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Electronic Supplementary information (ESI)

**Efficient Fullerene-Free Solar Cells with Wide Optical Band Gap
Polymers Based on Fluorinated Benzotriazole and Asymmetric
Benzodithiophene**

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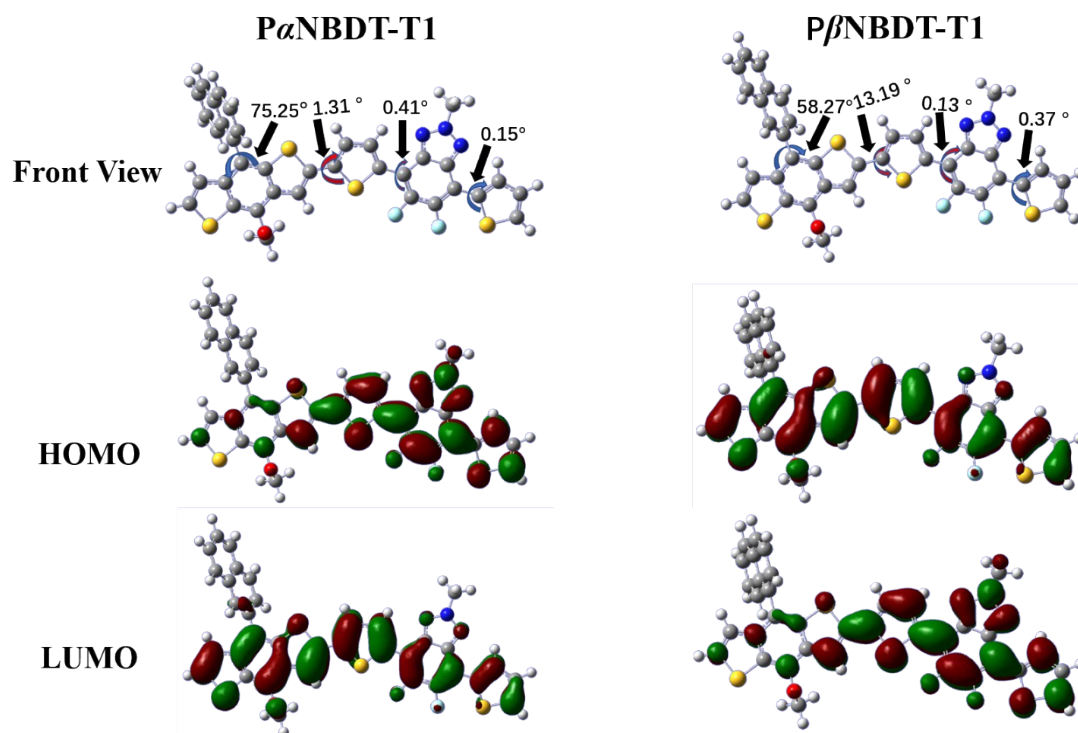


Fig. S1 DFT calculated optimal geometries and electron density distributions of P α NBDT-T1 and P β NBDT-T1.

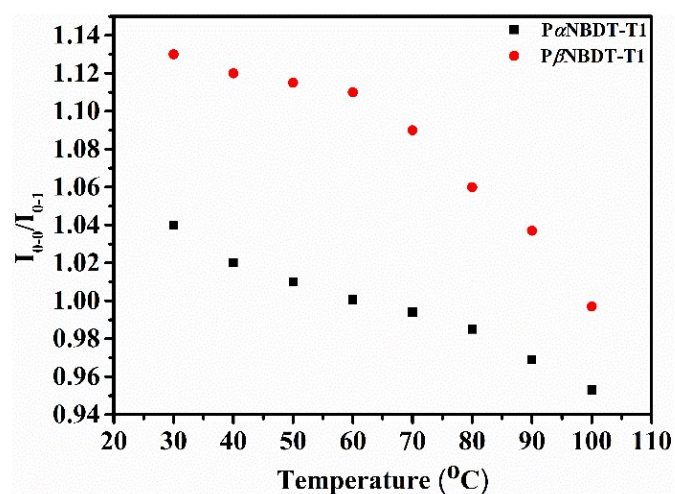


Fig. S2 I_{0-0}/I_{0-1} (UV-vis absorption intensity at λ_{0-0} and λ_{0-1}) of polymer solution at different temperature.

