

Electronic Supplementary Information

Two new fluorinated copolymers based on thieno[2,3-*f*]benzofuran for efficient polymer solar cells

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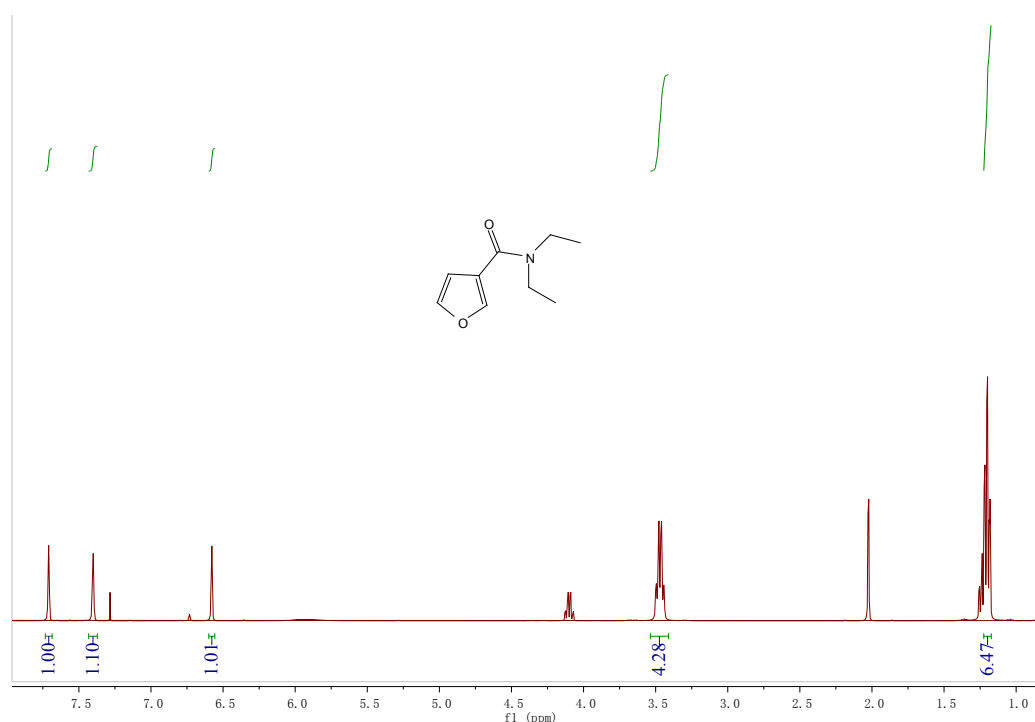


Figure S1. ¹H NMR spectrum of compound 1.

