Electronic Supplementary Material (ESI) for Polymer Chemistry.

Supporting Information

Regular Terpolymers with Fluorinated Bithiophene Units for High-Performing Photovoltaic Cells

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KEYWORDS conjugated copolymer, terpolymer, diketopyrrolopyrrole, photovoltaic properties, polymer solar cells

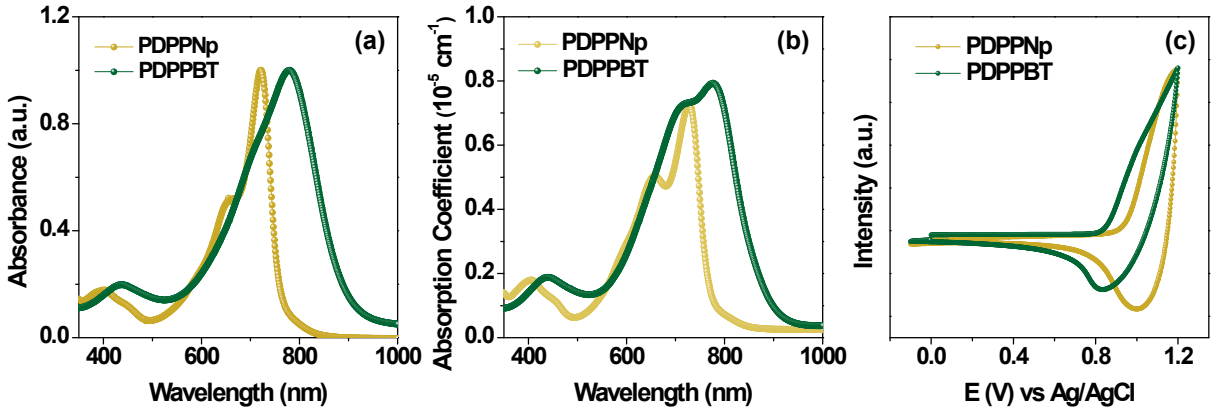

Fig. S1 UV-vis absorption spectra of DPP-based copolymers. (a)Solution in chloroform and (b) film states. (c) Cyclic voltammogram of DPP-based copolymer films on a platinum electrode.

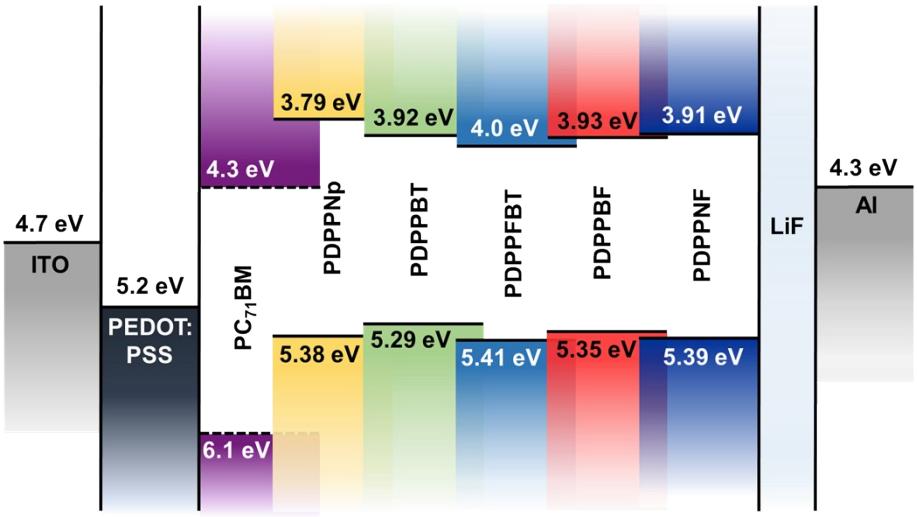

Fig. S2 HOMO and LUMO energy levels of DPP-based five polymers. Device configuration of inverted polymer solar cell.

