Supplementary Information:

Fluorinated low band gap copolymer based on dithienosilole-benzothiadiazole for high-performance photovoltaic device

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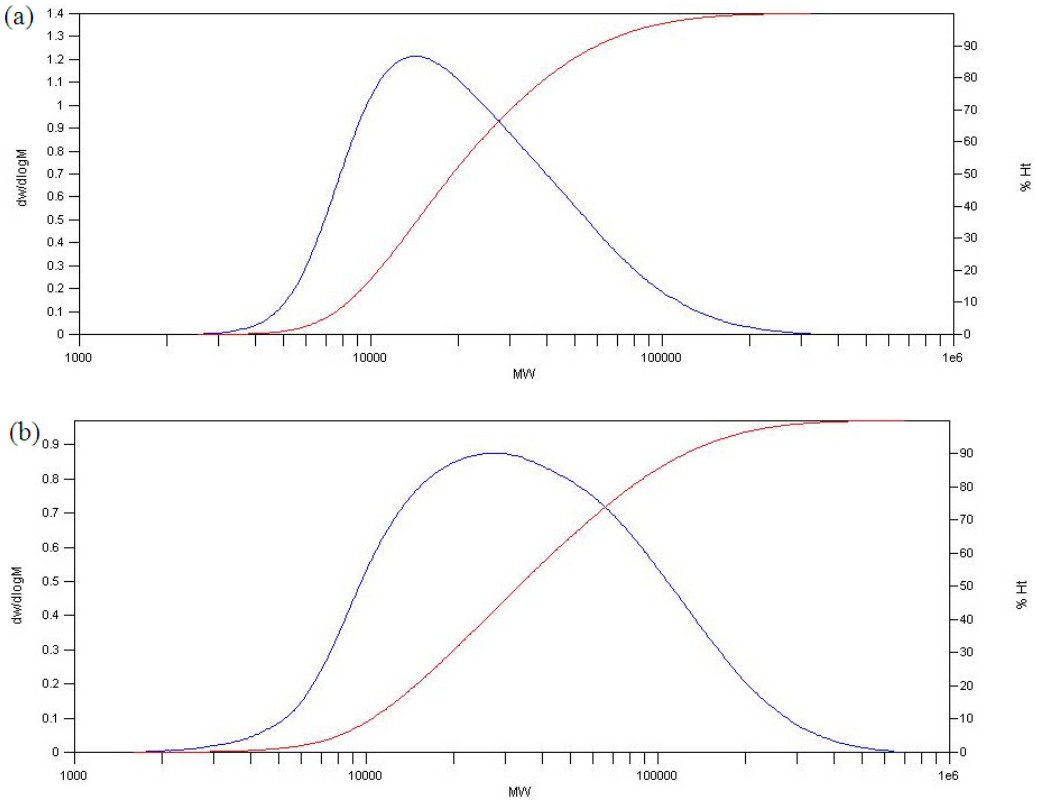

Figure S1. M_w distribution plots of PDTSBT-F (a) and PDTSBT (b), respectively.

