

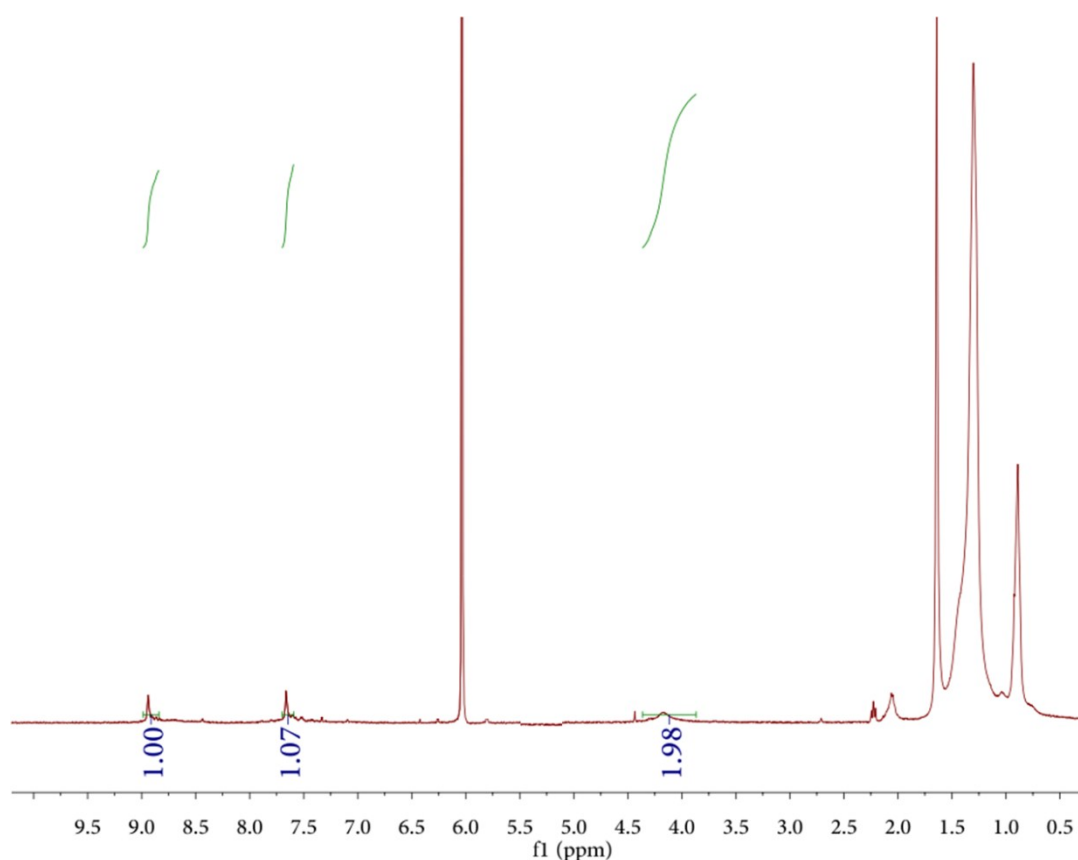
Design of Three-Component Randomly Incorporated Copolymers as Non-Fullerene Acceptors for All-Polymer Solar Cells

