

Supporting Information

High Efficiency Ternary Polymer Solar Cells based on a Fused Pentacyclic Electron Acceptor

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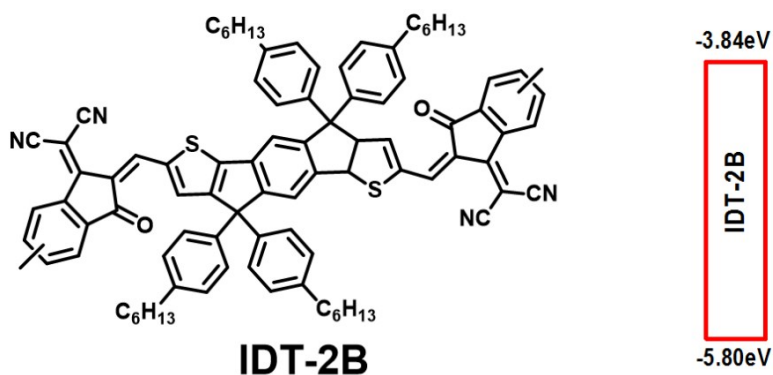


Fig. S1 Chemical structures and energy levels of IDT-2B.

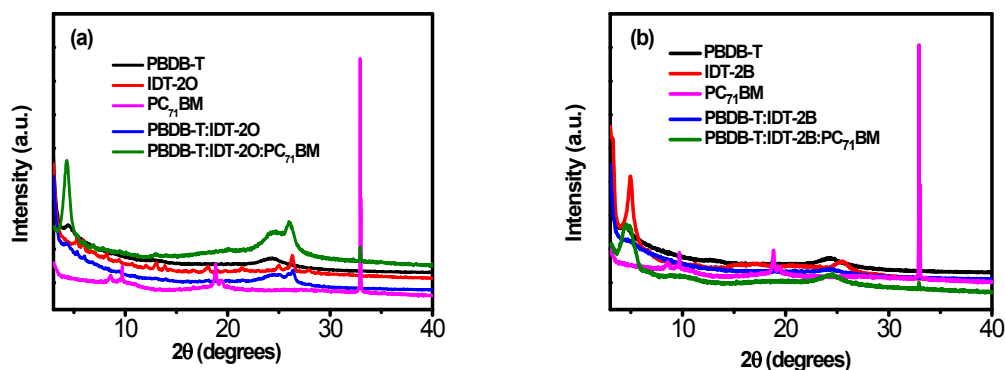


Fig. S2 XRD curves of PBDB-T, IDT-2O, IDT-2B, PC₇₁BM, PBDB-T:IDT-2O, PBDB-T:IDT-2B, and PBDB-T:IDT-2O:PC₇₁BM, PBDB-T:IDT-2B:PC₇₁BM films.

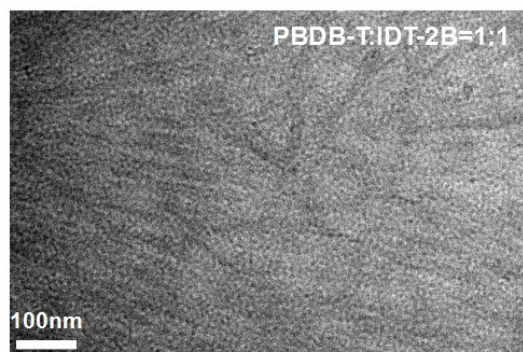


Fig. S3 TEM images of PBDB-T:IDT-2B blend films.