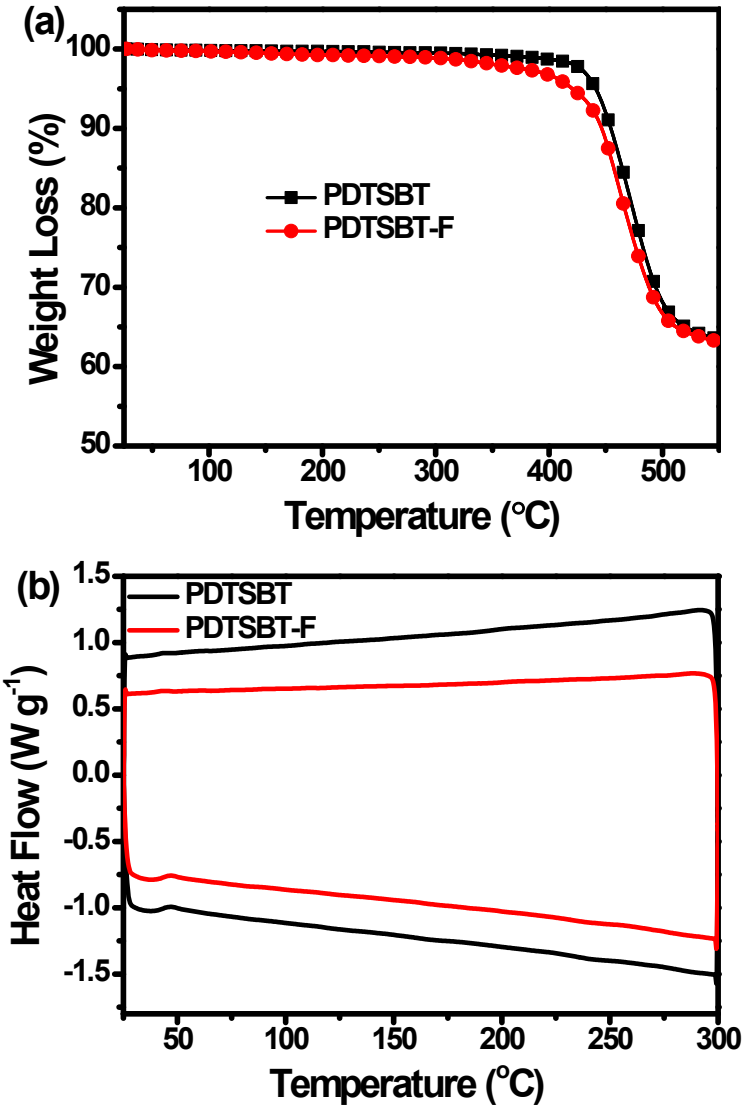

Figure S2. (a) TGA curves of PDTSBT-F and PDTSBT under nitrogen atmosphere at a heating rate of 10 °C min^{-1}. (b) DSC curves of both polymers under nitrogen atmosphere (heating and cooling rate of 10°C min^{-1}).

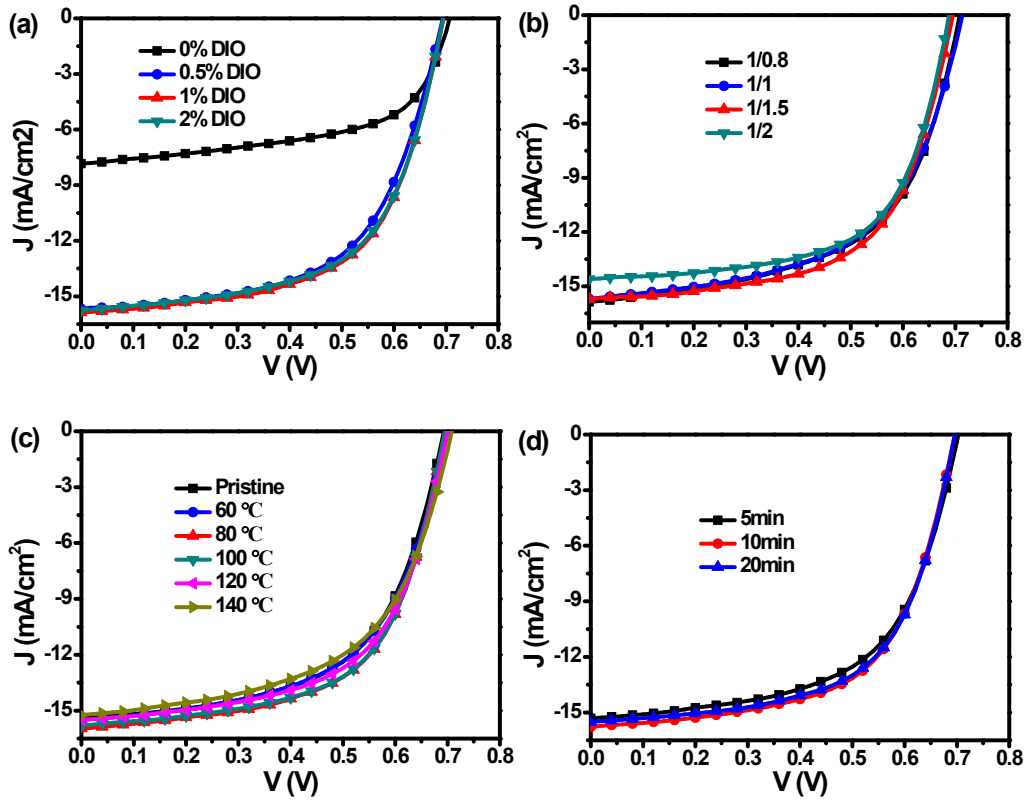

Figure S3. J–V characteristics of PDTSBT-F/$PC_{71}BM$ devices (a) different DIO volume (1/1.5 w/w), (b) different D/A ratio (1% DIO) with thermal annealing at 80 °C for 10min, respectively. (c) different thermal annealed temperature for 10min and (d) different thermal annealed time at 80 °C (1/1.5 w/w , 1% DIO), respectively.

