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Direct C-H arylation synthesis of (DD`AD`DA`) constituted alternating polymers with low bandgaps and their photovoltaic performance

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1. The bulk heterojunction (BHJ) optimization

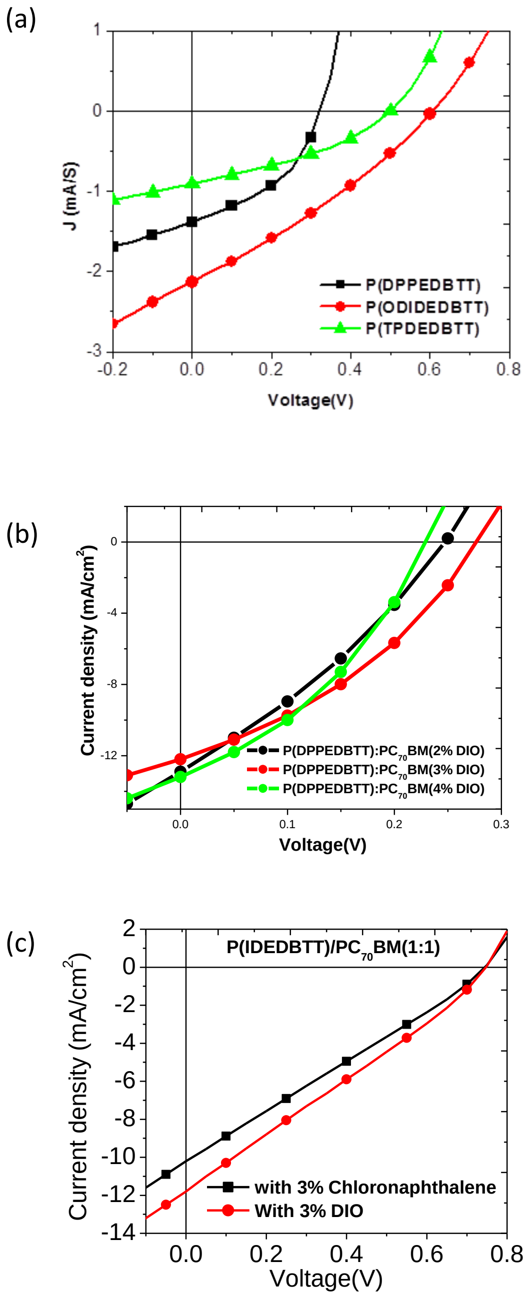

Figure S1. (a) Current density vs. voltage curves for OPV cells with the simple structure of ITO/PEDOT:PSS/polymer:$PC_{60}BM$(1:1)/Al. (b) Current density vs. voltage characteristics of ITO/ZnO/P(DPPEDBTT):$PC_{70}BM$(1:1)/MoO_3/Ag organic photovoltaic devices with different DIO content. (c) Current density vs. voltage characteristics of ITO/ZnO/P(IDEDBTT):$PC_{70}BM$(1:1)/MoO_3/Ag organic photovoltaic devices with different additives.

Table S1 Photovoltaic properties of the PSCs for simple device and inverted device with several ratio of DIO

Polymer : $PC_{60}BM$ (1:1)	**V_{oc}** (V)	**J_{sc}** (mA / cm^2)	**FF**	**PCE** **%**
	ITO/PEDOT:PSS/polymer:$PC_{60}BM$(1:1)/Al			
P(DPPEDBTT)	0.32	1.38	0.42	0.19
P(IDEDBTT)	0.59	2.18	0.30	0.39
P(TPDEDBTT)	0.50	0.90	0.35	0.16
DIO ratio (%)	**ITO/ZnO/P(DPPEDBTT):$PC_{70}BM$(1:1)/MoO_3/Ag**			
2	0.25	12.89	0.31	0.98
3	0.28	12.20	0.36	1.20
4	0.23	13.24	0.36	1.10
Additive 3% ratio	**ITO/ZnO/P(IDEDBTT):$PC_{70}BM$(1:1)/MoO_3/Ag**			
DIO	0.73	11.75	0.27	2.36
Chloronaphthalene	0.74	10.25	0.26	1.98

