Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.
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Electronic Supplementary information (ESI):

New π-Conjugated Polymers as Acceptors Designed for all Polymer Solar Cells based on Imide/Amide-Derivatives

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1. The TGA and DSC curves of P1 and P2

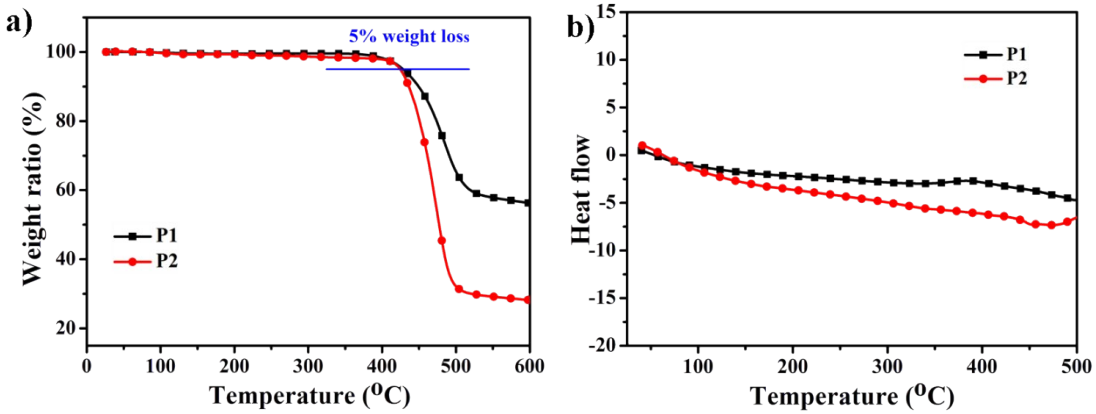


Fig. S1 The TGA curves (a) and DSC curves (b) of **P1** and **P2** (at a heating rate of 10 °C min $^{-1}$ under nitrogen atmosphere).

2. The calculated absorption profiles and molecular conformations of dimers of P1 and P2

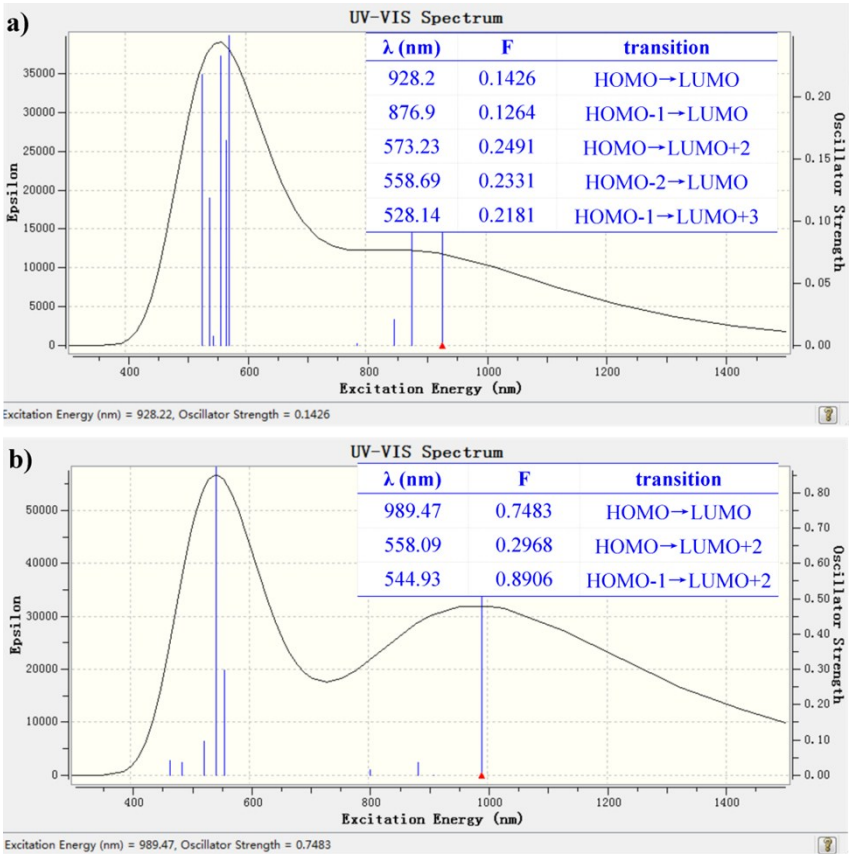


Fig. S2 The absorption profiles of dimers of **P1** (a) and **P2** (b) by quantum-chemical calculations (B3LYP/6-31G).