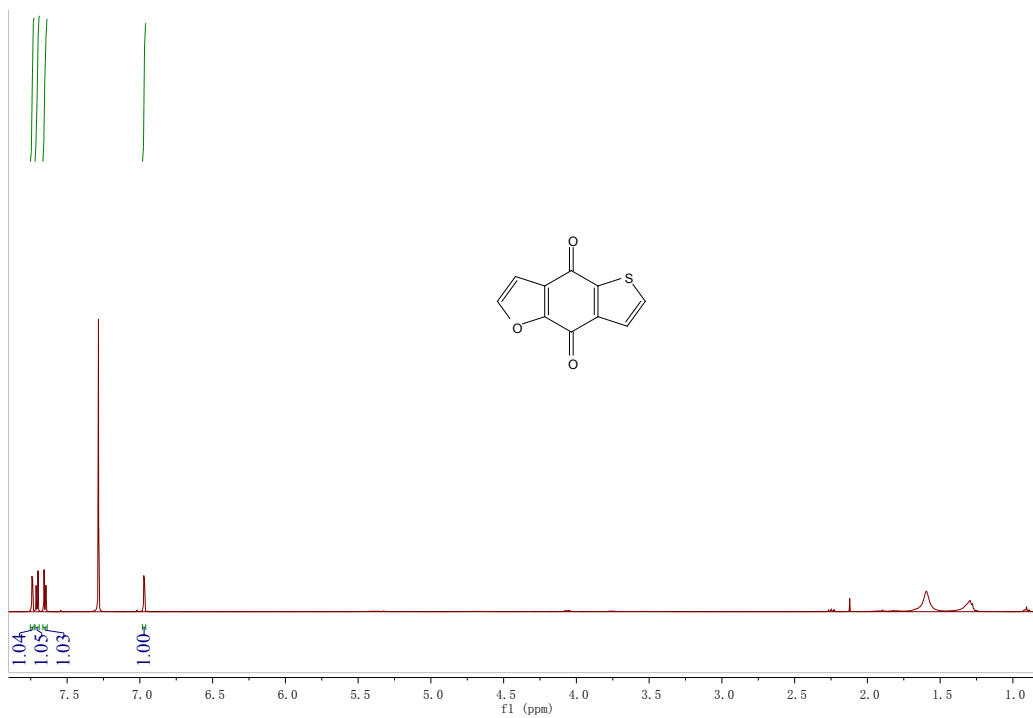


Figure S2. ¹H NMR spectrum of compound 2.

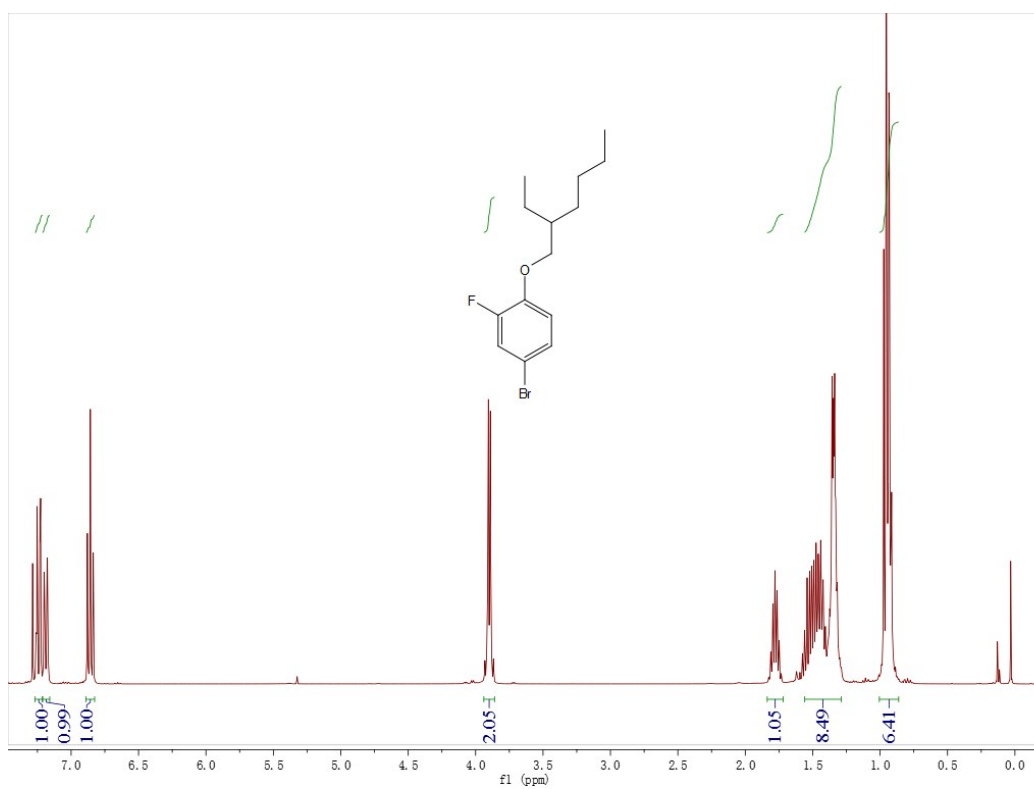


Figure S3. ¹H NMR spectrum of compound 3.