Table S1. Photovoltaic performance of PDTSBT-F devices under different condition.

Condition	Variable	J_{sc}	V_{oc}	FF	PCE (%)
D/A (w/w) = 1/1.5 **DIO/CB (v/v)**	0%	7.84	0.72	0.56	3.16
	0.5%	15.67	0.70	0.58	6.36
	1%	15.87	0.70	0.60	6.67
	2%	15.75	0.70	0.60	6.61
DIO/CB (v/v) = 1% **D/A (w/w)**	1/0.8	15.87	0.72	0.56	6.40
	1/1	15.69	0.72	0.56	6.32
	1/1.5	15.71	0.70	0.60	6.59
	1/2	14.61	0.70	0.61	6.24
D/A (w/w) = 1/1.5 DIO/CB (v/v) = 1% **TA temperature**	Pristine	15.43	0.70	0.57	6.2
	60 °C	15.49	0.72	0.56	6.24
	80 °C	15.96	0.70	0.60	6.70
	100 °C	15.80	0.70	0.60	6.64
	120 °C	15.49	0.72	0.58	6.47
	140 °C	15.24	0.72	0.55	6.04
D/A (w/w) = 1/1.5 DIO/CB (v/v) = 1% **80 °C**	5 min	15.31	0.72	0.57	6.28
	10 min	15.78	0.70	0.60	6.63
	20 min	15.51	0.70	0.60	6.51

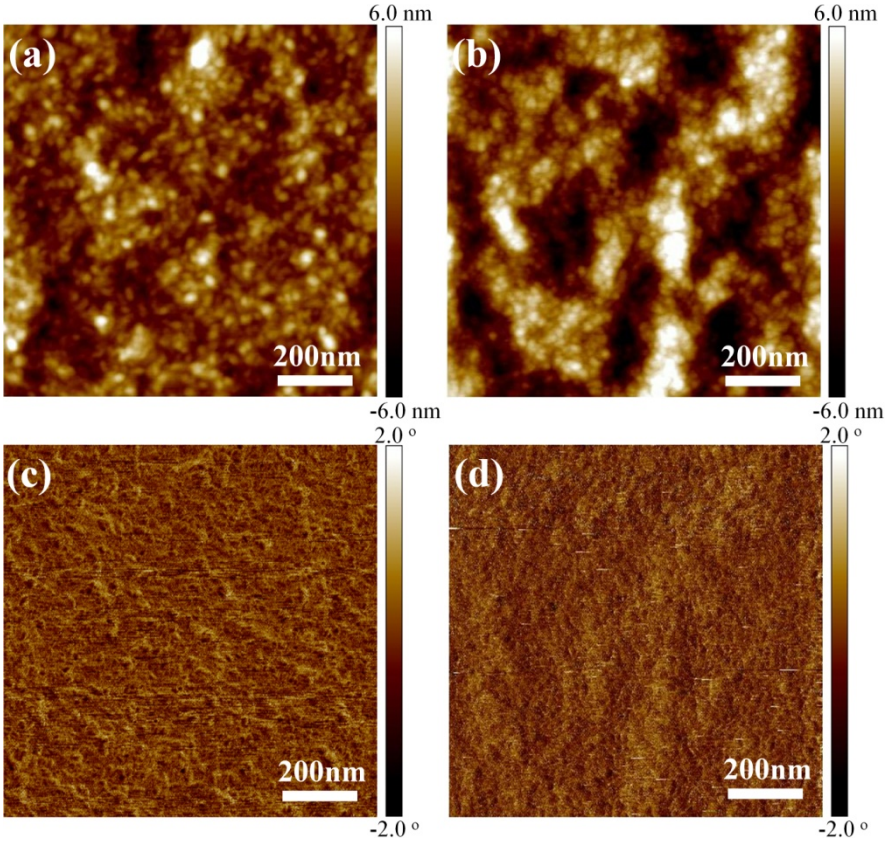

Figure S4. AFM of PDTSBT (a, c) and PDTSBT-F (b, d) composite films with $PC_{71}BM$, respectively. Topography images (a-b) and phase images (c-d).

