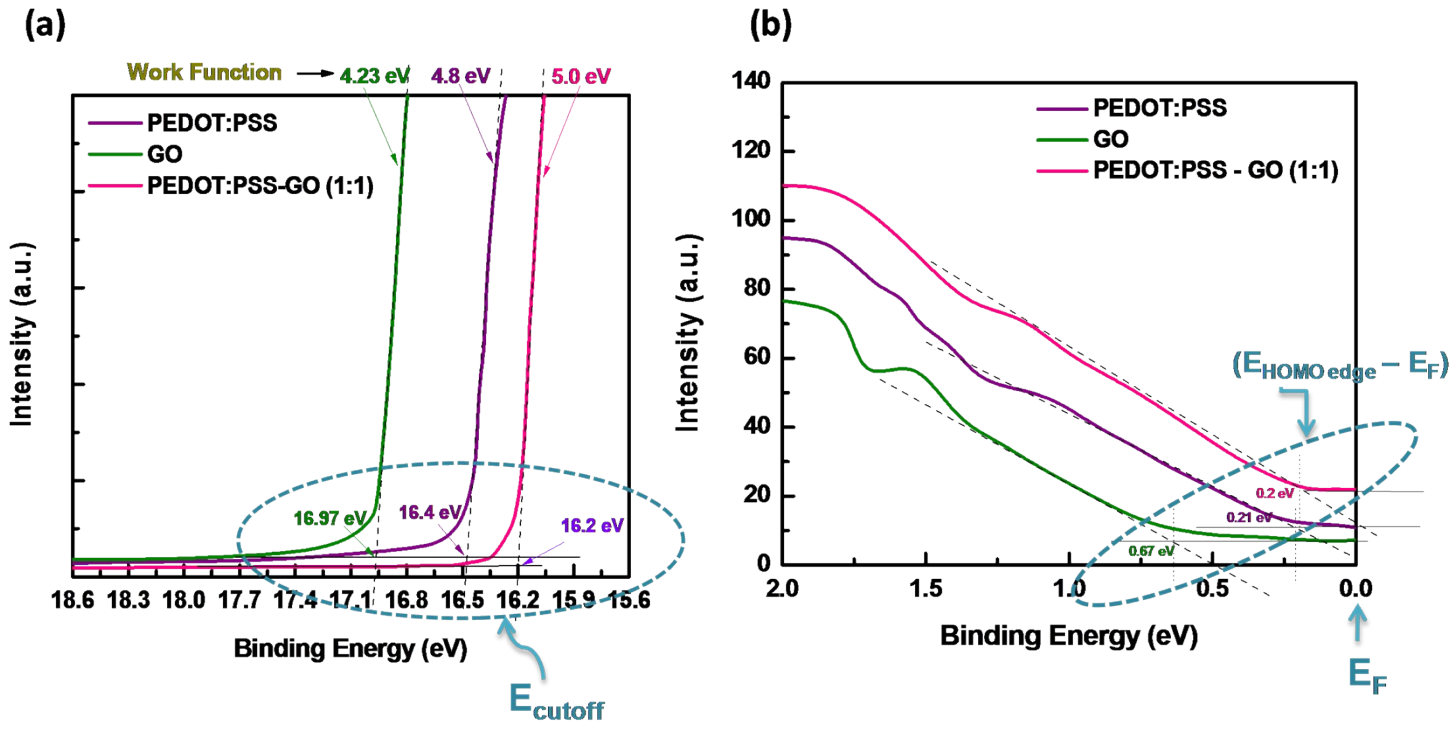

Fig. S5. The UPS measurements of GO, PEDOT:PSS and PEDOT:GO composite films (weight ratio of (1:1); (a) secondary electron cutoff regions and (b) Fermi edge (valence band edge) regions; Source (hν = 21.2 eV).

Sample	E_{cutoff} (eV)	$E_{HOMO\ edge}-E_F$ (0) (eV)	Φ (eV)	E_{HOMO} (eV)	E_{LUMO} (eV)	E_g (eV)
PEDOT:PSS	16.4	0.21	4.8	5.01	3.3	1.71
GO	16.97	0.67	4.23	4.9	1.3	3.61
PEDOT:PSS-GO (1:1)	16.2	0.22	5.0	5.22	1.83	3.39

Table S1. E_{cutoff}, Work function(ϕ), E_{HOMO} and E_{LUMO}, E_g determined from UPS analysis.

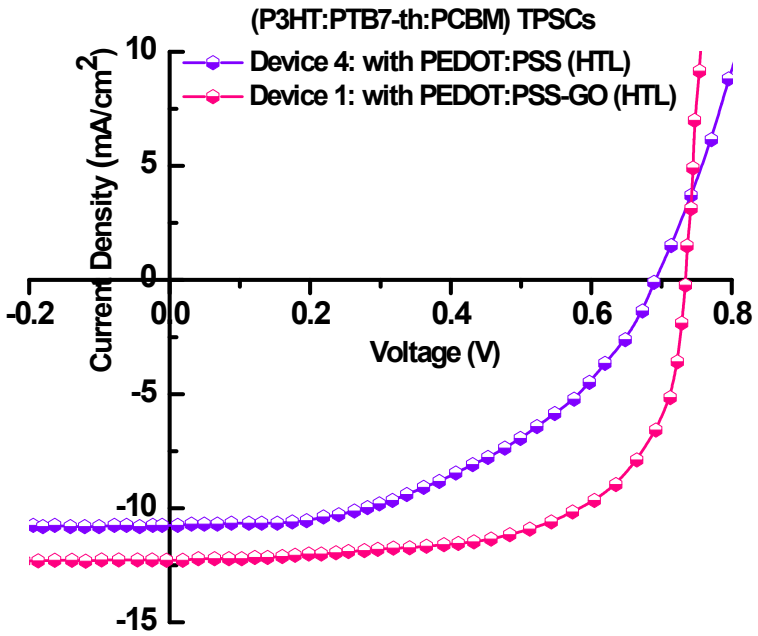

Fig. S6. *J-V* characteristics of TPSC Device 1: ITO/ PEDOT:PSS-GO(1:1)/ P3HT:PTB7-Th:PCBM (0.3:0.7:1)/ LiF/Al, and TPSC Device 4: ITO/ PEDOT:PSS/ P3HT:PTB7-Th:PCBM (0.3:0.7:1)/ LiF/Al, under Air Mass 1.5 Solar illumination (P_{in} =100 mW/cm^2).

Device Parameters	Device 4 (with PEDOT:PSS HTL)	Device 1 (with PEDOT:PSS-GO HTL)
J_{sc} (mA/cm2)	10.7	12.3
V_{oc} (V)	0.69	0.74
FF	0.43	0.78
PCE (%)	3.2	7.1
R_s (Ω cm^2)	17	5
R_{sh} (Ω cm^2)	977	4111

Table S2: Photovoltaic parameters for TPSCs: Device 1 and Device 4.