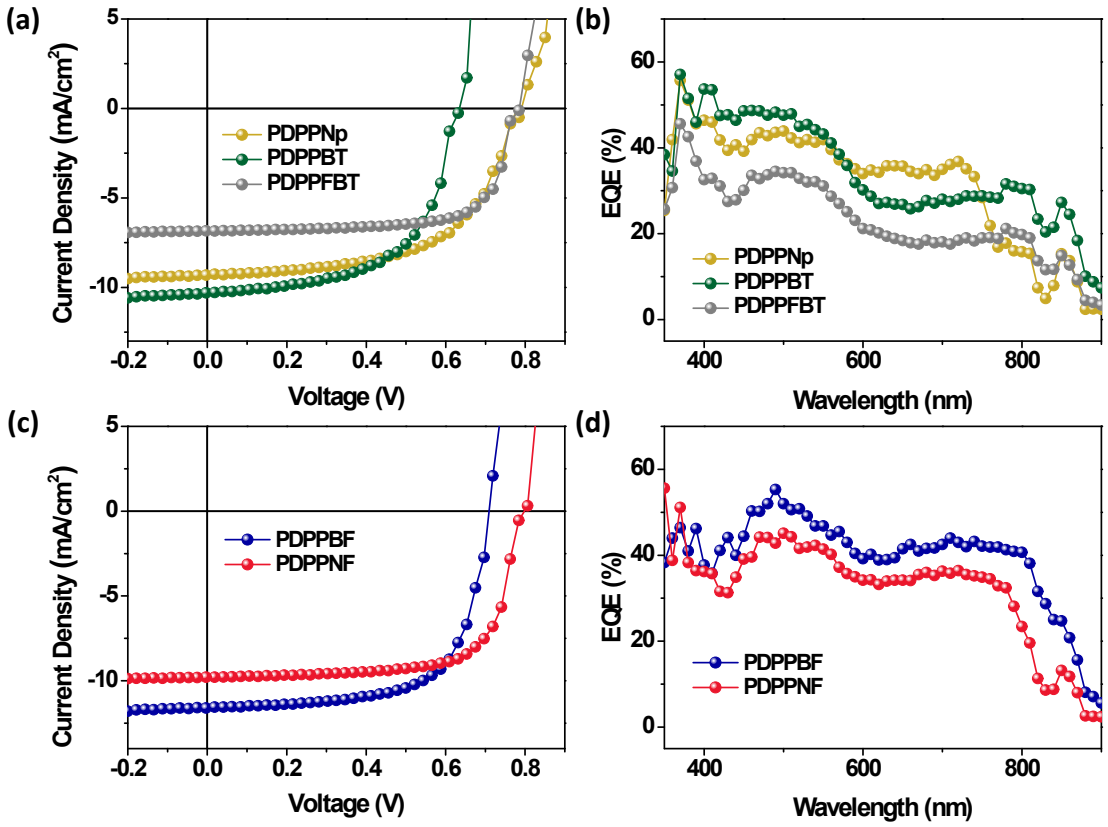

Fig. S3 Current density-voltage (*J-V*) curves and EQE spectra of (a,b) three DPP-based copolymers and (c,d) two DPP-based terpolymers. Conventional solar cell: ITO/PEDOT:PSS/Active layer/LiF/Al.

Table S1. Photovoltaic performance for the conventional solar cells.

	V_{oc} (V)[a]	J_{sc} (mA/cm²)[a]	*FF* (%) [a]	PCE_{max} (ave)[b] (%)
PDPPNp	0.78	9.29	58.16	4.21 (4.18)
PDPPBT	0.63	10.29	58.81	3.81 (3.69)
PDPPFBT	0.79	6.85	70.54	3.82 (3.75)
PDPPBF	0.71	11.58	66.77	5.48 (5.41)
PDPPNF	0.80	9.78	70.30	5.50 (5.39)

[a] The best values are given. [b] The photovoltaic properties were averaged over 20 devices.

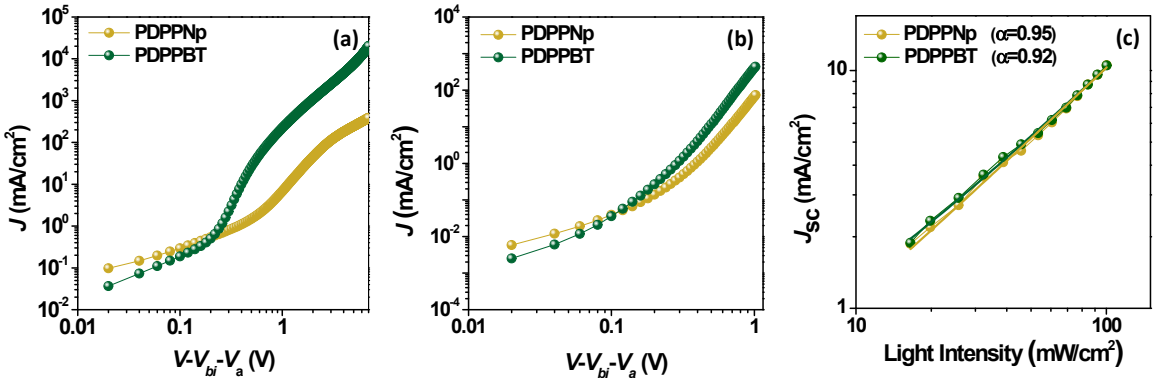

Fig. S4 Measured space-charge-limited *J-V* characteristics of all the derived blends under dark conditions for (a) hole-only devices and (b) electron-only devices. (c) Photocurrent versus light intensity of the photovoltaic devices.