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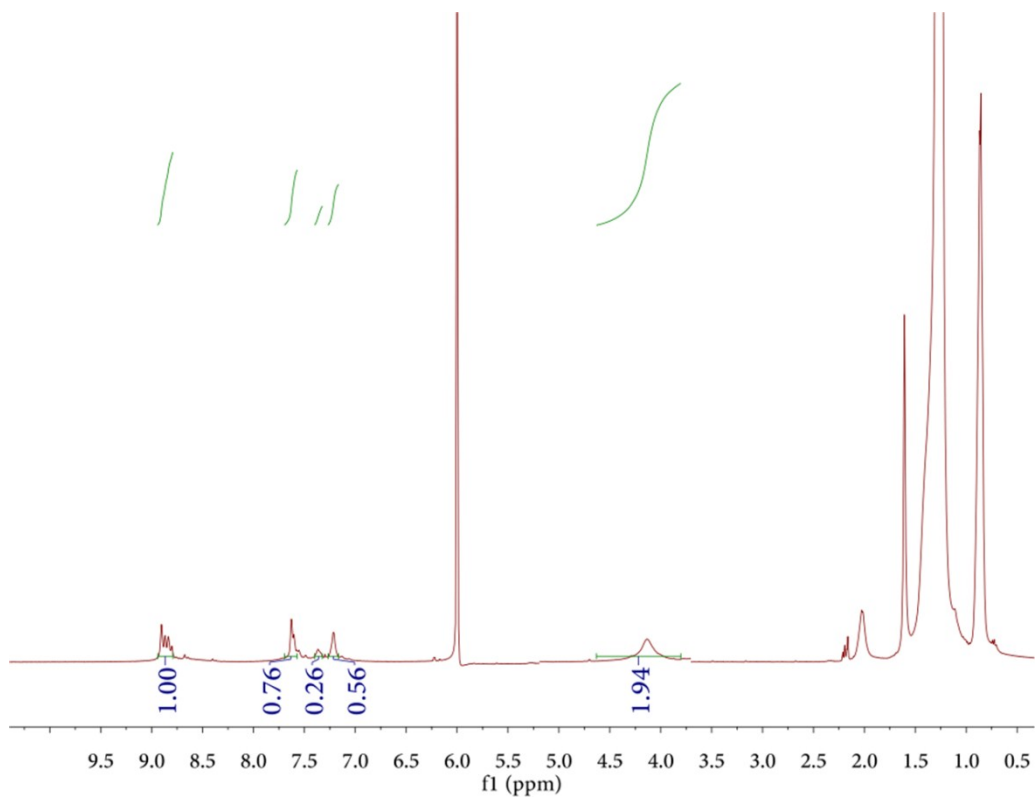
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