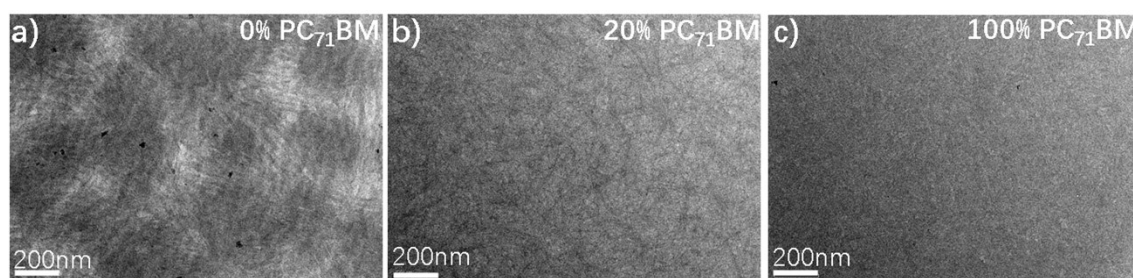


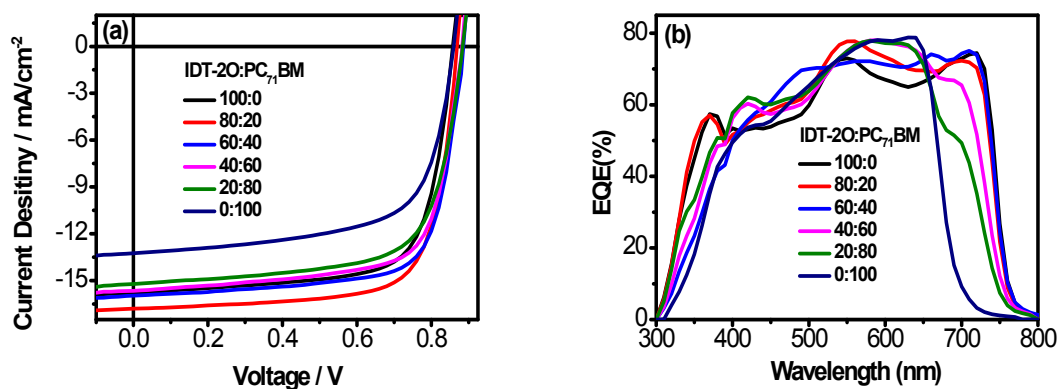
Fig. S4 TEM images of the corresponding blend films in Fig. 3 with a larger scale.

Table S1. Photovoltaic parameters of IDT-2B based PSCs using PBDB-T:IDT-2B:PC₇₁BM as the active layer with different PC₇₁BM contents (wt%) in the acceptor under AM 1.5G illumination at 100 mW cm⁻².

PBDB-T:IDT- 2B:PC ₇₁ BM	PC ₇₁ BM [wt%]	IDT-2B:PC ₇₁ BM [wt%]	V _{oc} [V]	J _{sc} [mA cm ⁻²]	FF [%]	PCE [%]
1:1:0	0	100:0	0.87	11.84	47.9	4.95
1:0.8:0.2	20	80:20	0.87	13.32	62.1	7.20
1:0:1	100	0:100	0.86	13.25	65.6	7.47

Table S2. Hole and electron mobilities of devices.

Active layer (weight ratios)	μ_e [cm ² V ⁻¹ s ⁻¹]	μ_h [cm ² V ⁻¹ s ⁻¹]	μ_h/μ_e
PBDB-T:IDT-2O (1:1)	9.85×10^{-5}	1.88×10^{-4}	1.91
PBDB-T:IDT-2O:PC ₇₁ BM (1:0.8:0.2)	1.79×10^{-4}	2.21×10^{-4}	1.23
PBDB-T:IDT-2B (1:1)	1.61×10^{-5}	8.81×10^{-5}	5.47
PBDB-T:IDT-2B:PC ₇₁ BM (1:0.8:0.2)	4.09×10^{-5}	9.84×10^{-5}	2.41

**Fig. S5** (a) J - V characteristics and (b) EQE curves of PBDB-T:IDT-2O:PC₇₁BM blend devices with different IDT-2O:PC₇₁BM ratios.

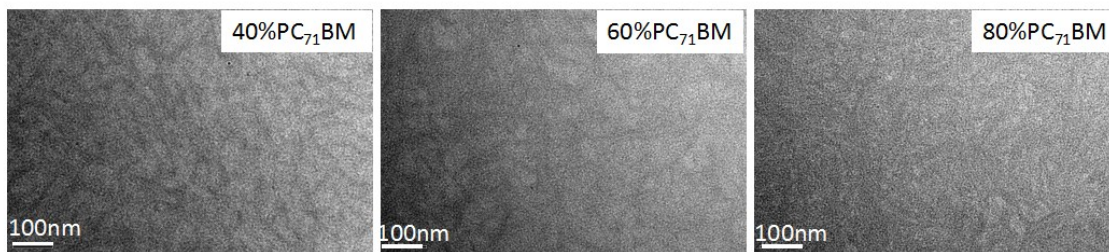


Fig. S6 TEM images of PBDB-T:IDT-2O:PC₇₁BM blend films with different contents (40%, 60% and 80%) of PC₇₁BM (wt%) in the total acceptor amount.