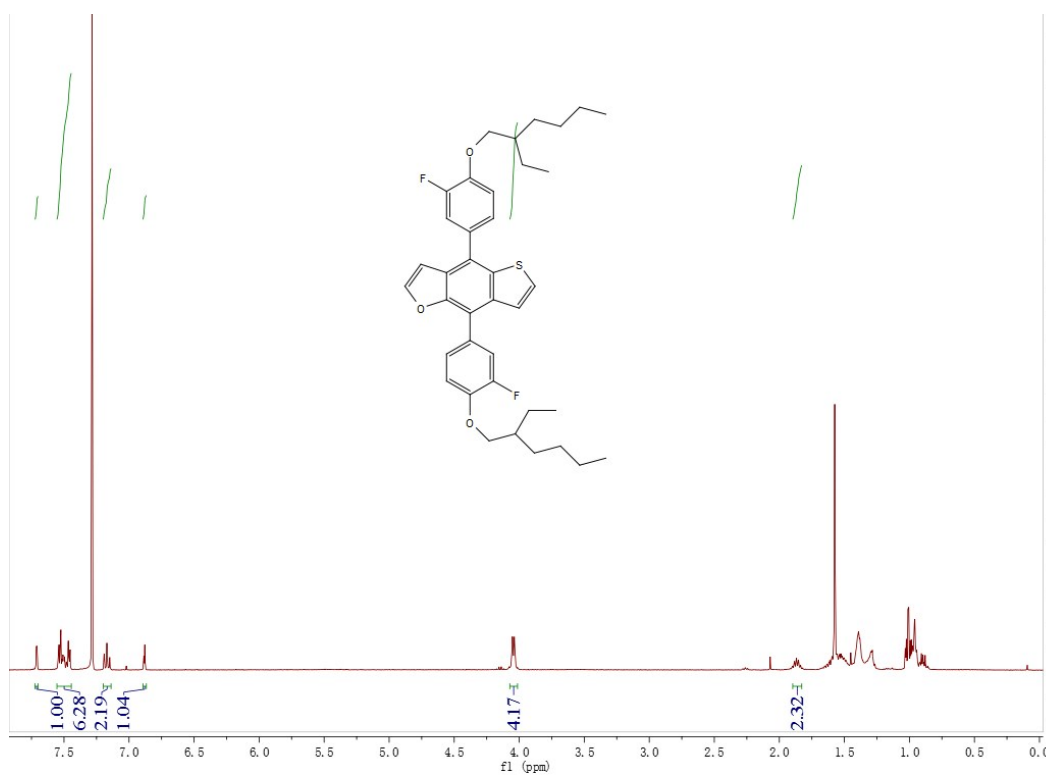


Figure S4. ¹H NMR spectrum of compound 4.