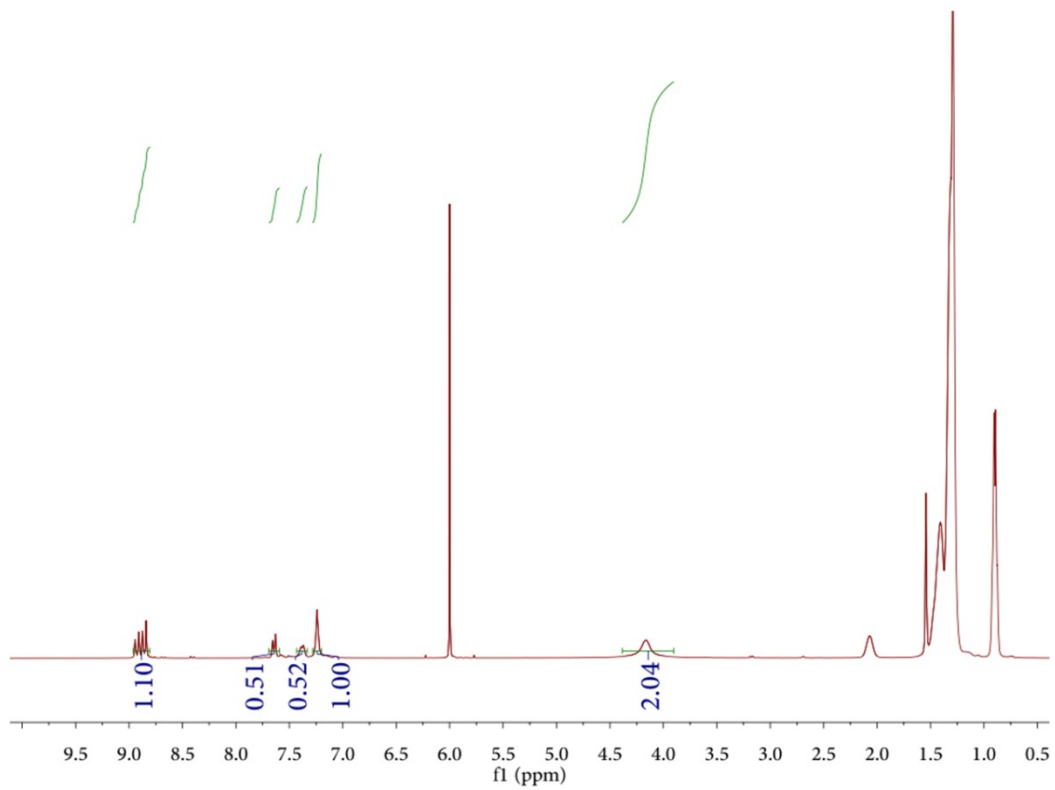
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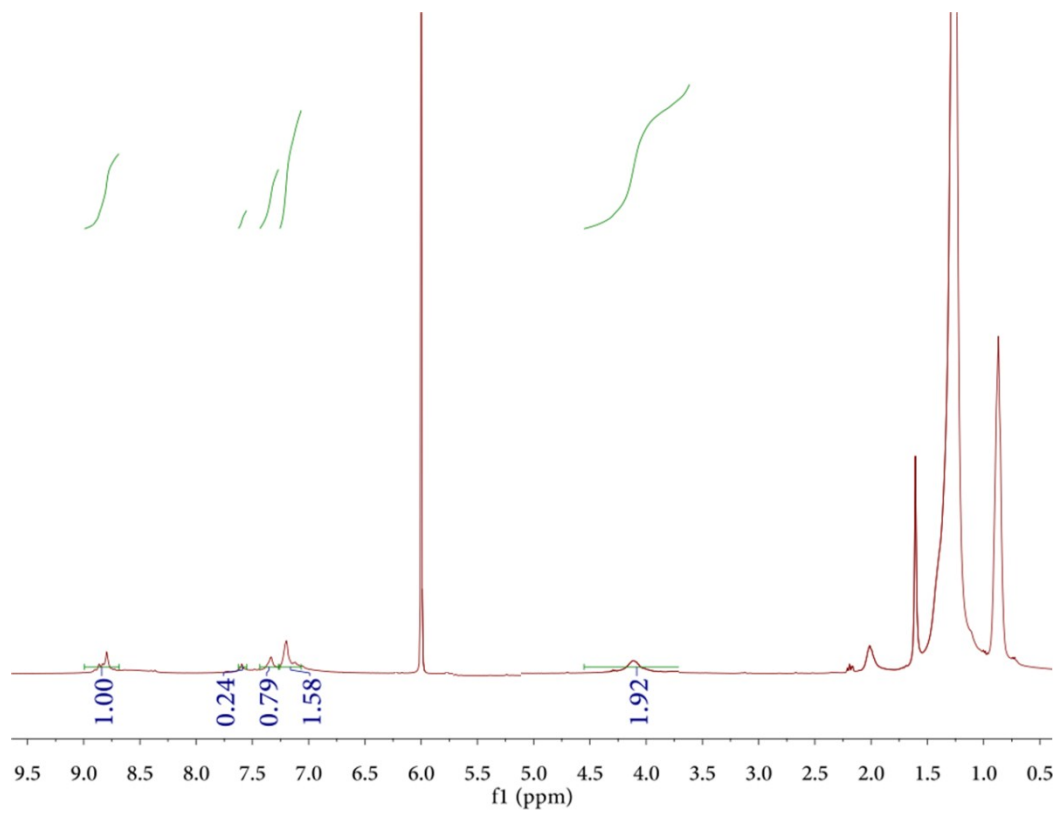
¹H NMR spectrum of copolymer 1