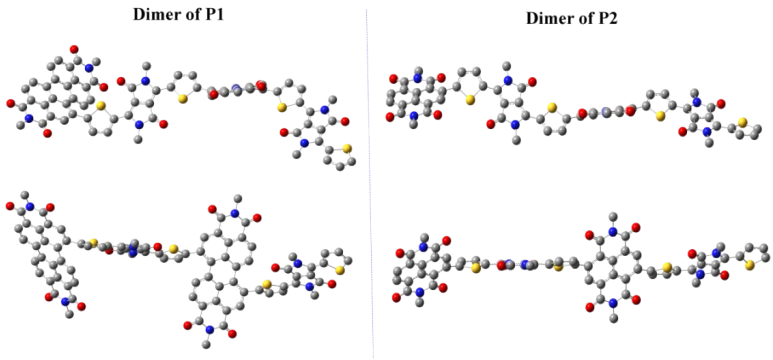


Fig. S3 The diagram of molecular conformations of dimers of **P1** and **P2** by quantum-chemical calculations.

3. UV-vis-NIR absorption spectra of donor, acceptors and blending films

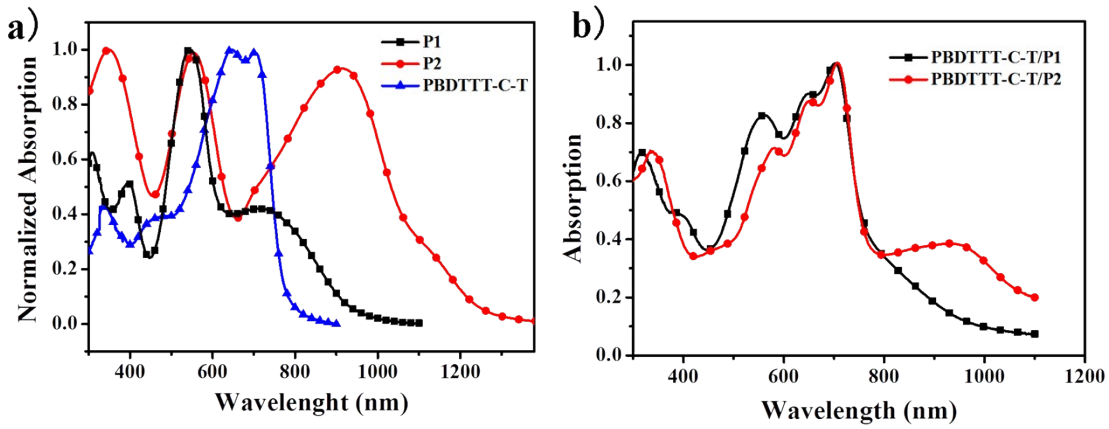


Fig. S4 a) Normalized UV-vis-NIR absorption spectra of thin films for **P1**, **P2** and PBDTTT-C-T; b) Absorptions of the blend thin films of PBDTTT-C-T:**P1** (*w*/*w* = 1/1) and PBDTTT-C-T:**P2** (*w*/*w* = 1/1).

4. The calculated HOMO/LUMO energy levels of DPP, NDI and PDI moieties by DFT

	HOMO	LUMO	Eg
DPP	-4.980	-2.467	2.512
NDI	-7.032	-3.407	3.625
PDI	-5.997	-3.462	2.535

Fig. S5 The diagram of HOMO/LUMO energy levels of DPP, NDI and PDI moieties calculated by DFT (the alkyl chains in *N*-positions were replaced by methyl group).

5. Characteristics of all-PSCs

Table S1 Characteristics of all-PSCs based on blend films of PTB7-Th/**P1** and PTB7-Th/**P2**, PBDTTT-C-T/**P1** and PBDTTT-C-T/**P2**

Donor:Acceptor	*w*/*w*	V_{OC} (V)	J_{SC} (mA cm^{-2})	FF (%)	PCE (%) [b]
PTB7-Th:**P1** [a]	1:1	0.67	6.24	43.75	1.83 (1.78)
PBDTTT-C-T:**P1**	1:1	0.68	7.06	41.78	2.01 (1.96)
PTB7-Th:**P2** [a]	1:1	0.57	0.93	43.03	0.23 (0.20)
PBDTTT-C-T:**P2**	1:1	0.58	1.16	44.32	0.30 (0.27)

[a] The data were based on 40 devices. [b] Data were provided in "highest (average)" format.

