Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting information

Solution-processed small molecules with ethynylene bridges for highly efficient organic solar cells

Yuanyuan Kan,[a] Chang Liu,[a] Lianjie Zhang,[a] Ke Gao,[a] Feng Liu,*[b]

Junwu Chen*[a] and Yong Cao[a]

[a] *Institute of Polymer Optoelectronic Materials & Devices, State Key Laboratory of Luminescent Materials & Devices, South China University of Technology, Guangzhou 510640, China*

[b] *Materials Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, California 94720, United States*

**Correspondence - psjwchen@scut.edu.cn*

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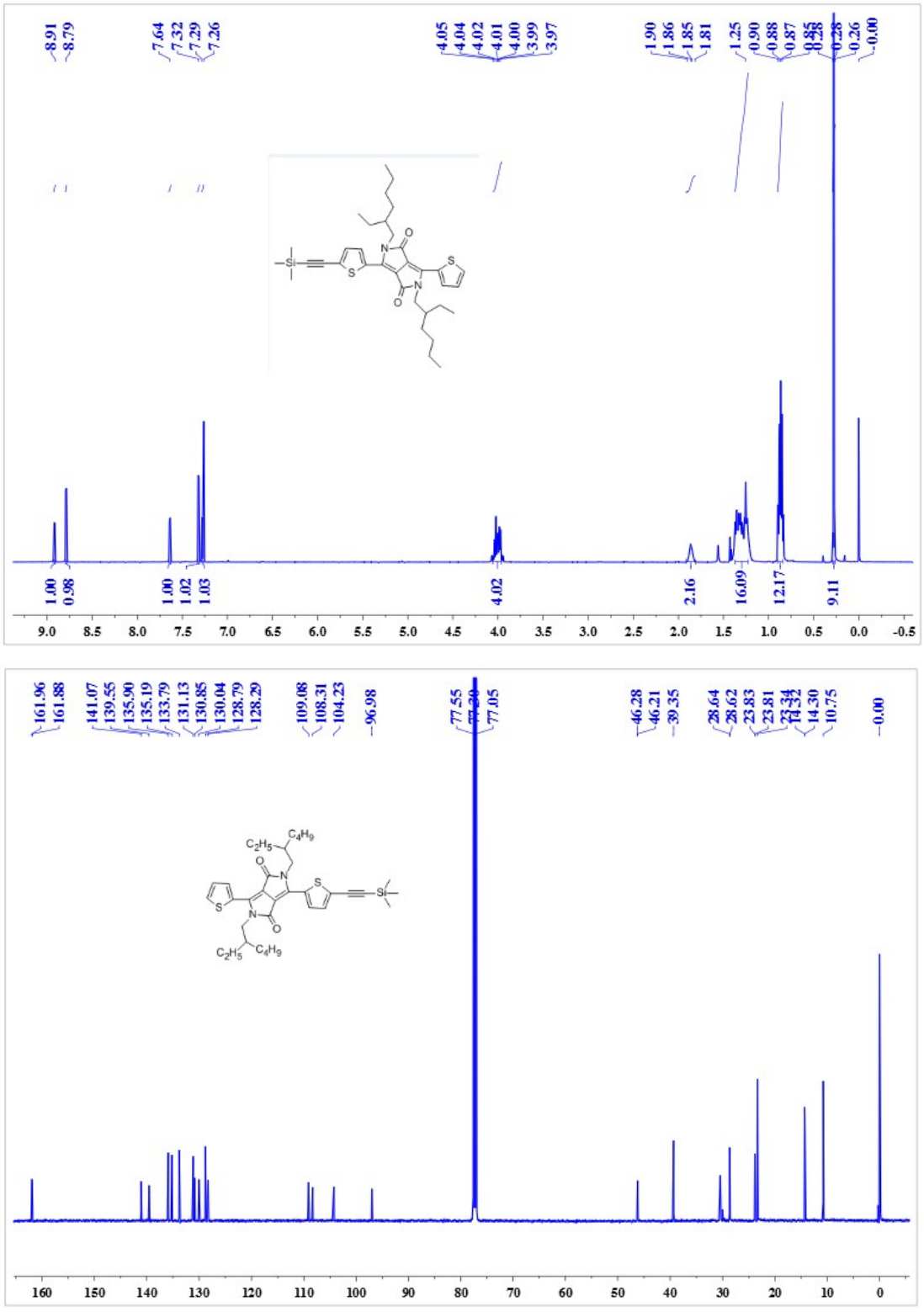
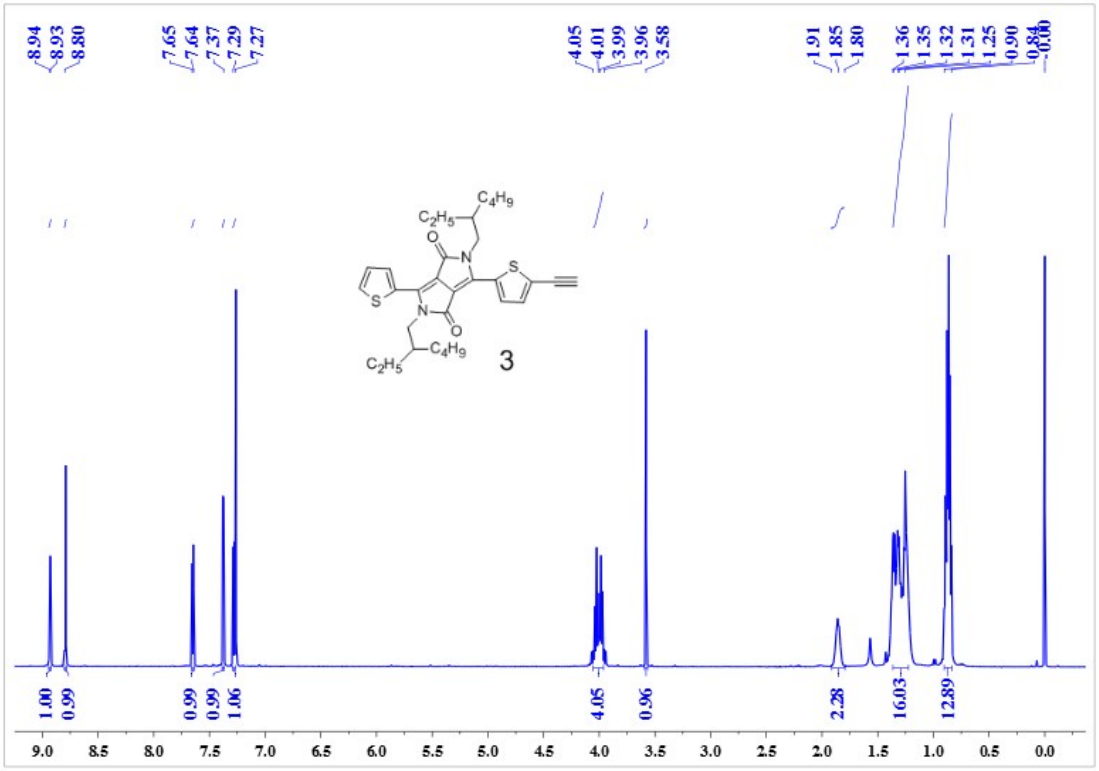