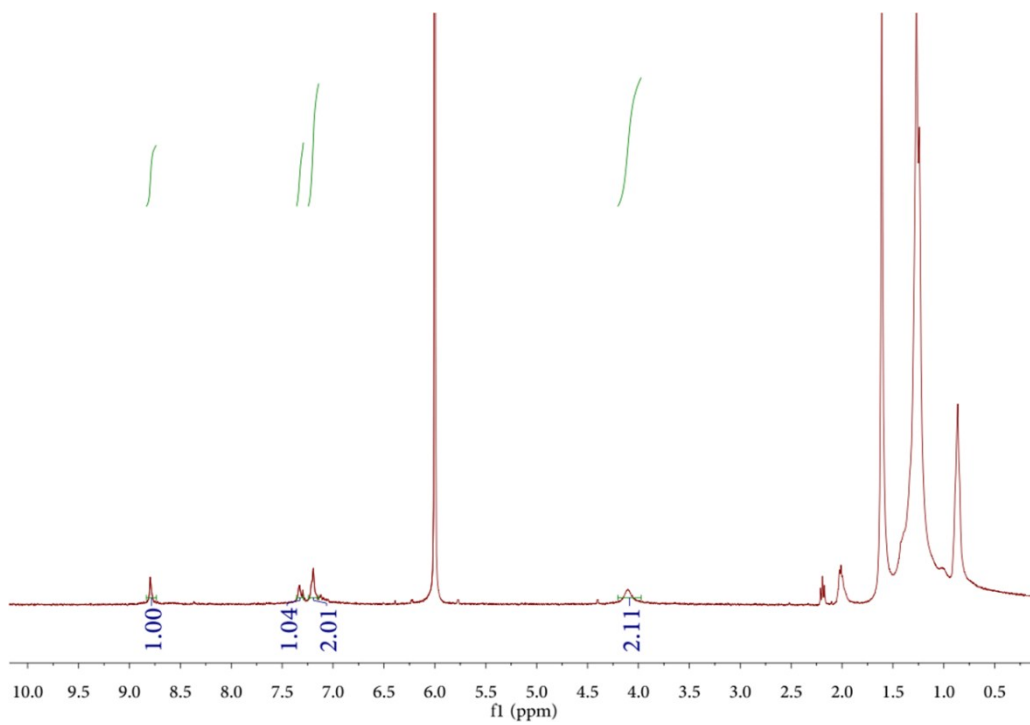
¹H NMR spectrum of copolymer 2



¹H NMR spectrum of copolymer 3



¹H NMR spectrum of copolymer 4



¹H NMR spectrum of copolymer 5

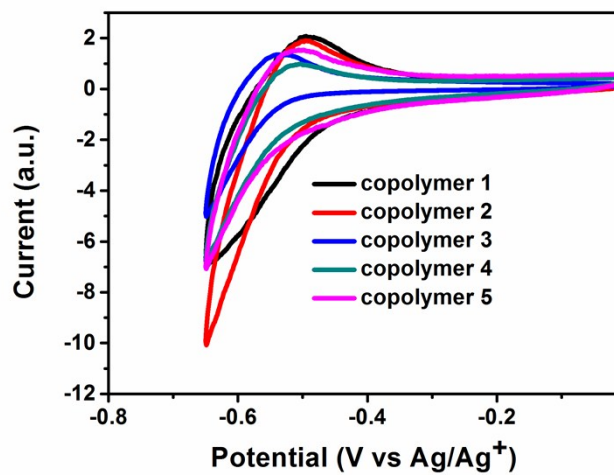


Figure S1. Cyclic voltammometry spectra of five copolymers.

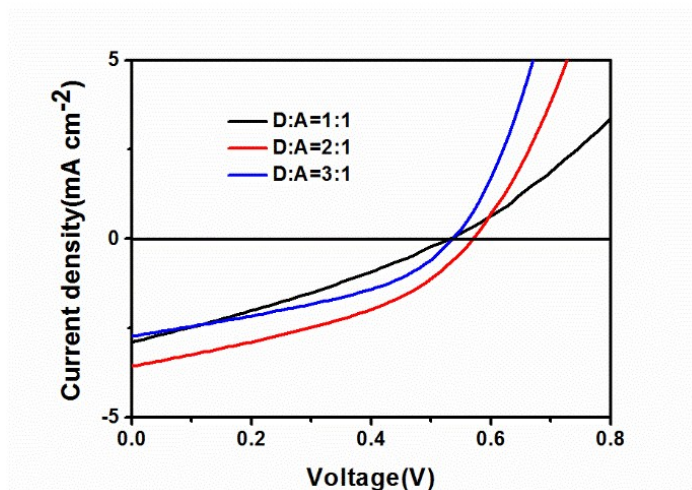


Figure S2. J-V curves of PTB7-Th:Copolymer 1 blend with different weight ratio.