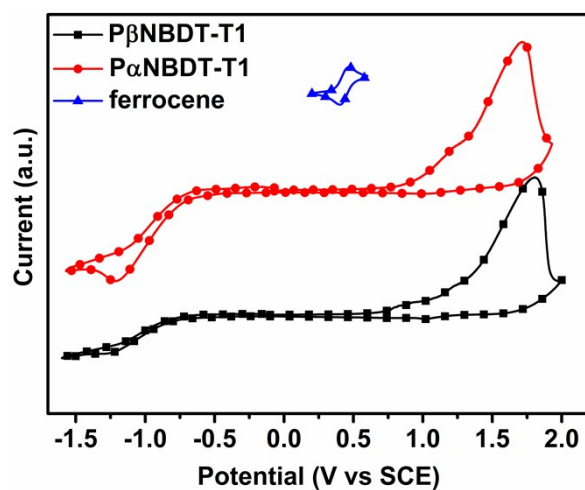


Fig. S3 Electrochemical cyclic voltammetry curves of the P α NBDT-T1 and P β NBDT-T1.

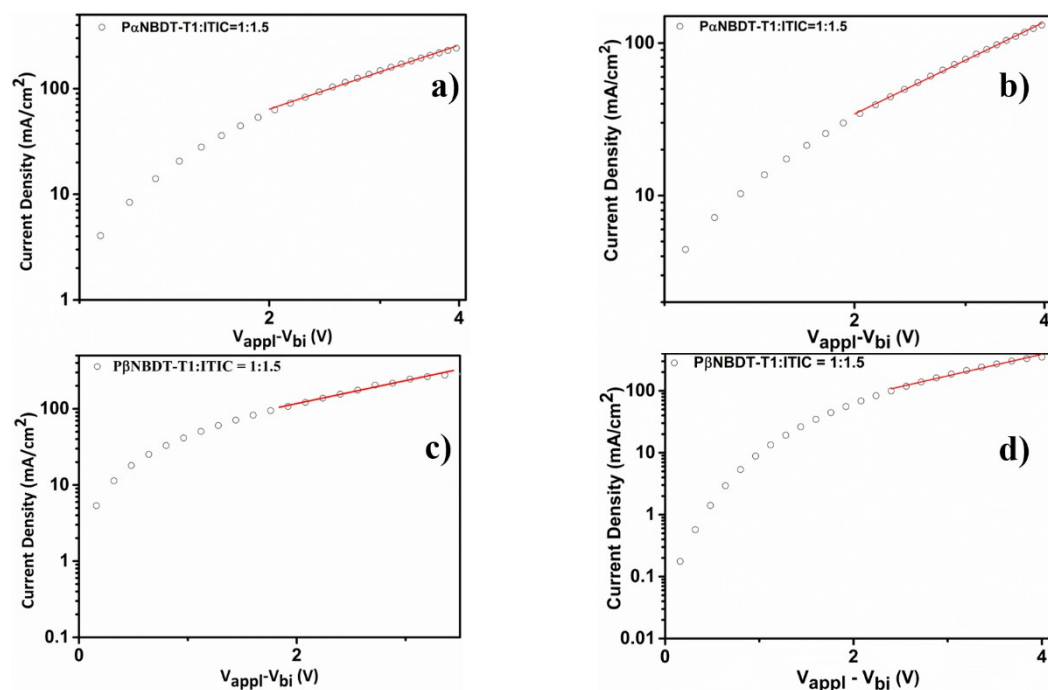


Fig. S4 Hole mobility characteristics of optimum devices based on P α NBDT-T1/P β NBDT-T1 and ITIC (a and c), electron mobility of optimum devices based on P α NBDT-T1/P β NBDT-T1 and ITIC (b and d).

Table S1. Photovoltaic Properties of PSCs Based on different ratios of Polymers and acceptor materials

Device	Ratio (w/w)	V_{OC} (V)	J_{SC} (mA cm ⁻²)	FF (%)	PCE (%)
P α NBDT-T1/ITIC	1:1	0.87	15.96	51.18	7.11
	1:1.2	0.85	17.92	55.46	8.45
	1:2	0.86	17.54	52.36	7.90
	2:1	0.84	15.25	53.41	6.84
P β NBDT-T1/ITIC	1:1	0.78	16.68	49.43	6.43
	1:2	0.74	16.74	46.50	5.52
	2:1	0.75	16.03	47.88	5.76
P α NBDT-T1/PC ₇₁ BM	1:1	0.79	6.67	45.81	2.41
	1:1.5	0.78	3.64	50.89	1.44
P β NBDT-T1/PC ₇₁ BM	1:1	0.75	8.67	58.23	3.79
	1:2	0.72	8.91	67.11	4.30