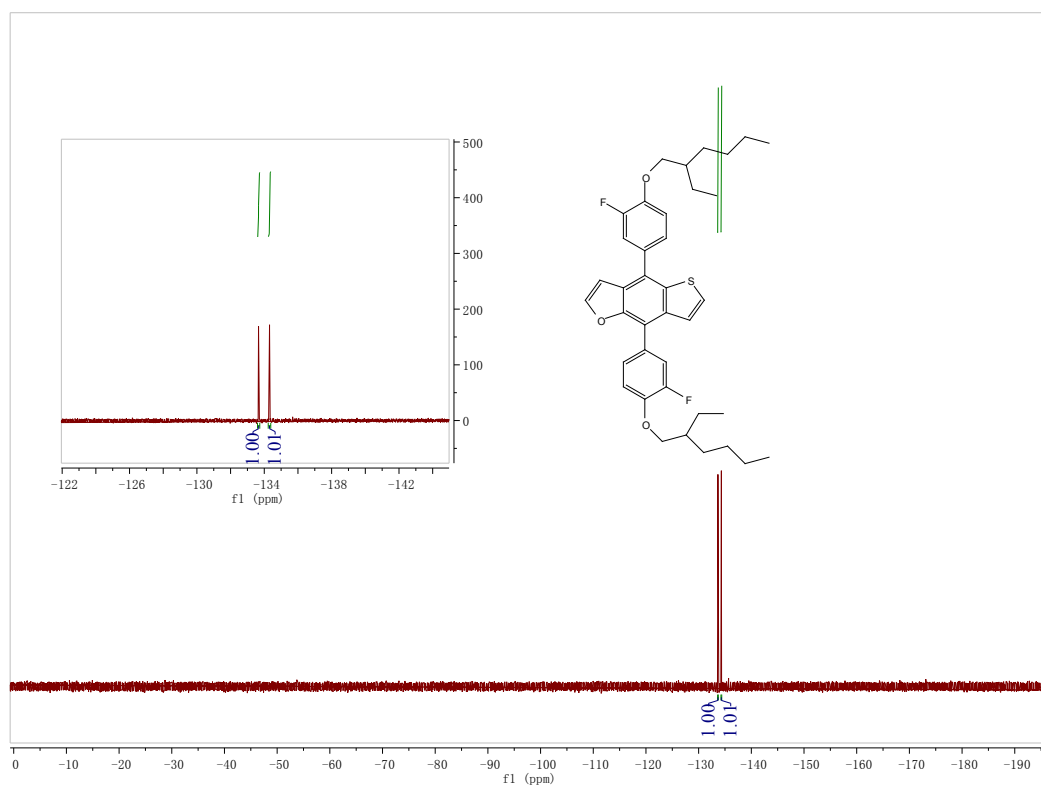
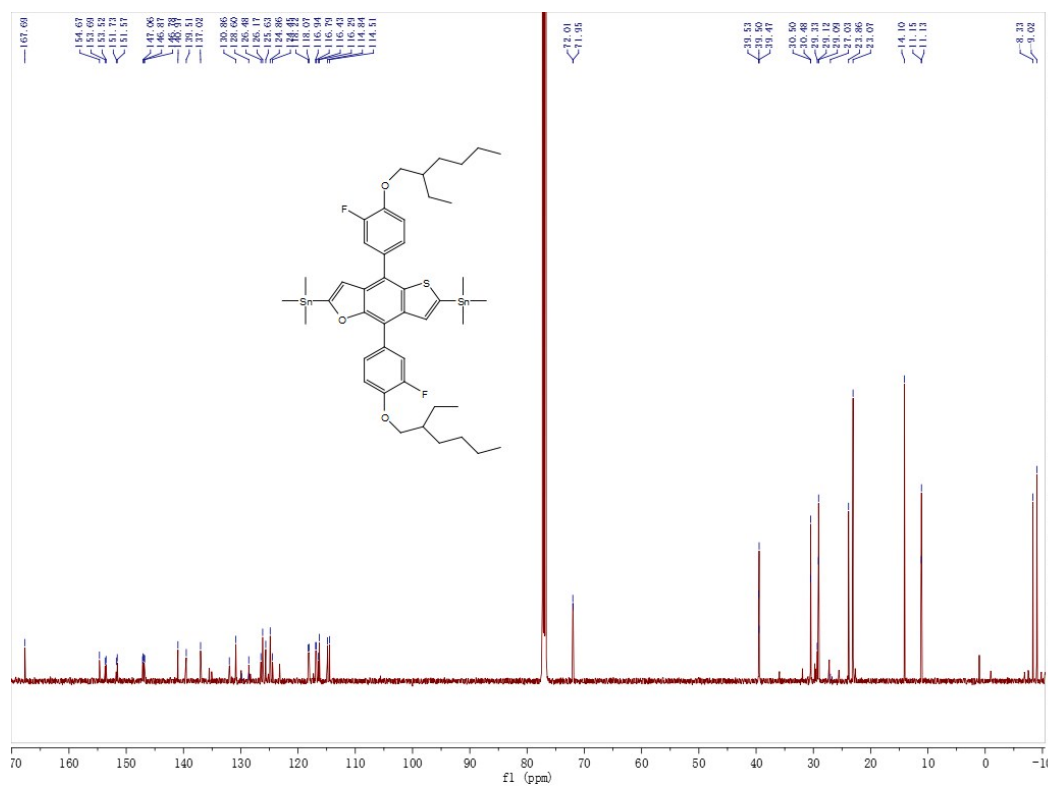