6. Energy level diagrams of the materials in all-PSCs

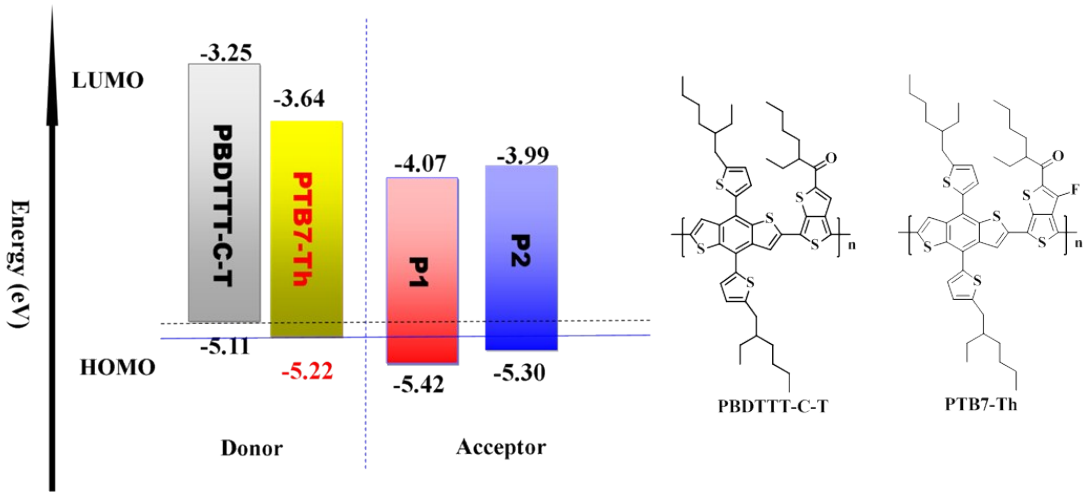
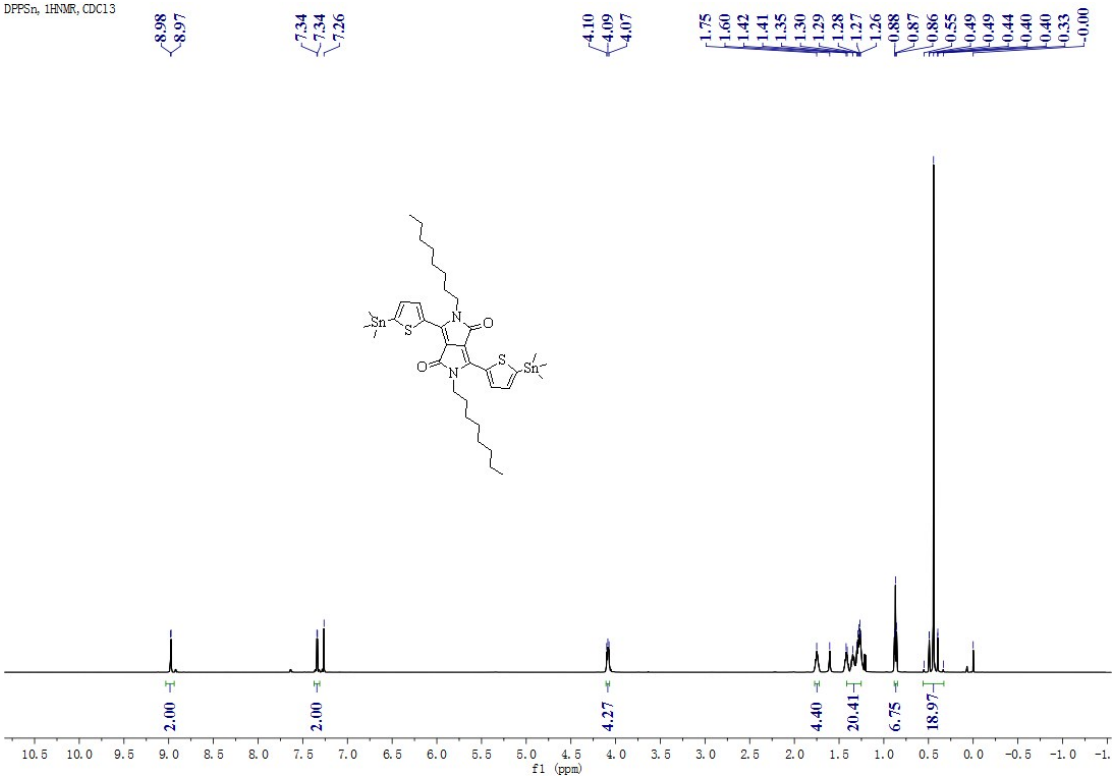
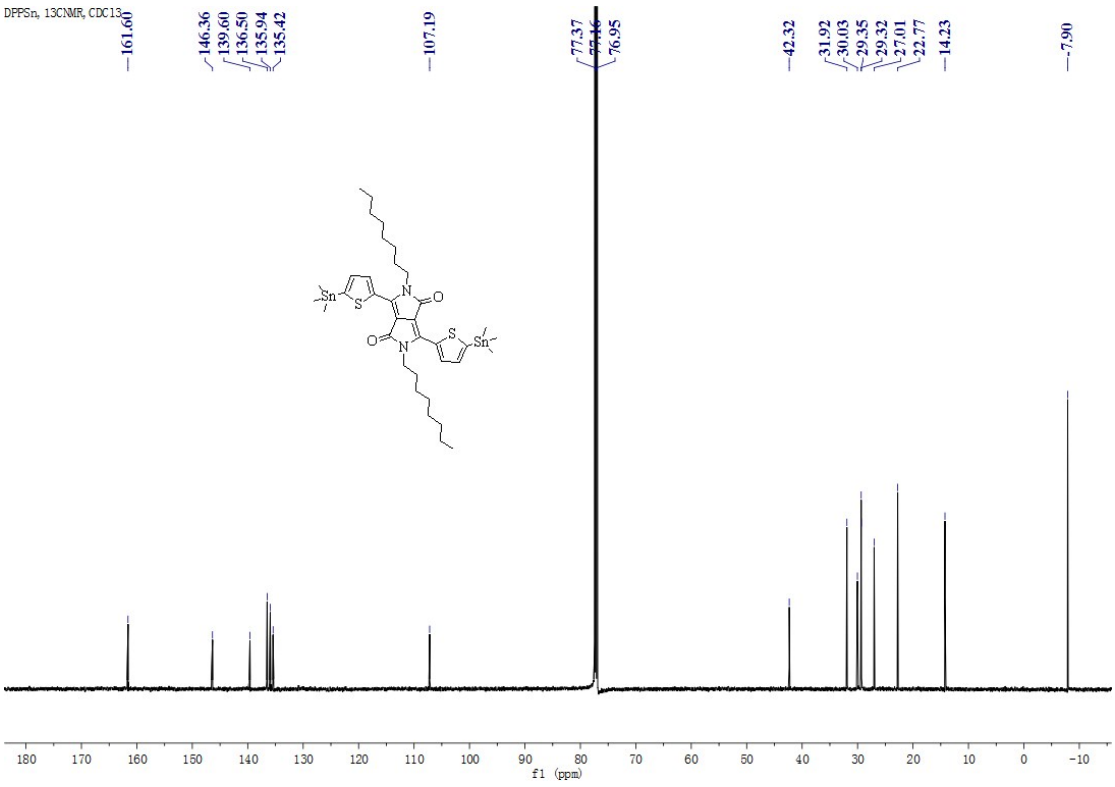


