Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting information

Semitransparent All-Polymer Solar Cells Through Lamination

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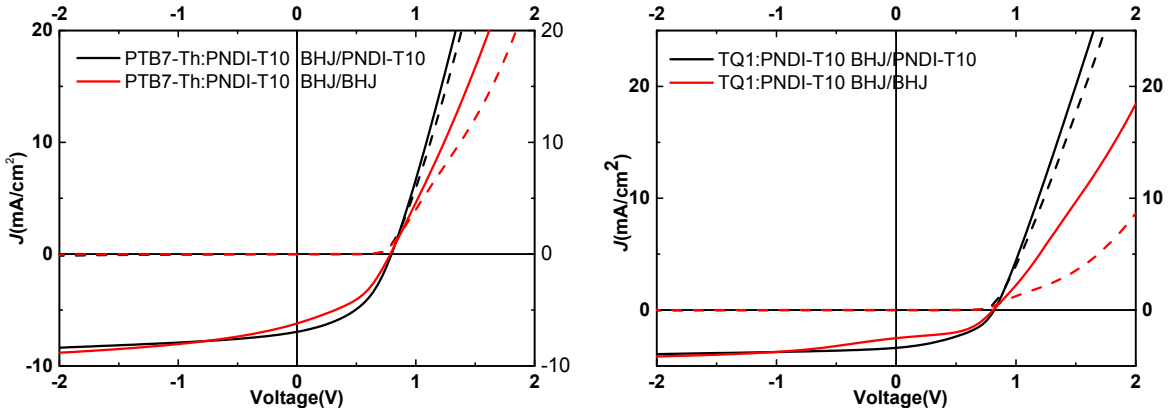


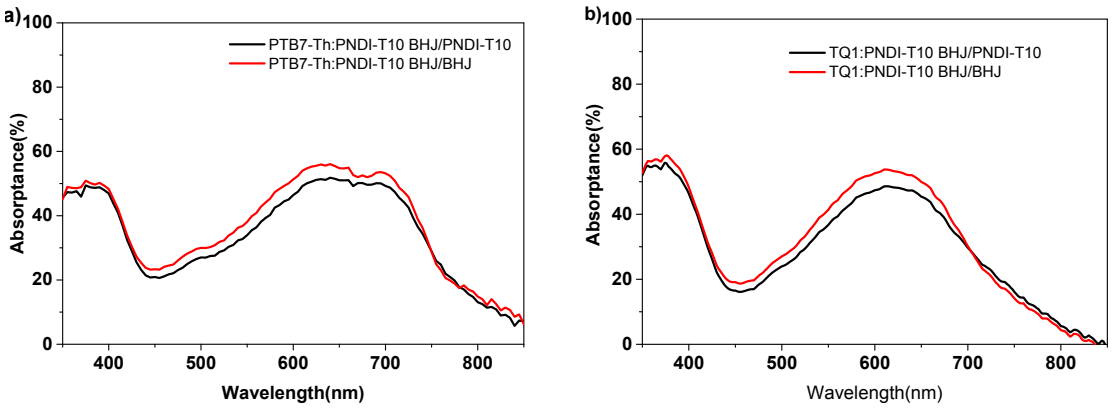
Figure S1. *JV* curves of PTB7-Th:PNDI-T10 and TQ1: PNDI-T10 samples, solid lines and dashed lines are light current and dark current.

Table S1. Photovoltaic data (average of 4 devices) with illumination from cathode side. Both *J*sc and FF are lower compared to the data with illumination from anode side, showing asymmetric photocarrier extraction.

Anode	Cathode	J_{sc}(mA/cm^2)	FF(%)	V_{oc} (V)	PCE(%)
TQ1:PNDI-T10	PNDI-T10	3.31	40.93	0.80	1.1
TQ1:PNDI-T10	TQ1:PNDI-T10	2.265	48.05	0.80	0.9
PTB7-Th:PNDI-T10	PNDI-T10	5.69	43.70	0.79	2.0
PTB7-Th:PNDI-T10	PTB7-Th:PNDI-T10	5.44	34.97	0.78	1.5

Table S2. Photovoltaic data (average of 4 devices) for normal structure devices ITO/PEDOT:PSS (4083)/active layer/LiF/Al. Thickness of active layer is same as the laminated device.

Device	J_{sc}(mA/cm^2)	FF(%)	V_{oc} (V)	PCE(%)
TQ1:PNDI-T10	6.3	45	0.87	2.5
PTB7-Th:PNDI-T10	11.7	48	0.81	4.5