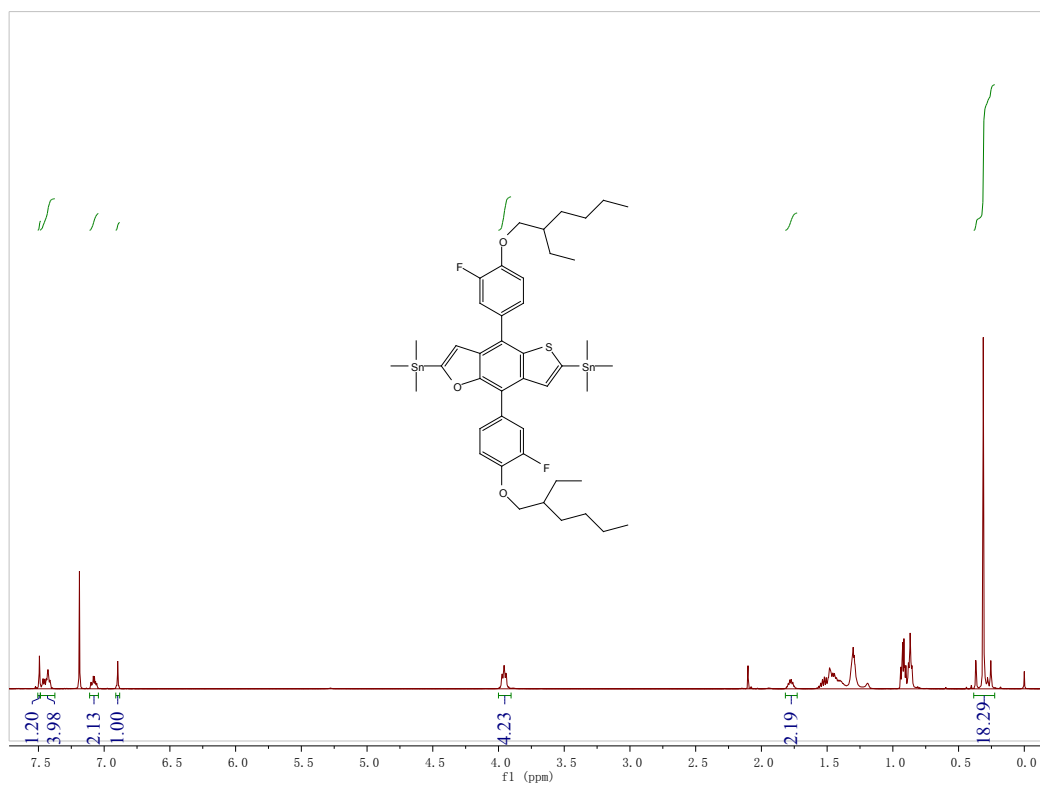