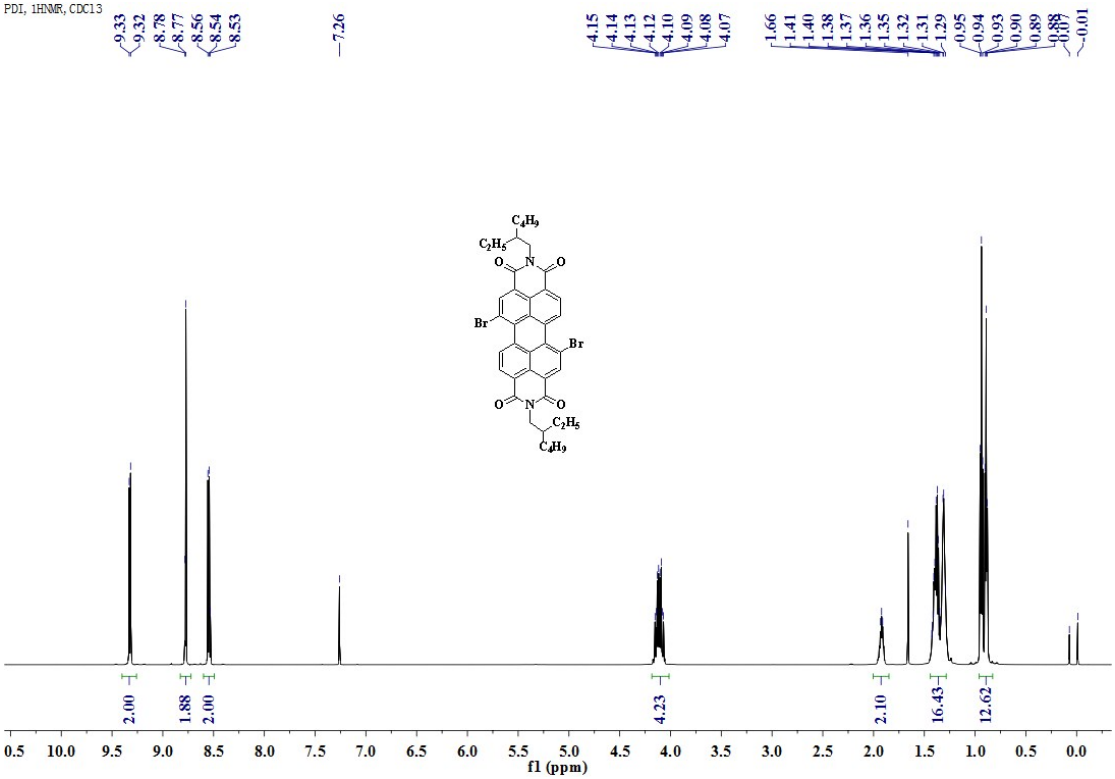
Fig. S6 Energy level diagrams of the materials in PTB7-Th[a]/ (**P1** or **P2**) and PBDTTT-C-T/(**P1** or **P2**) based photovoltaic devices.