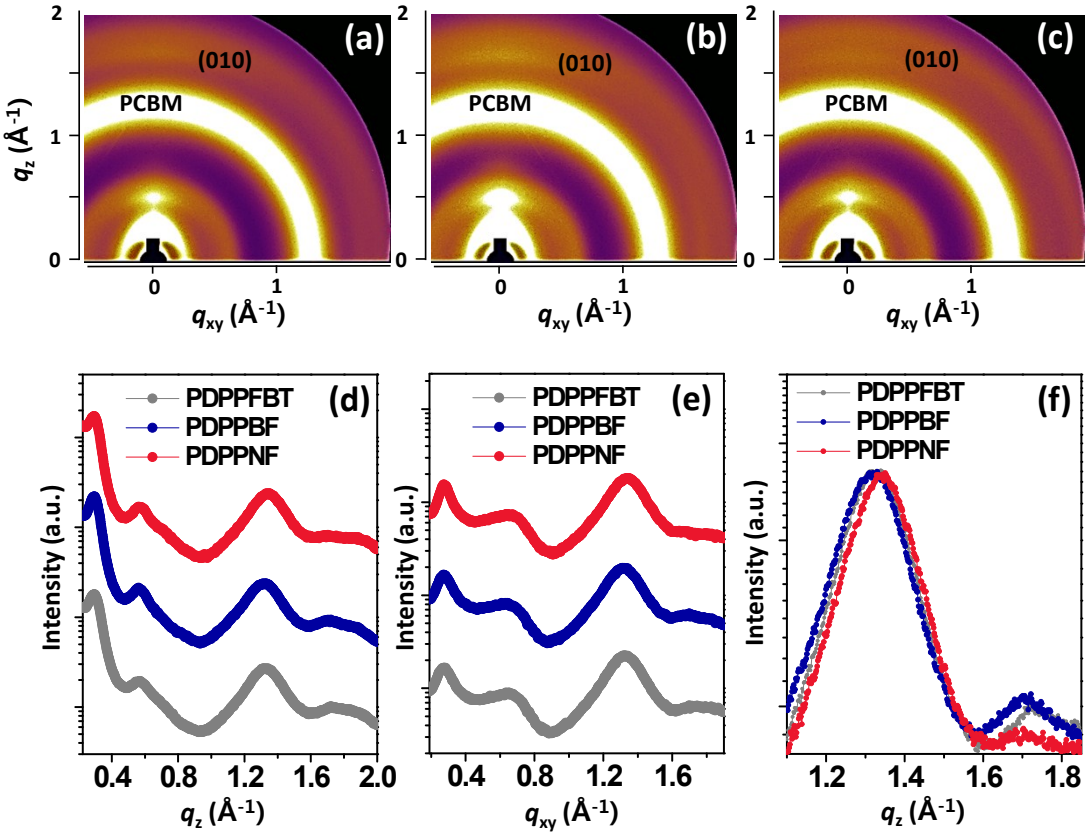

Fig. S5 GIWAXS 2D patterns. (a) PDPPFBT:$PC_{71}BM$ blend film, (b) PDPPBF:$PC_{71}BM$ blend film and (c) PDPPNF:$PC_{71}BM$ blend film. 1D diffraction profile of the three polymers : (d) out-of-plane, (e) in-plane and (f) the expanded diffraction profile along the q_z direction.

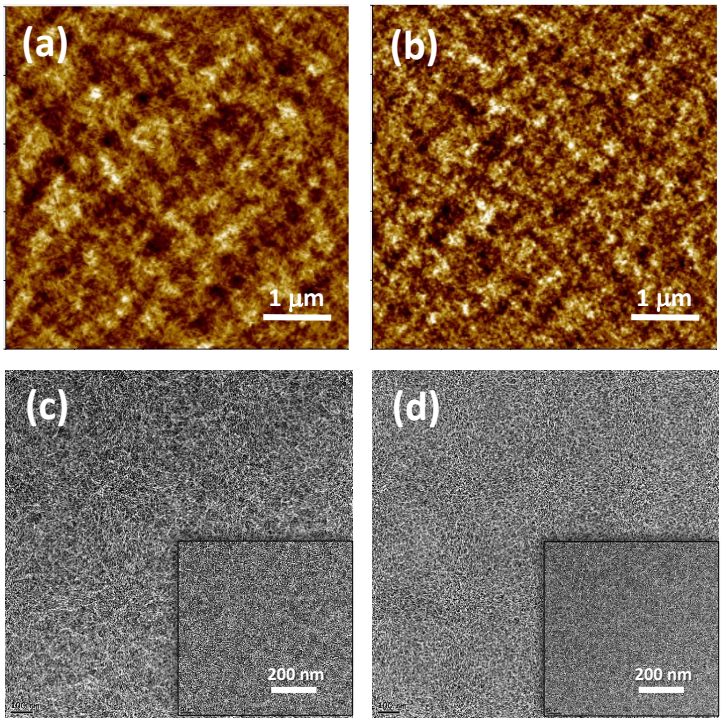

Fig. S6 AFM and TEM images of PSCs of blending films of (a,c) PDPPNp and (b,d) PDPPBT with $PC_{71}BM$.