Figure S5. ¹⁹F NMR spectrum of compound 4.



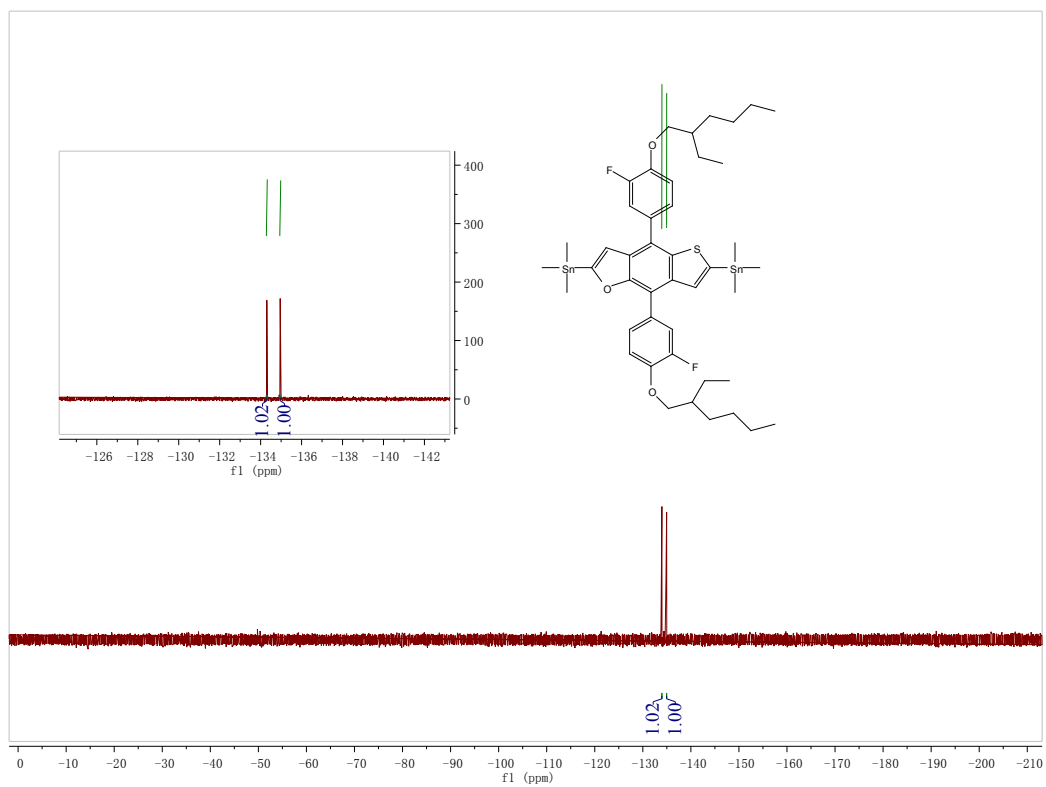
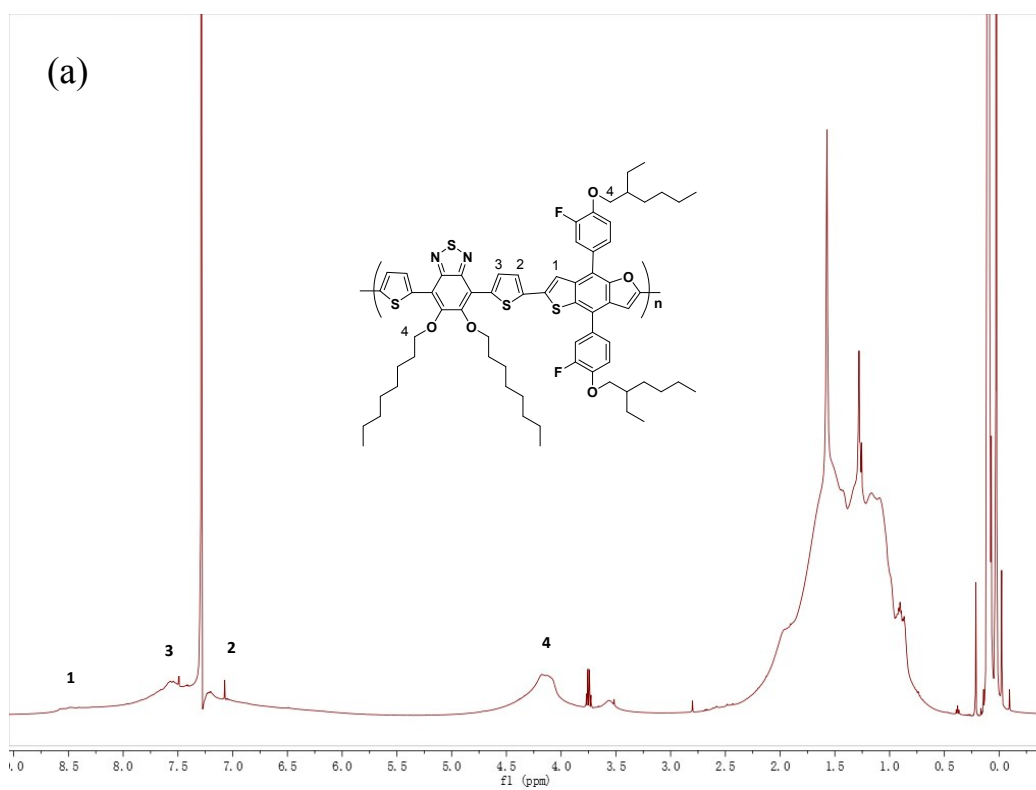