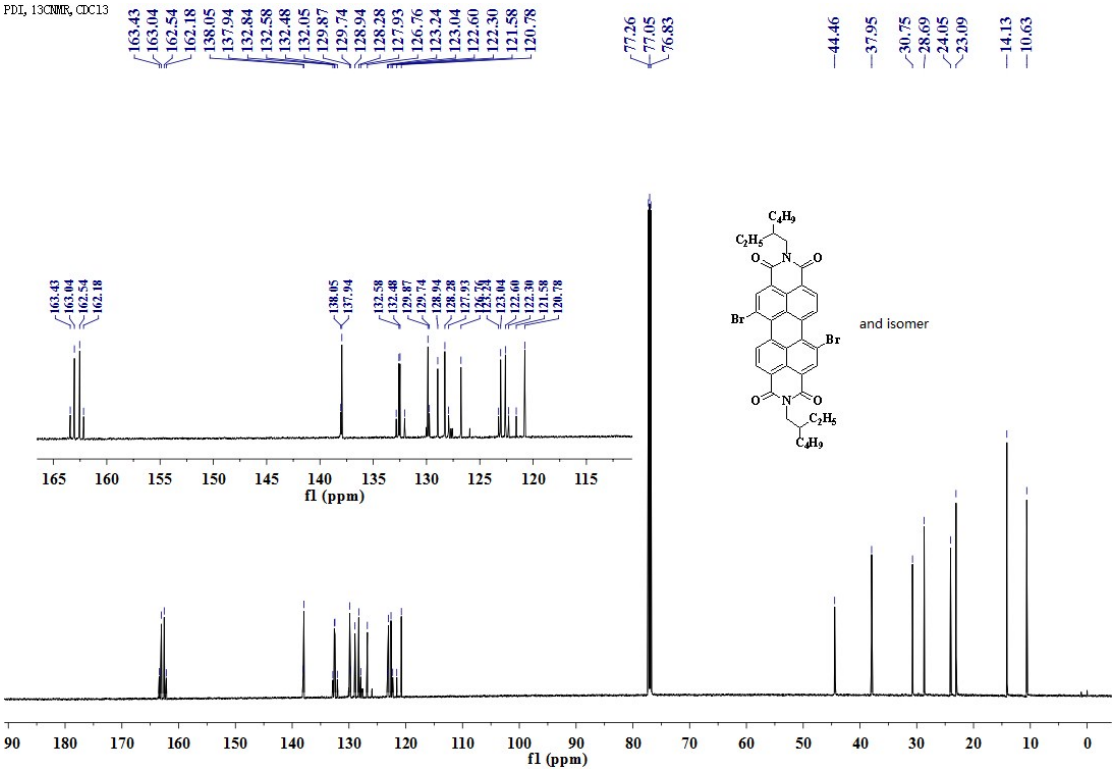
[a] L. Ye, C. Zhou, H. Meng, H. Wu, C. Lin, H. Liao, S. Zhang and J. Hou, J. Mater. Chem. C, 2015, 3, 564-569.