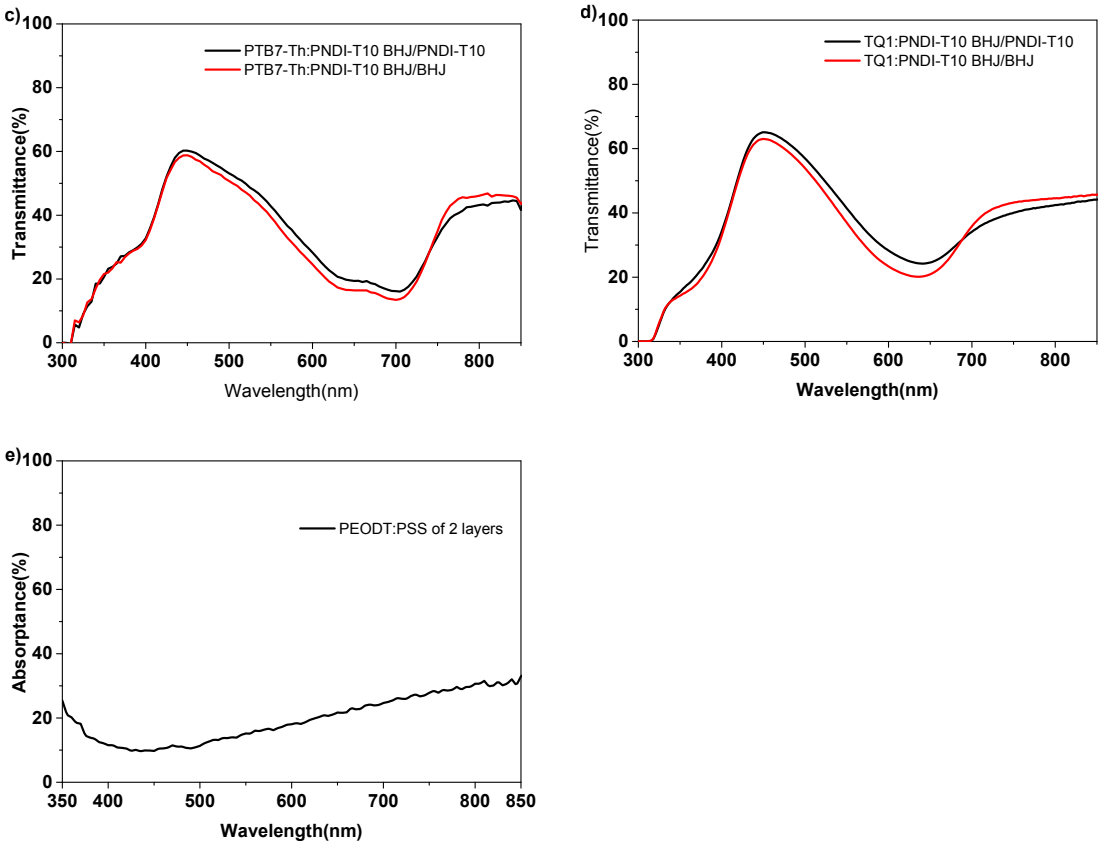


Figure S2. Absorptance and Transmittance spectra. Transmittance was measured on encapsulated devices and absorptance was corrected by subtracting the absorption of 2 layer of PEDOT:PSS. We observe a bit more absorption in BHJ/BHJ films, in certain range, which agrees with higher current under high reverse voltage.

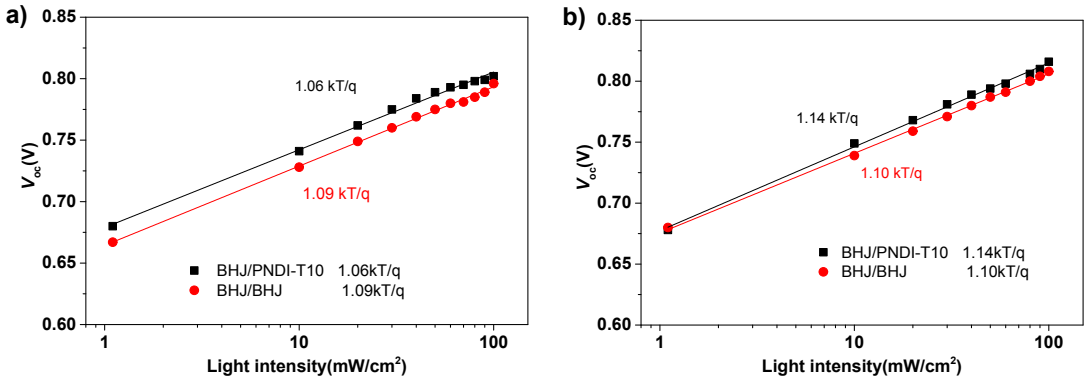


Figure S3. Light intensity dependence of V_{oc} for **a)**PTB7-Th:PNDI-T10 **b)** TQ1:PNDI-T10. Fitting was done thought the whole range, representing an average over different recombination mechanisms.

Table S2. Mobility fitted using equation 1 in main paper. For PTB7-Th BHJ/PEDOT devices, we tried many times and ended as all devices shorted which might due to pressure so high (to make sure films laminated together) that top and bottom PEDOT:PSS have contact with each other.