Figure S8. ^{19}F NMR spectrum of compound M1.



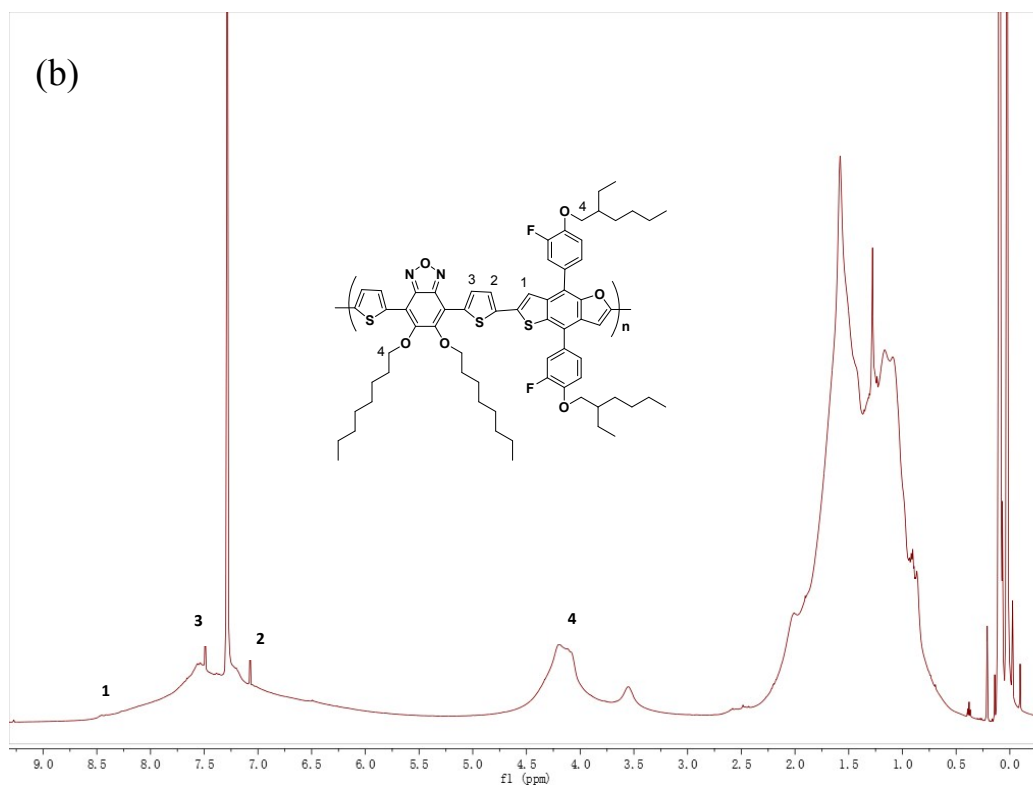


Figure S9. ¹H NMR spectra of TBFPF-BT (a) and TBFPF-BO (b).