Figure S1. ^{1}H NMR and ^{13}C NMR spectra of compound **2** in $CDCl_3$.



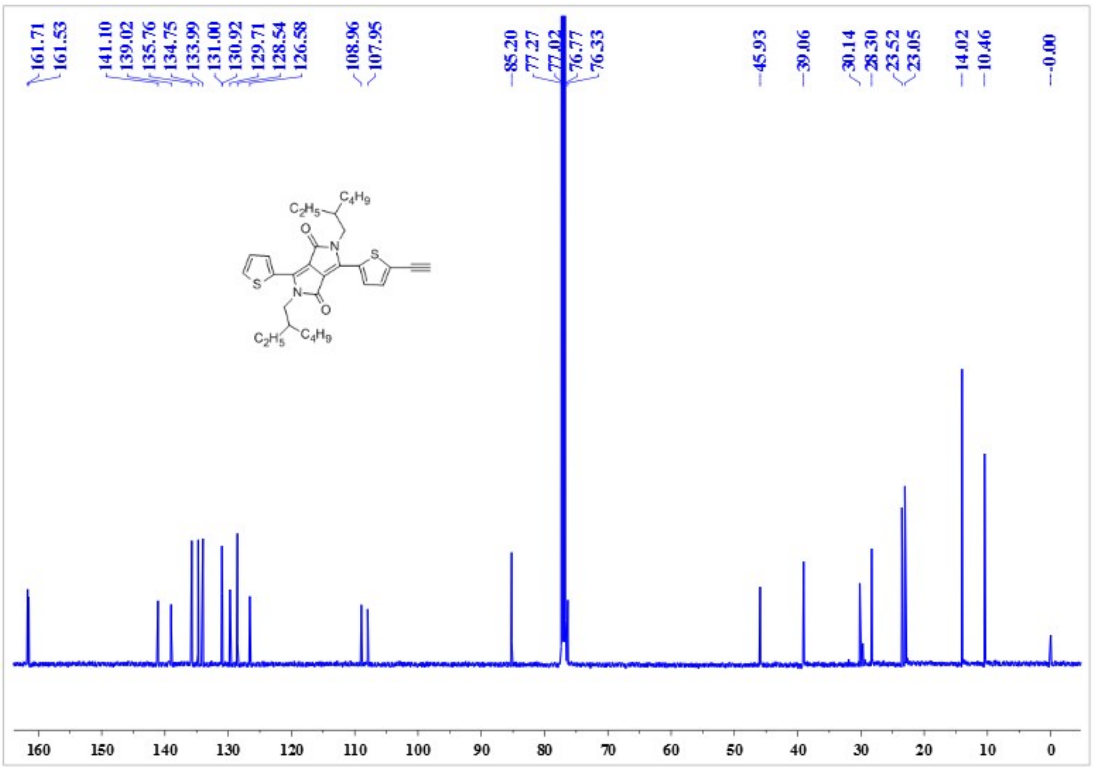
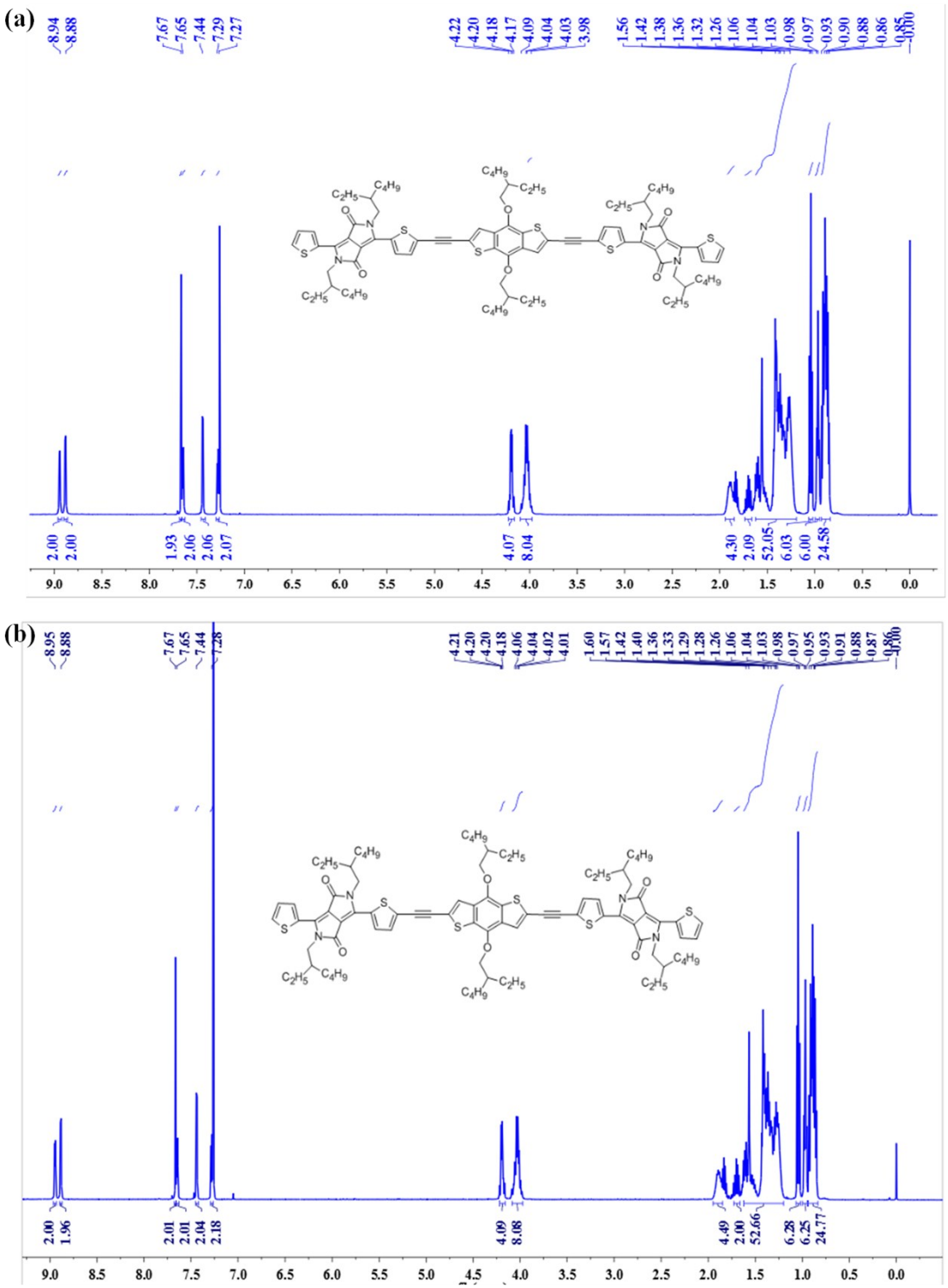