Configuration	μ_n ($10^{-6}cm^2V^{-1}s^{-1}$)	Configuration	μ_p ($10^{-6}cm^2V^{-1}s^{-1}$)
TQ1 BHJ/T10	4.9		
TQ1 BHJ/BHJ	1.7	TQ1 BHJ/BHJ	3.2
TQ1 BHJ/PEI	1.7	TQ1 BHJ/PEDOT	4.2
PTB7-Th BHJ/T10	8.5		
PTB7-Th BHJ/BHJ	0.75	PTB7-Th BHJ/BHJ	1.8
		TQ1 TQ1/TQ1	78

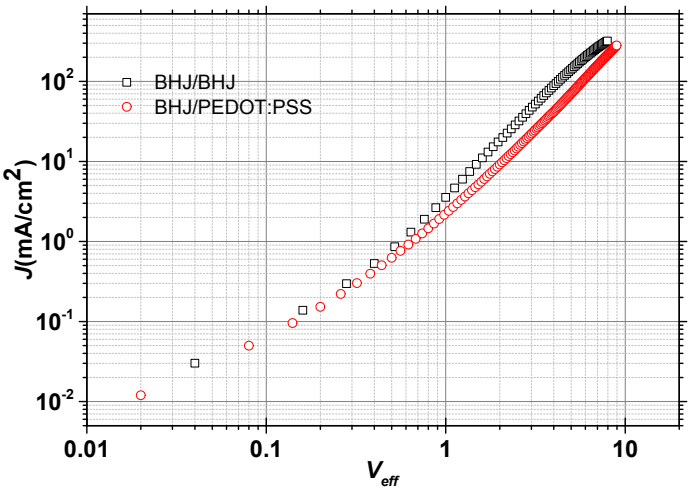
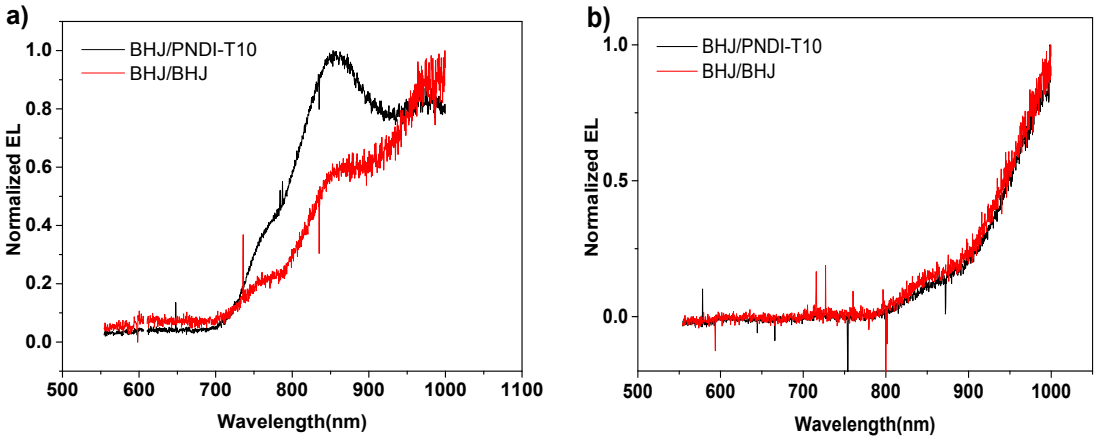


Figure S4. *J-V* of hole only devices of TQ1:PNDI-T10 using PEDOT:PSS as electrodes.



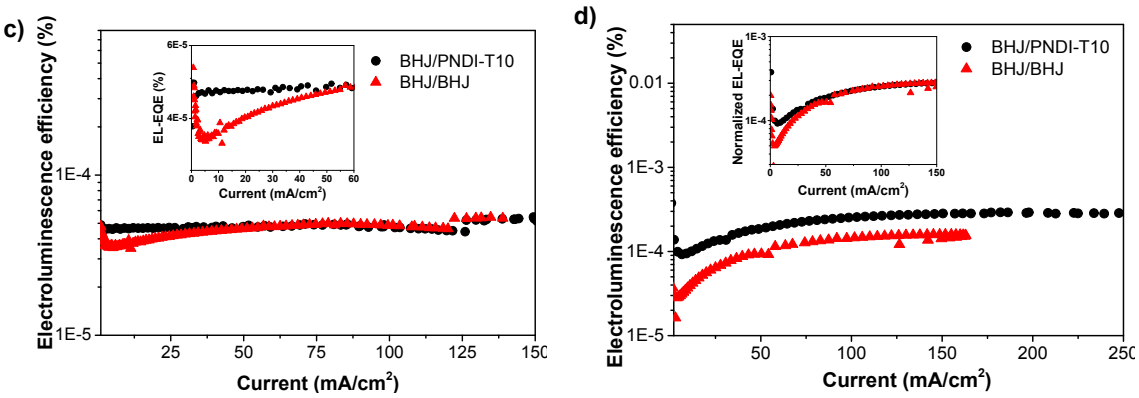


Figure S5. EL measurements under same applied voltage for BHJ/BHJ and BHJ/PNDI-T10, for **a)** PTB7-Th:PNDI-T10 system V_a =1.2 V and **b)** TQ1:PNDI-T10 system V_a = 1.5 V. Electroluminescence efficiency vs injection current for **c)** TQ1:PNDI-T10 and **d)** PTB7-Th: PNDI-T10 systems.