Table S1. Photovoltaic parameters of devices under diverse weight ratio of D/A.

Active layer	D/A ratio(w/w)	V _{oc} (V)	J _{sc} (mA cm ⁻²)	FF(%)	PCE(%)
TBFPF-BT:PC ₇₁ BM	1:1	0.81	5.94	63	3.05
TBFPF-BT:PC ₇₁ BM	1:2	0.82	7.64	67	4.27
TBFPF-BO:PC ₇₁ BM	1:1	0.90	8.23	52	3.86
TBFPF-BO:PC ₇₁ BM	1:2	0.91	7.76	57	4.07

Table S2. Photovoltaic parameters of devices with different DIO ratio.

Active layer ^a	DIO (v %)	V _{oc} (V)	J _{sc} (mA cm ⁻²)	FF(%)	PCE(%)
TBFPF-BT:PC ₇₁ BM	0	0.82	7.64	67	4.27
TBFPF-BT:PC ₇₁ BM	0.5	0.79	10.67	67	5.59
TBFPF-BT:PC ₇₁ BM	1	0.80	12.12	71	6.80
TBFPF-BT:PC ₇₁ BM	1.5	0.80	11.12	66	5.92
TBFPF-BT:PC ₇₁ BM	3	0.79	10.42	67	5.50
TBFPF-BT:PC ₇₁ BM	5	0.79	8.96	71	5.07
TBFPF-BO:PC ₇₁ BM	0	0.91	7.76	57	4.07
TBFPF-BO:PC ₇₁ BM	0.5	0.89	8.82	58	4.54
TBFPF-BO:PC ₇₁ BM	1	0.89	10.35	65	5.98
TBFPF-BO:PC ₇₁ BM	1.5	0.90	9.47	61	5.19
TBFPF-BO:PC ₇₁ BM	3	0.90	8.76	59	4.60
TBFPF-BO:PC ₇₁ BM	5	0.89	8.49	59	4.46

^a Polymer:PC₇₁BM=1:2(w/w)

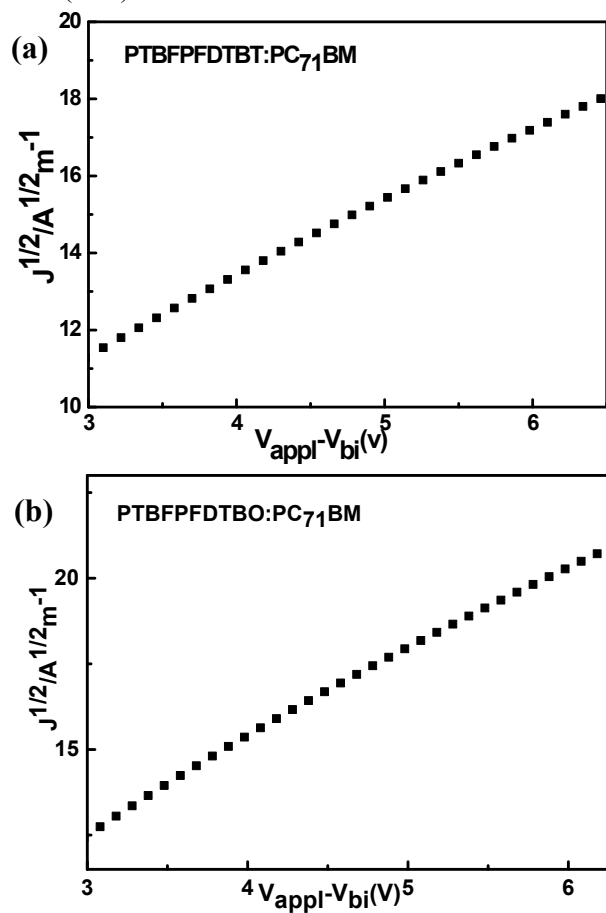


Figure S10. $J^{1/2} - V$ curves of TBFPF-BT (a) and TBFPF-BO (b) without DIO.