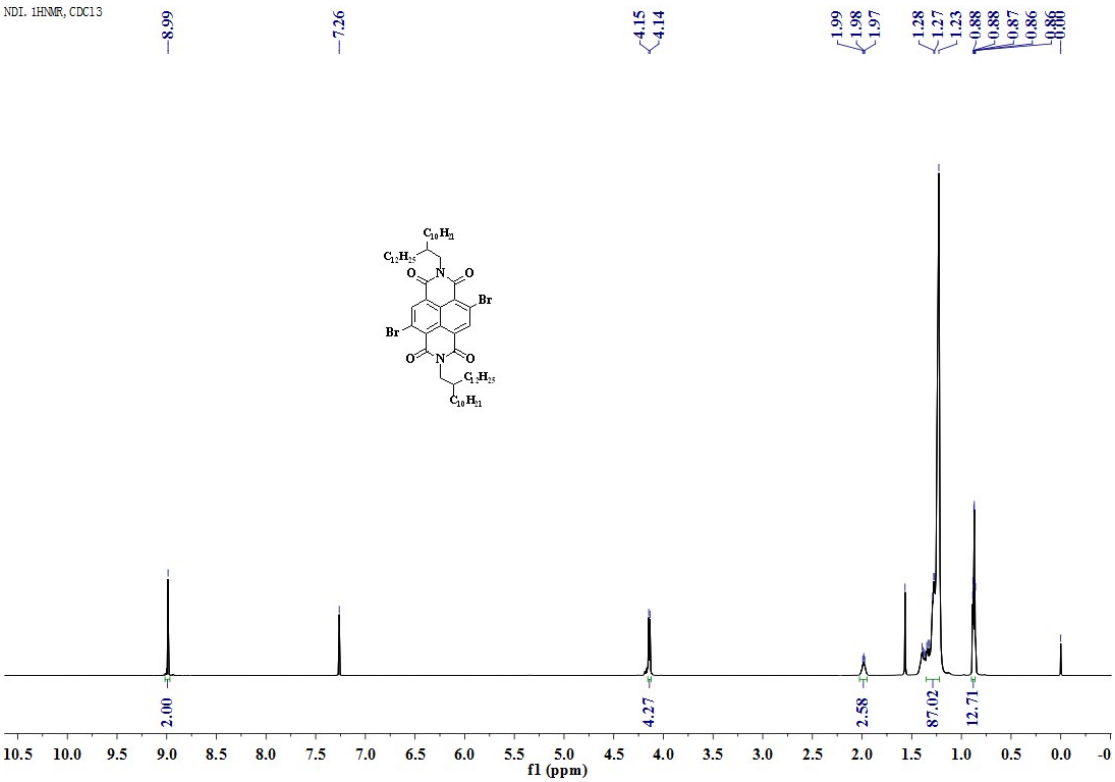
7. ^{1}H NMR and ^{13}C NMR spectra

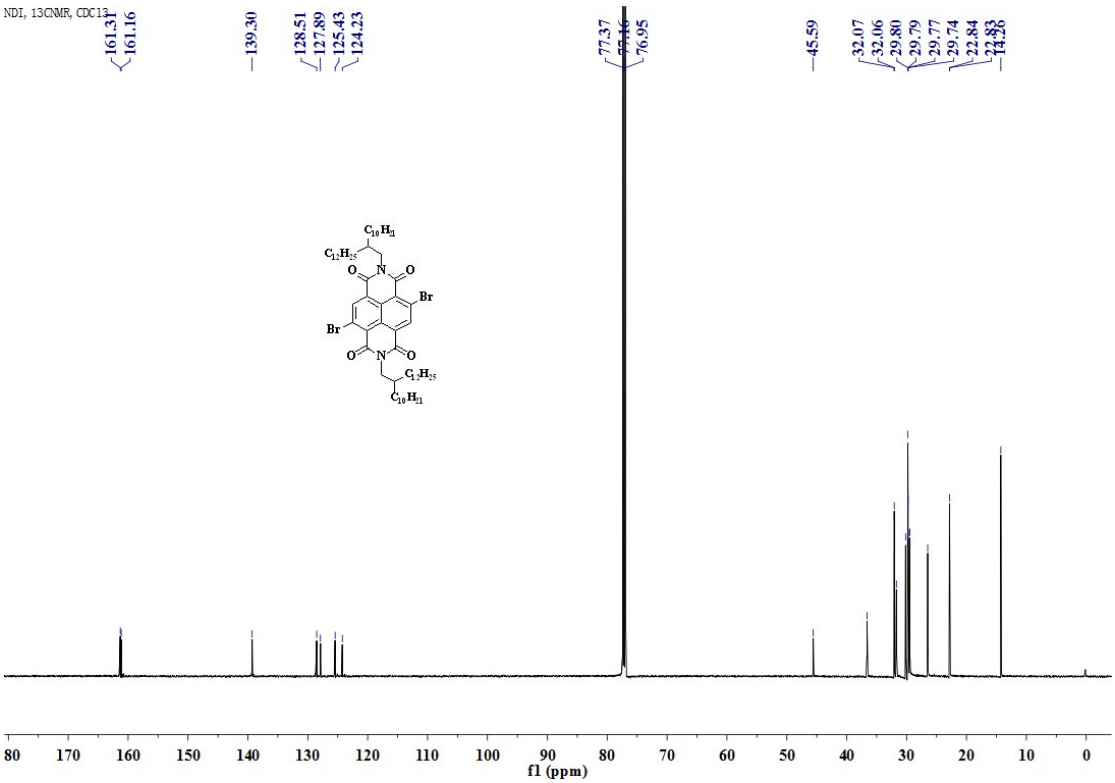


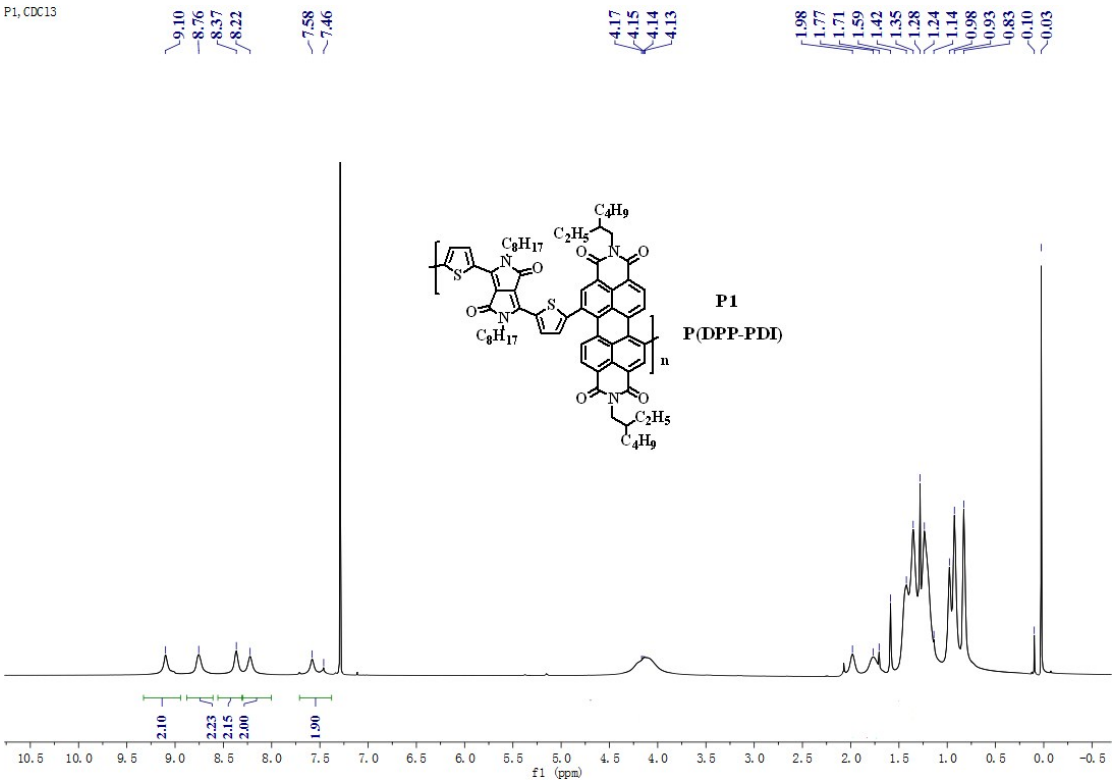


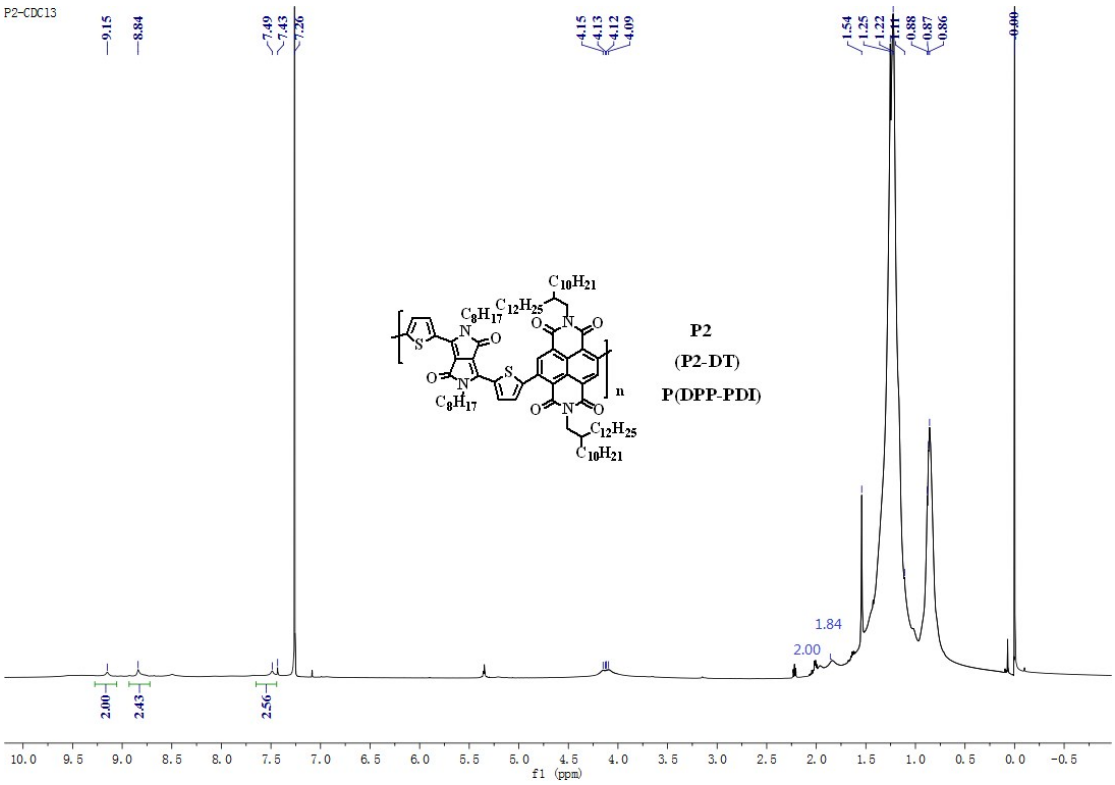

PDI, 1HNMR, CDCl3
9.33
9.32
8.78
8.77
8.56
8.54
8.53
7.26
4.15
4.14
4.13
4.12
4.10
4.09
4.08
4.07
1.66
1.41
1.40
1.38
1.37
1.36
1.35
1.32
1.31
1.29
0.95
0.94
0.93
0.90
0.89
0.88
0.07
-0.01
2.00
1.88
2.00
4.23
2.10
16.43
12.62