2. Absorption Coefficient spectra

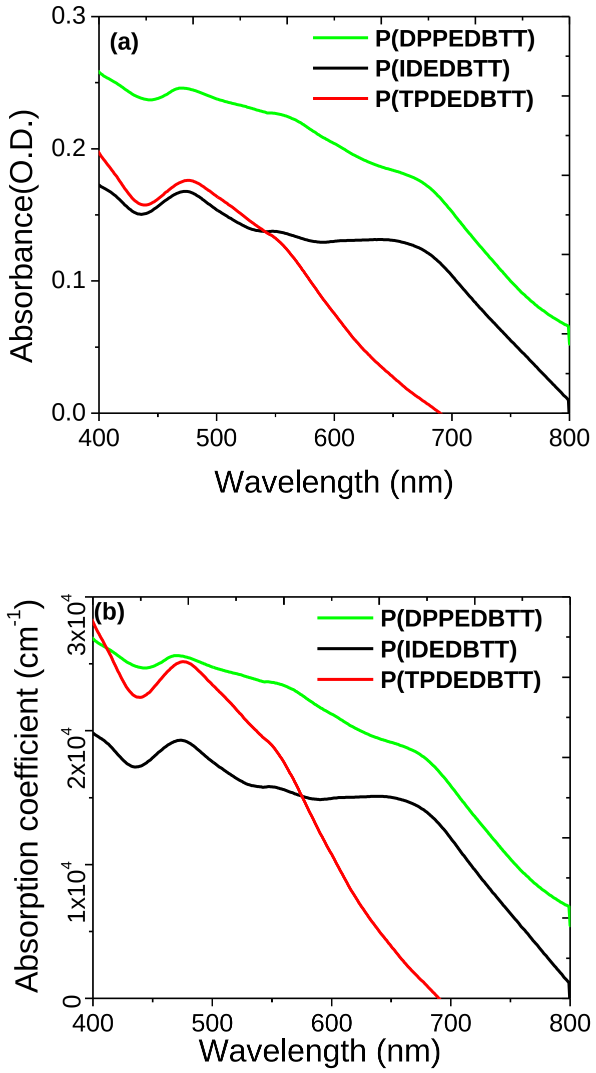

Figure S2. The BHJ films absorption spectra (a) and the corresponding absorption coefficient spectra (b).

3. ^{1}H and ^{13}C NMR spectra of Monomer

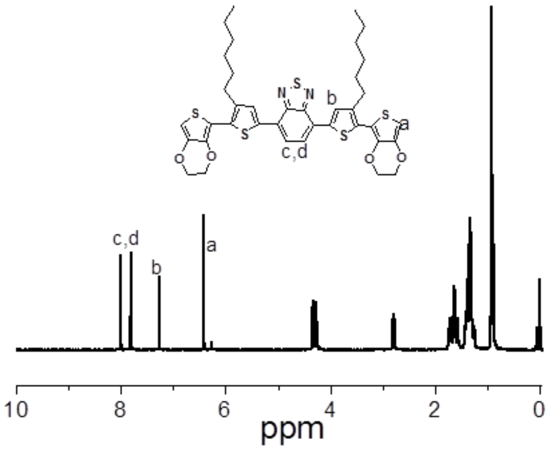

Figure S3. ^{1}H NMR spectrum of Compound 3.

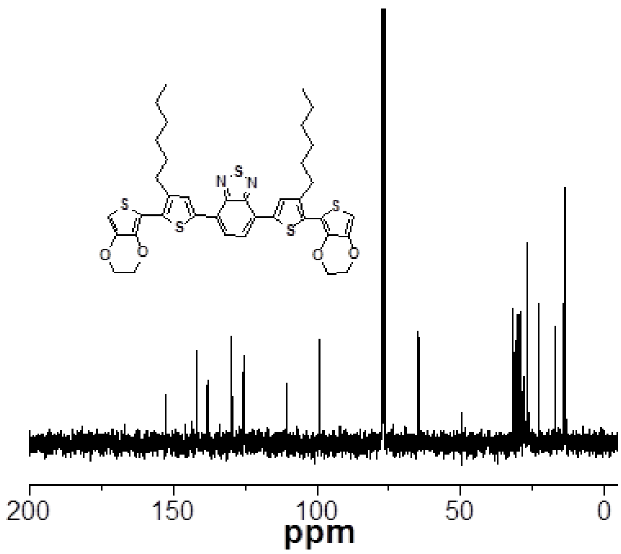

Figure S4. ^{13}C NMR spectrum of Compound 3.