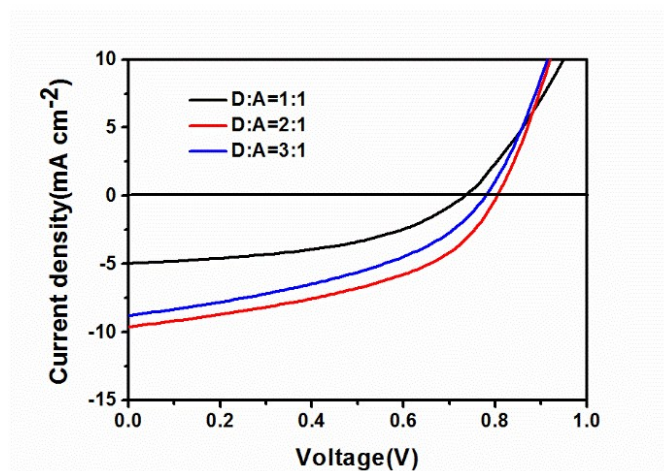


Figure S3. J-V curves of PTB7-Th:Copolymer 2 blend with different weight ratio.

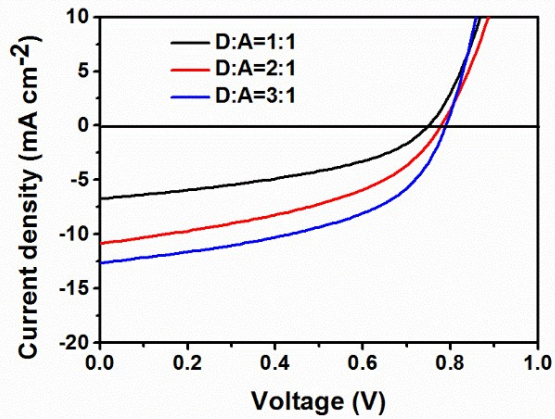


Figure S4. J-V curves of PTB7-Th:Copolymer 3 blend with different weight ratio.

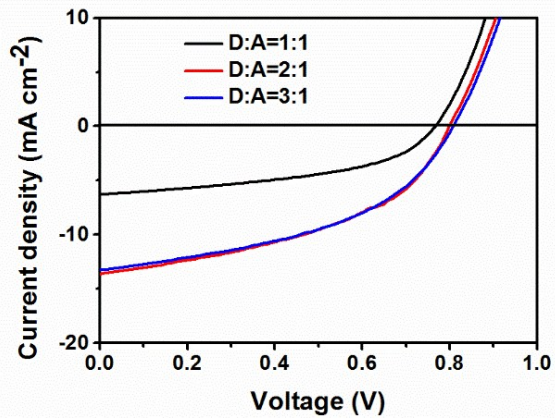


Figure S5. J-V curves of PTB7-Th:Copolymer 4 blend with different weight ratio.

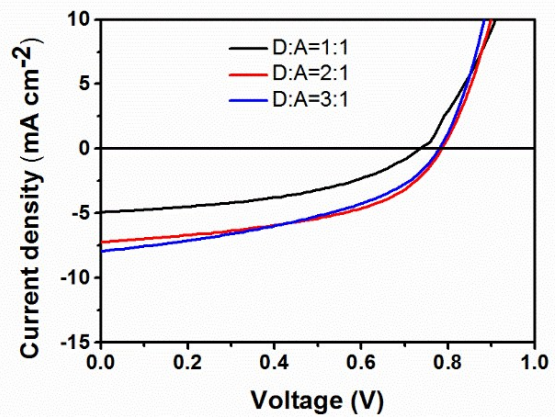


Figure S6. J-V curves of PTB7-Th:Copolymer 5 blend with different weight ratio.