f1 (ppm)


PDI, 13CNMR, CDCl3
163.43
163.04
162.54
162.18
138.05
137.94
132.84
132.58
132.48
132.05
129.87
129.74
128.94
128.28
127.93
126.76
123.24
123.04
122.60
122.30
121.58
120.78
77.26
77.05
76.83
44.46
37.95
30.75
28.69
24.05
23.09
14.13
10.63
and isomer
f1 (ppm)


NDI. 1HNMR, CDC13
8.99
7.26
4.15
4.14
1.99
1.98
1.97
1.28
1.27
1.23
0.88
0.88
0.87
0.86
2.00
4.27
2.58
87.02
12.71
f1 (ppm)


NDI, 13CNMR, CDC13
161.37
161.16
139.30
128.51
127.89
125.43
124.23
77.37
76.95
45.59
32.07
32.06
29.80
29.79
29.77
29.74
22.84
14.26
f1 (ppm)


P1, CDC13
9.10
8.76
8.37
8.22
7.58
7.46
4.17
4.15
4.14
4.13
1.98
1.77
1.71
1.59
1.42
1.35
1.28
1.24
1.14
0.98
0.93
0.83
0.10
0.03
P1
P(DPP-PDI)
2.10
2.23
2.15
2.00
1.90
f1 (ppm)


P2-CDC13
9.15
8.84
7.49
7.43
7.26
4.15
4.13
4.12
4.09
1.54
1.25
1.22
0.88
0.87
0.86
0.00
P2
(P2-DT)
P(DPP-PDI)
1.84
2.00
2.00
2.43
2.56
f1 (ppm)