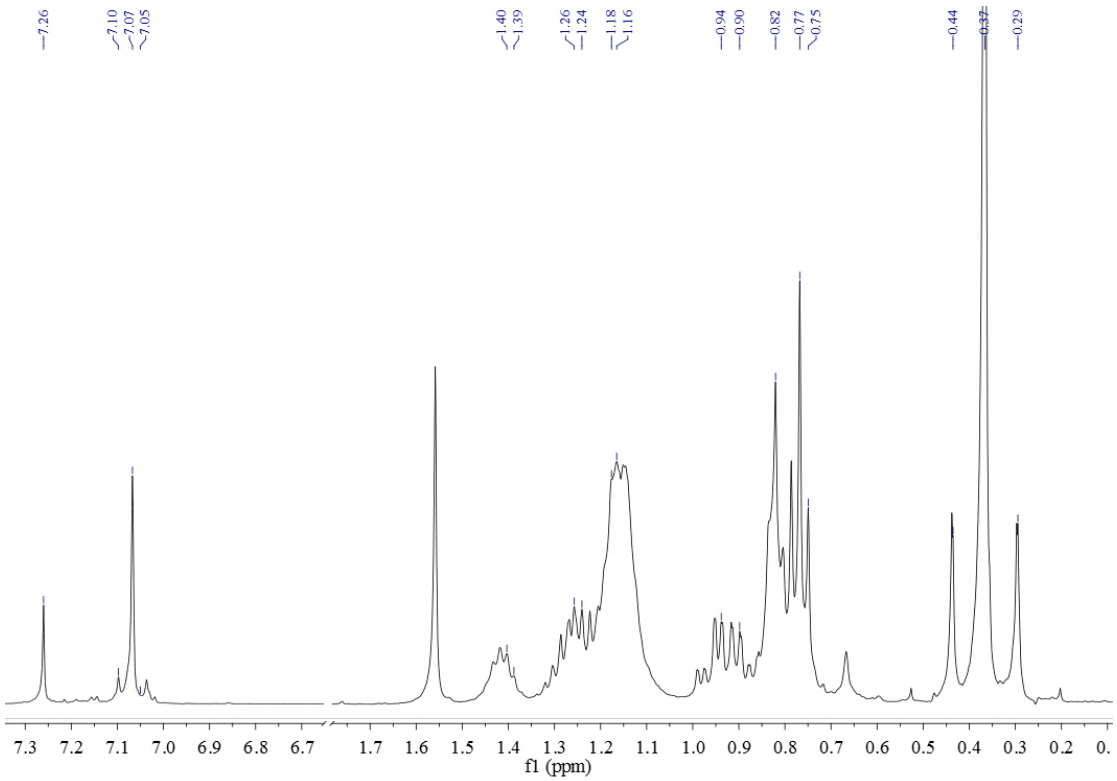

Figure S5. ^{1}H NMR spectrum of M3 monomer.