Figure S2. ^{1}H NMR and ^{13}C NMR spectra of compound **3** in $CDCl_3$.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4.04
4.03
3.98
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1.36
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1.03
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0.88
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2.06
2.06
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9.0
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3.5
3.0
2.5
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1.5
1.0
0.5
0.0
(b)
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7.67
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7.44
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4.20
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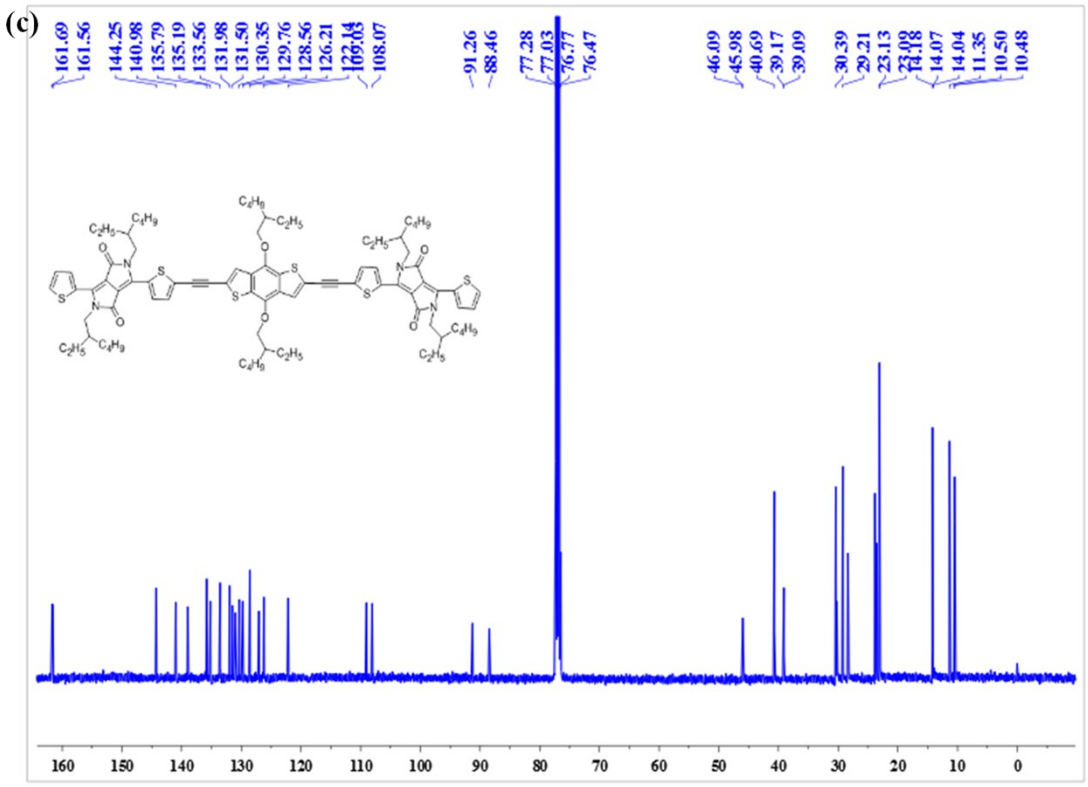
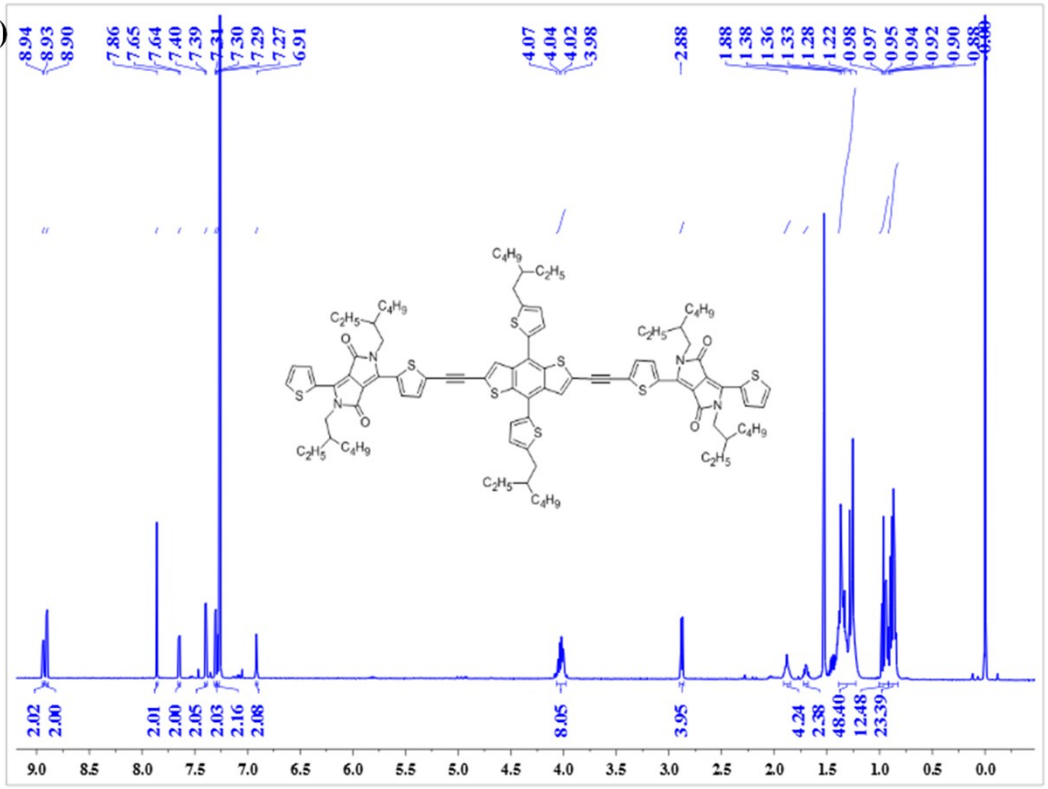