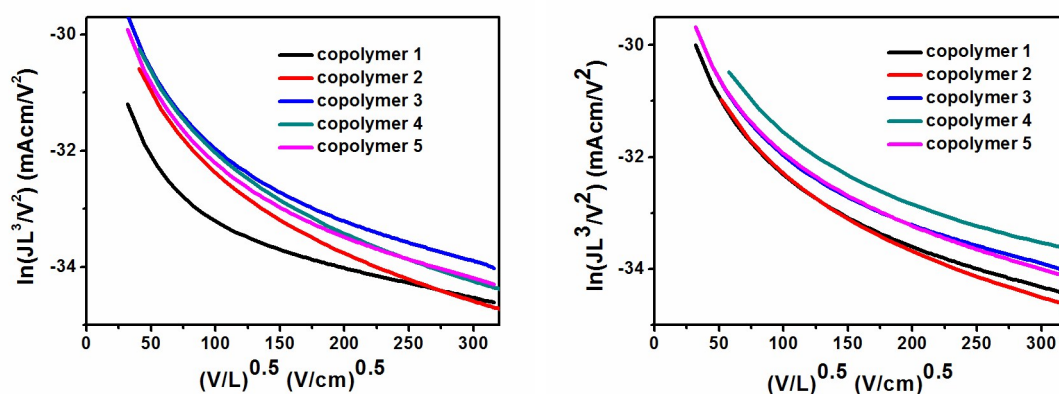


Figure S7. Space-charge-limited current (SCLC) fittings of devices: Hole-only SCLC devices (left): ITO/PEDOT:PSS/blend/MoO_x/Al and electron-only devices (right) with the structure of ITO/ZnO/blend/Ca/Al.

Table S1 Photovoltaic performance of PTB7-Th:Copolymer 1 blend with different weight ratio.

D/A (w/w)	V _{oc} [V]	J _{sc} [mA cm ⁻²]	FF	PCE ^a (%)
1:1	0.612	2.72	0.329	0.55 (0.50±0.05)
2:1	0.570	3.56	0.391	0.79 (0.65±0.14)
3:1	0.472	2.20	0.357	0.37 (0.31±0.06)

^aAverage PCE in brackets

Table S2 Photovoltaic performance of PTB7-Th:Copolymer 2 blend with different weight ratio.

D/A (w/w)	V _{oc} [V]	J _{sc} [mA cm ⁻²]	FF	PCE ^a (%)
1:1	0.750	513	0.495	1.90 (1.81±0.06)
2:1	0.805	9.60	0.451	3.48 (3.41±0.07)
3:1	0.779	8.79	0.409	2.48 (2.40±0.08)

^aAverage PCE in brackets

Table S3 Photovoltaic performance of PTB7-Th:Copolymer 3 blend with different weight ratio.

D/A (w/w)	V _{oc} [V]	J _{sc} [mA cm ⁻²]	FF	PCE ^a (%)
1:1	0.741	6.06	0.455	2.05 (1.97±0.08)
2:1	0.779	10.86	0.431	3.65 (3.56±0.09)
3:1	0.790	12.66	0.486	4.86 (4.8±0.06)

^aAverage PCE in brackets

Table S4 Photovoltaic performance of PTB7-Th:Copolymer 4 blend with different weight ratio.

D/A (w/w)	V _{oc} [V]	J _{sc} [mA cm ⁻²]	FF	PCE ^a (%)
1:1	0.767	6.30	0.467	2.26 (2.14±0.12)
2:1	0.794	13.75	0.483	5.27 (5.14±0.13)
3:1	0.798	13.26	0.466	4.94 (4.87±0.07)

^aAverage PCE in brackets

Table S5 Photovoltaic performance of PTB7-Th:Copolymer 5 blend with different weight ratio.

D/A (w/w)	V _{oc} [V]	J _{sc} [mA cm ⁻²]	FF	PCE ^a (%)
1:1	0.744	5.02	0.476	1.78 (1.70±0.08)
2:1	0.795	7.41	0.499	2.94 (2.75±0.19)
3:1	0.778	8.04	0.424	2.65 (2.61±0.04)

^aAverage PCE in brackets