4. [1]H NMR spectra of polymers

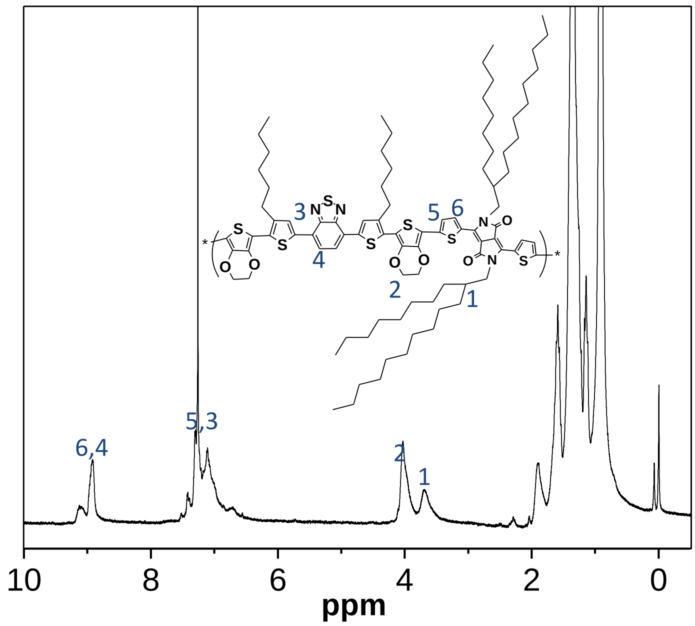

Figure S5. ^{1}H NMR spectrum of P(DPPEDBTT).

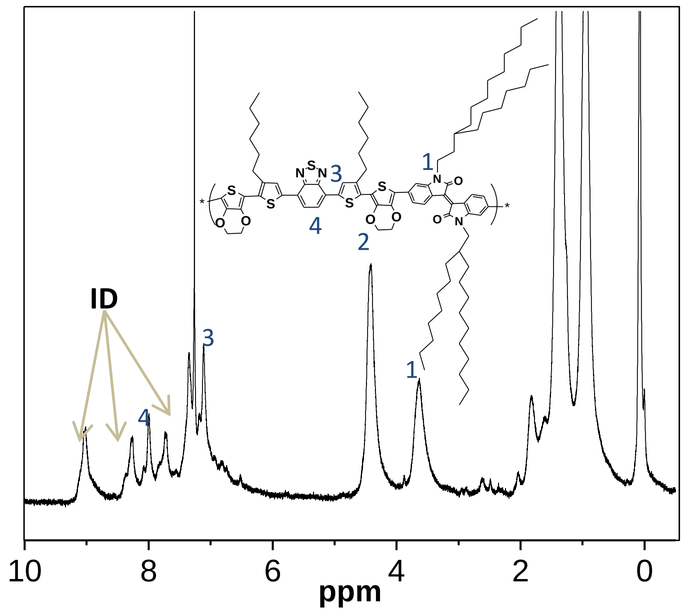

Figure S6. ^{1}H NMR spectrum of P(IDEDBTT).

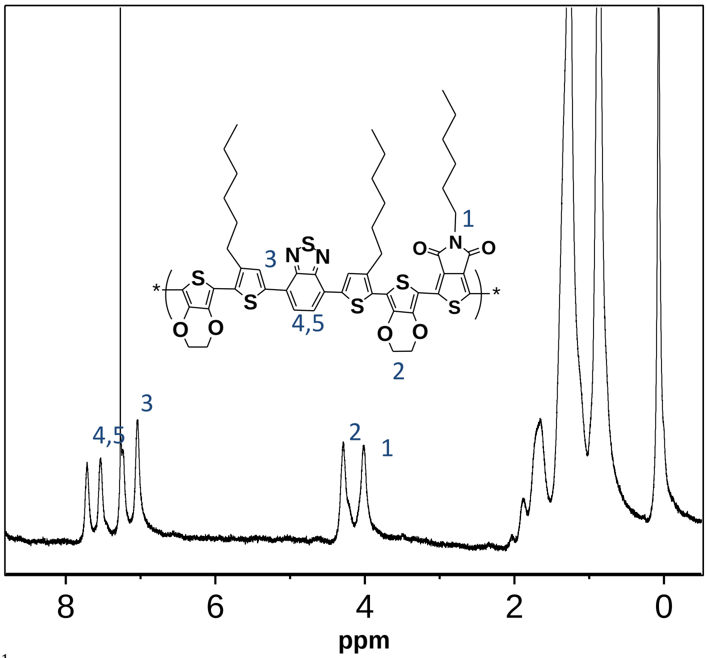

Figure S7. [1]H NMR spectrum of P(TPDEDBTT).