Figure S3. ^{1}H NMR (a) and ^{13}C NMR (c) spectra of DPP-E-BDT in $CDCl_3$. ^{1}H NMR spectrum (b) of the sample after exposure to the light and air for two months.

(a)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1.33
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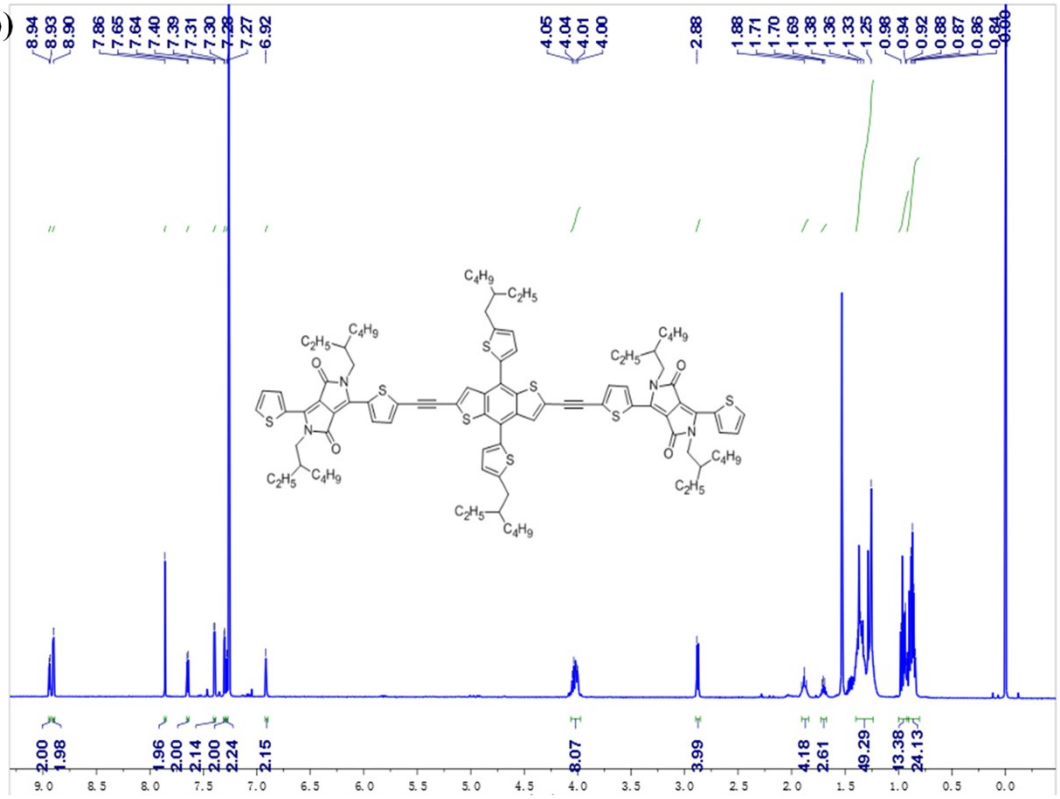
(b)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4.01
4.00
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1.88
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1.69
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1.33
1.25
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0.87
0.86
0.84
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1.98
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2.00
2.24
2.15
8.07
3.99
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6.0
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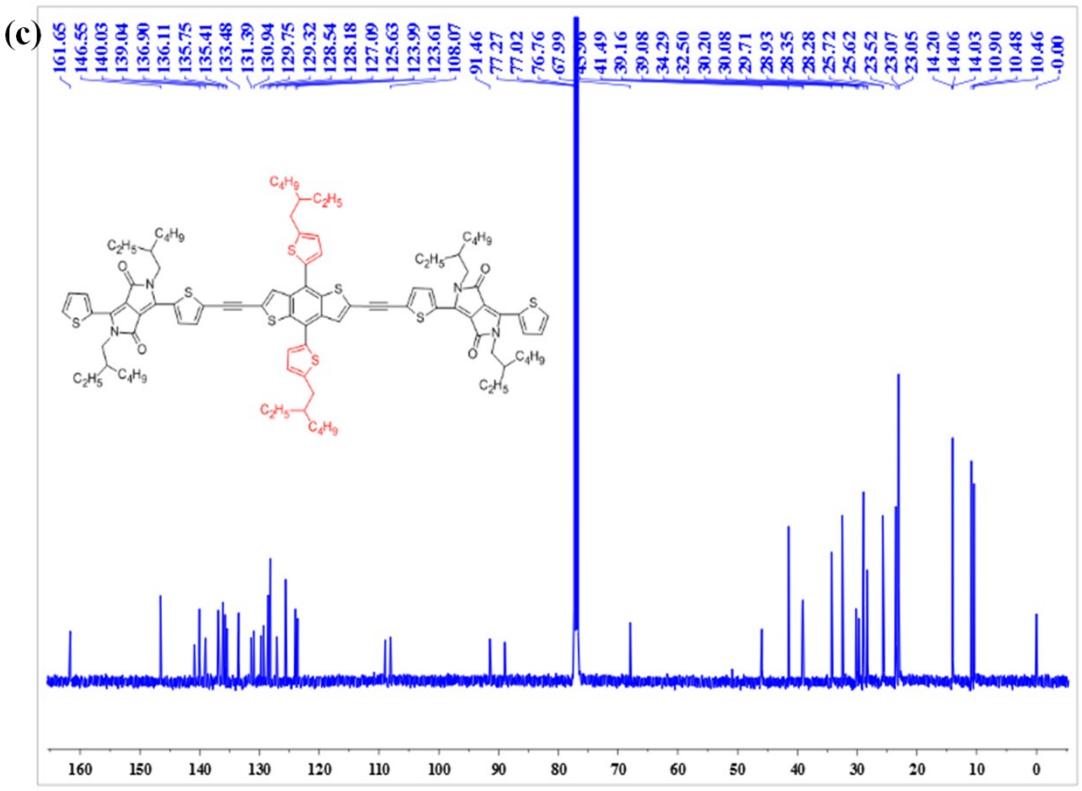

Figure S4. ^{1}H NMR (a) and ^{13}C NMR (c) spectra of DPP-E-BDT-T in $CDCl_3$. ^{1}H NMR spectrum (b) of the sample after exposure to the light and air for two months.