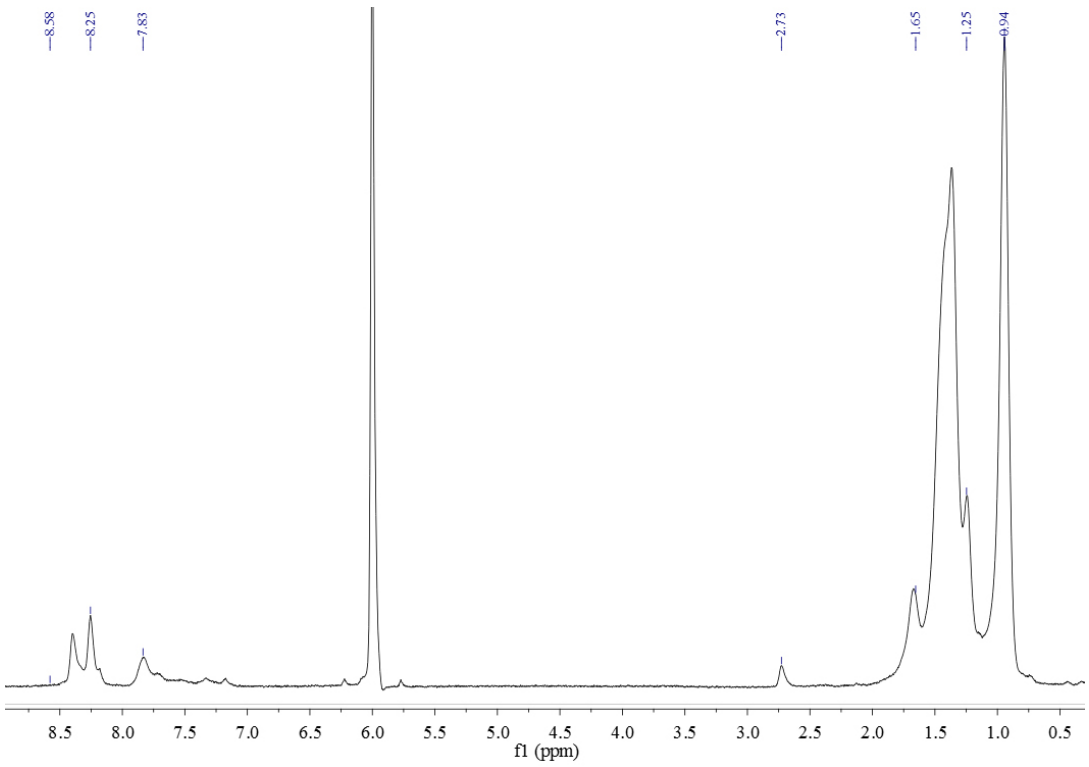

Figure S6. ^{1}H NMR spectrum of PDTSBT-F copolymer.

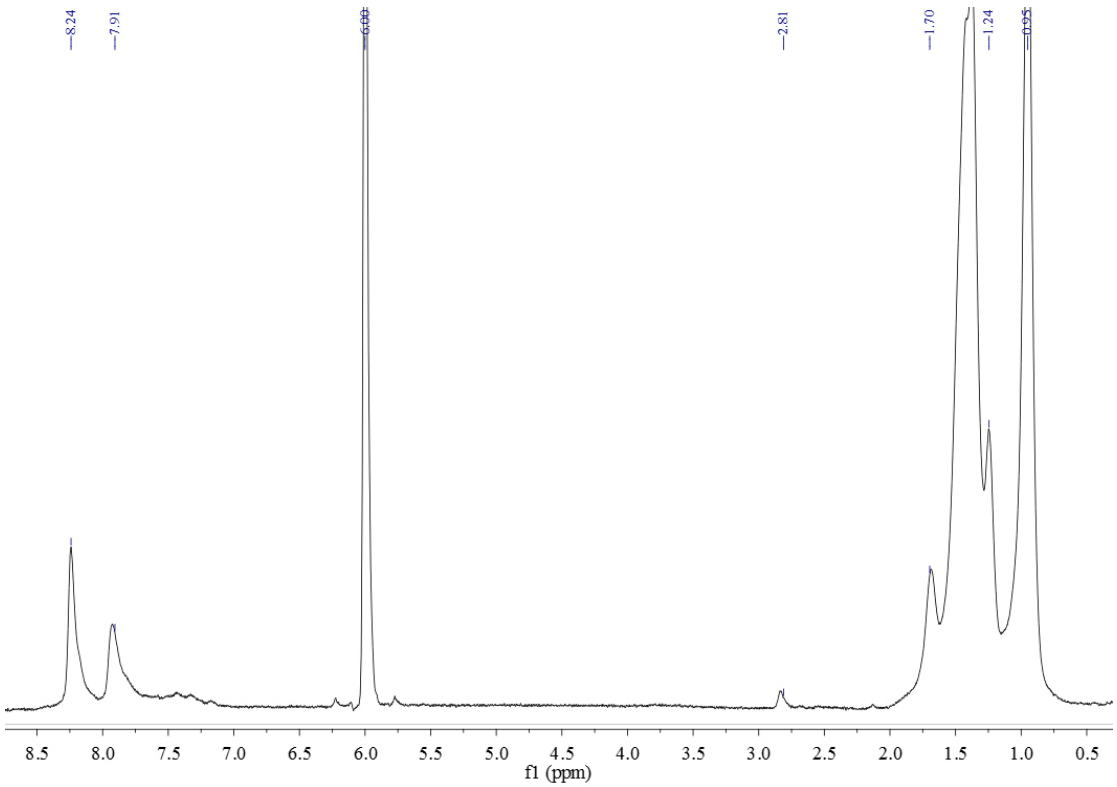

Figure S7. ^{1}H NMR spectrum of PDTSBT copolymer.