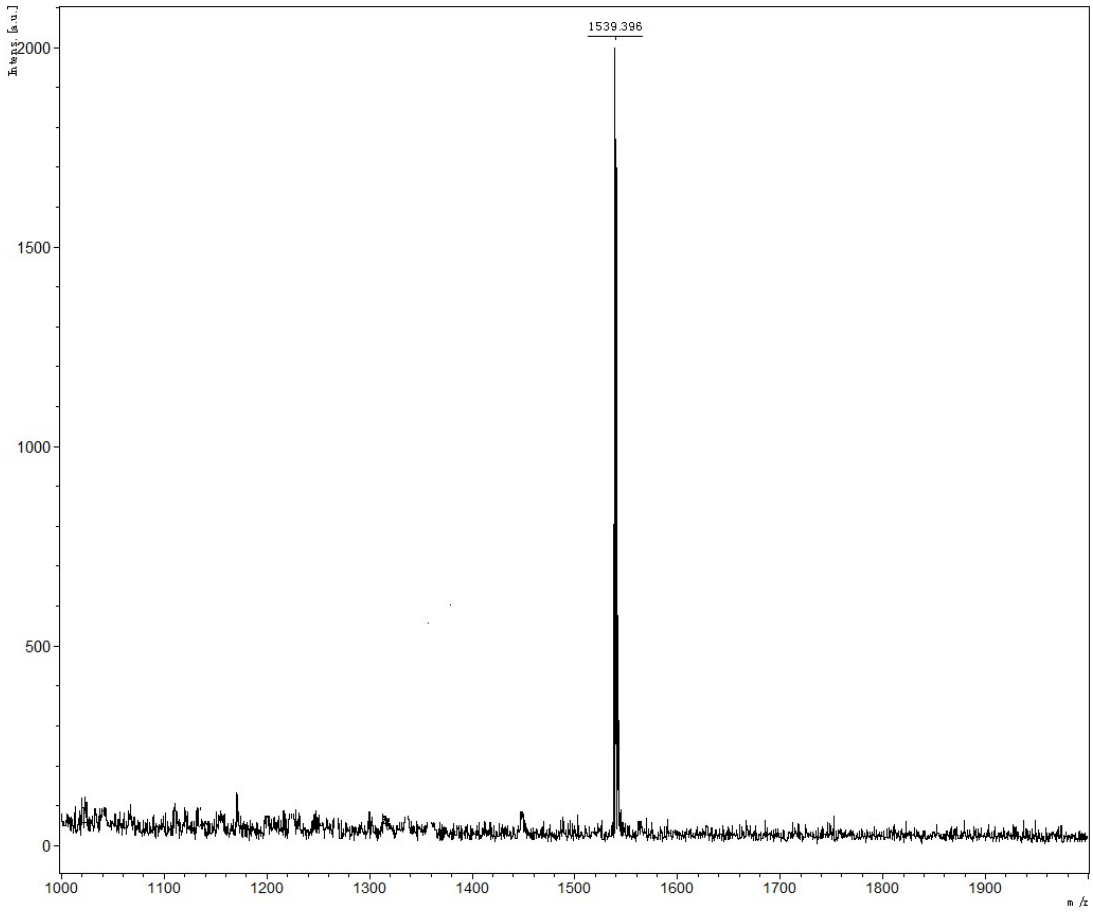

Figure S5. Mass (MALDI-TOF) spectrum of DPP-E-BDT.

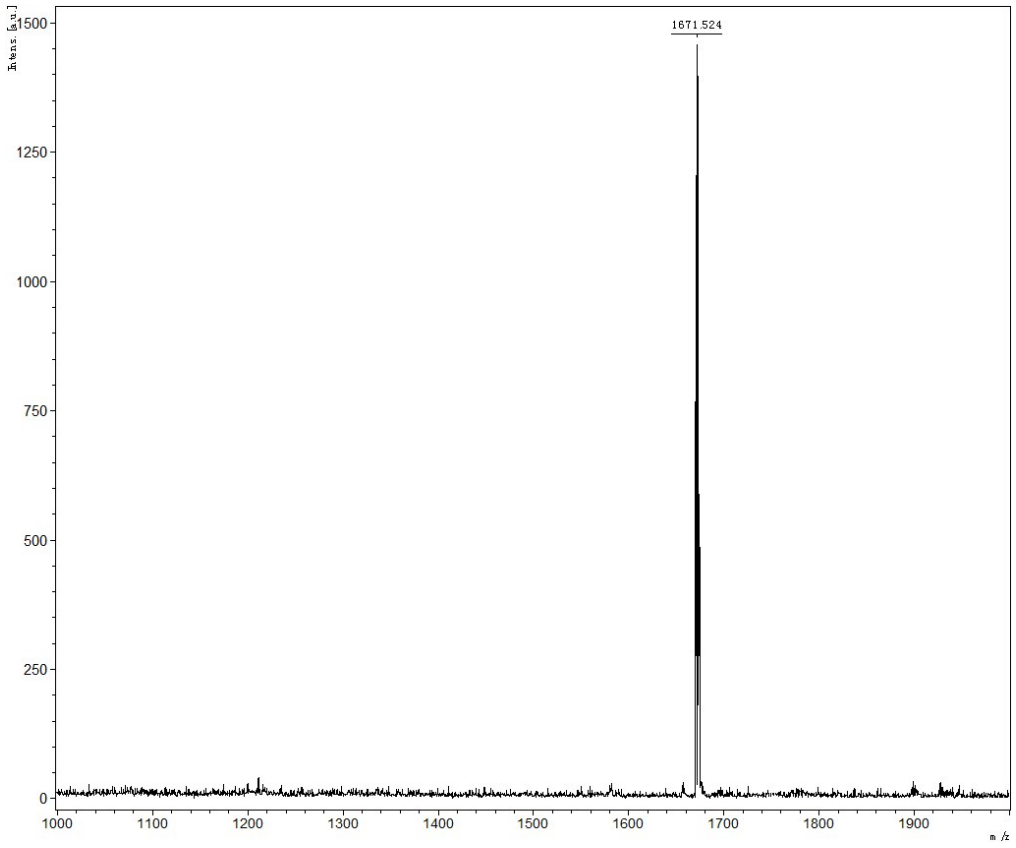

Figure S6. Mass (MALDI-TOF) spectrum of DPP-E-BDT-T.

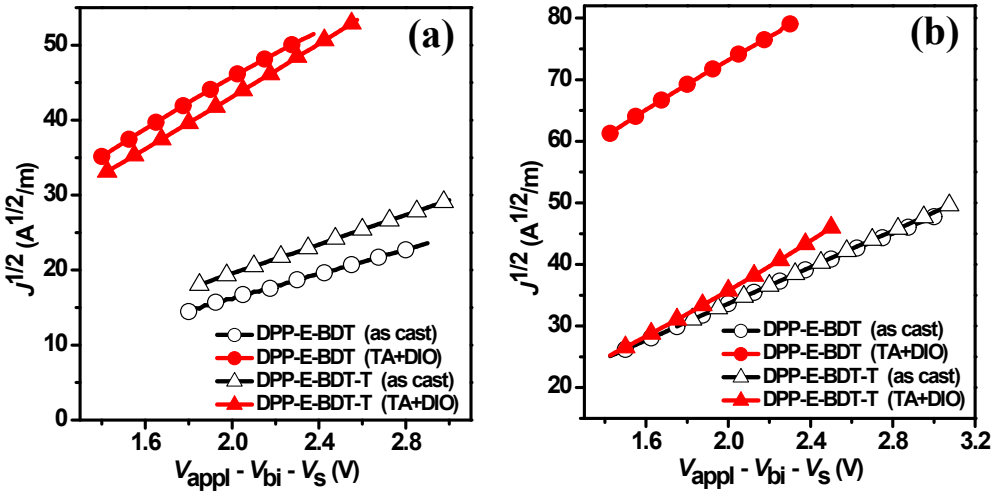

Figure S7. SCLC $J^{1/2}$-V characteristics of DPP-E-BDT and DPP-E-BDT-T based active layers in hole-only (a) and electron-only (b) devices. Hole-only device: ITO/PEDOT:PSS/active layer/MoO3/Al; electron-only device: ITO/ZnO/active layer/PFN/Al.

Table S1. Photovoltaic performances of the OSCs with different D:A ratios, based on the as-cast active layer films.

Donor	D:A ratio	V_{oc} (V)	J_{sc} (mA/cm^2)	FF (%)	PCE (%)
DPP-E-BDT	2:1	0.84	5.59	49.6	2.33
	1:1	0.91	5.81	56.1	2.97
	1:2	0.81	4.23	51.3	1.76
DPP-E-BDT-T	2:1	0.88	4.22	32.9	1.22
	1:1	0.98	5.92	32.9	1.91
	1:2	0.83	1.88	31.8	0.50

Table S2. Comparison of photovoltaic performances of the OSCs based on active layers fabricated with chlorobenzene or $CHCl_3$ as the solvent, where 0.4 v% DIO and thermal annealing at 100 °C for 10 min were applied.

Donor	Solvent	V_{oc} (V)	J_{sc} (mA/cm^2)	FF (%)	PCE (%)
DPP-E-BDT	Chlorobenzene	0.88	7.87	60.4	4.19
	$CHCl_3$	0.92	7.45	54.6	3.74
DPP-E-BDT-T	Chlorobenzene	0.89	10.9	73.6	7.12
	$CHCl_3$	0.89	9.46	68.3	5.75