Electronic Supplementary Information (ESI)

Novel conjugated polymers based on bis-dithieno[3,2-b;2',3'-d] pyrrole vinylene donor and diketopyrrolpyrrole acceptor: side chain engineering in organic field effect transistors

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1. Analytical Characterization of Materials.

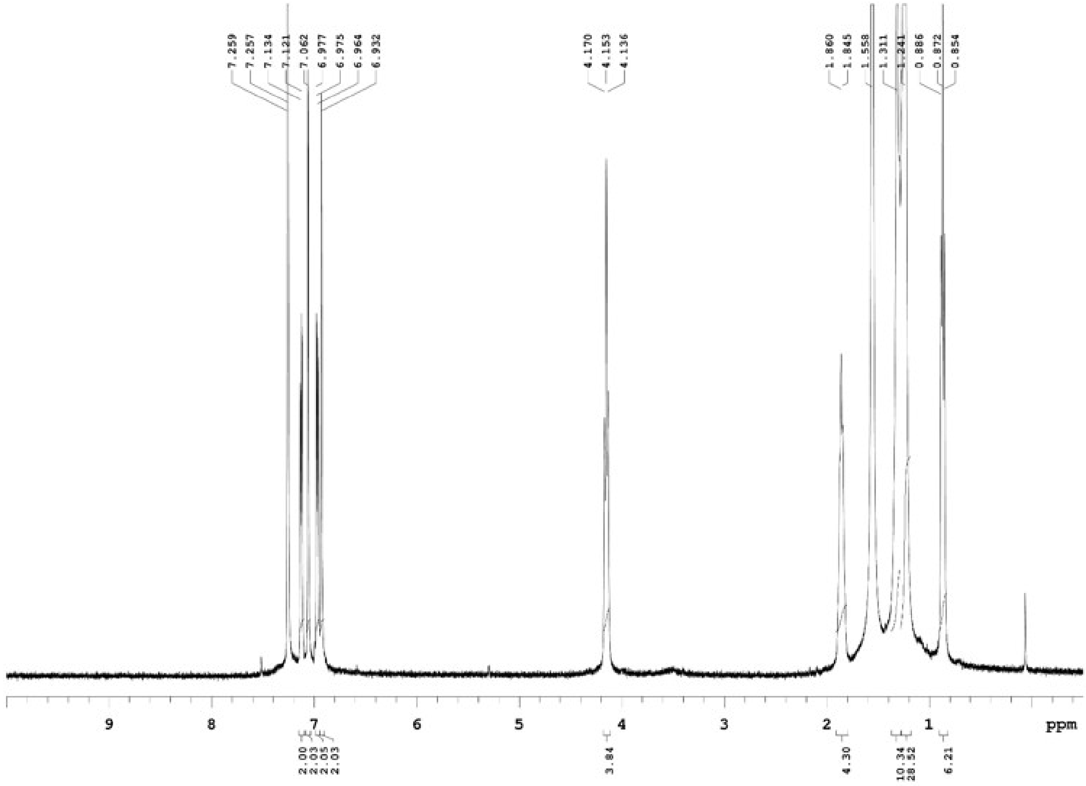

Fig. S1 ^{1}H NMR Spectra of B(C_{12}-DTP)V

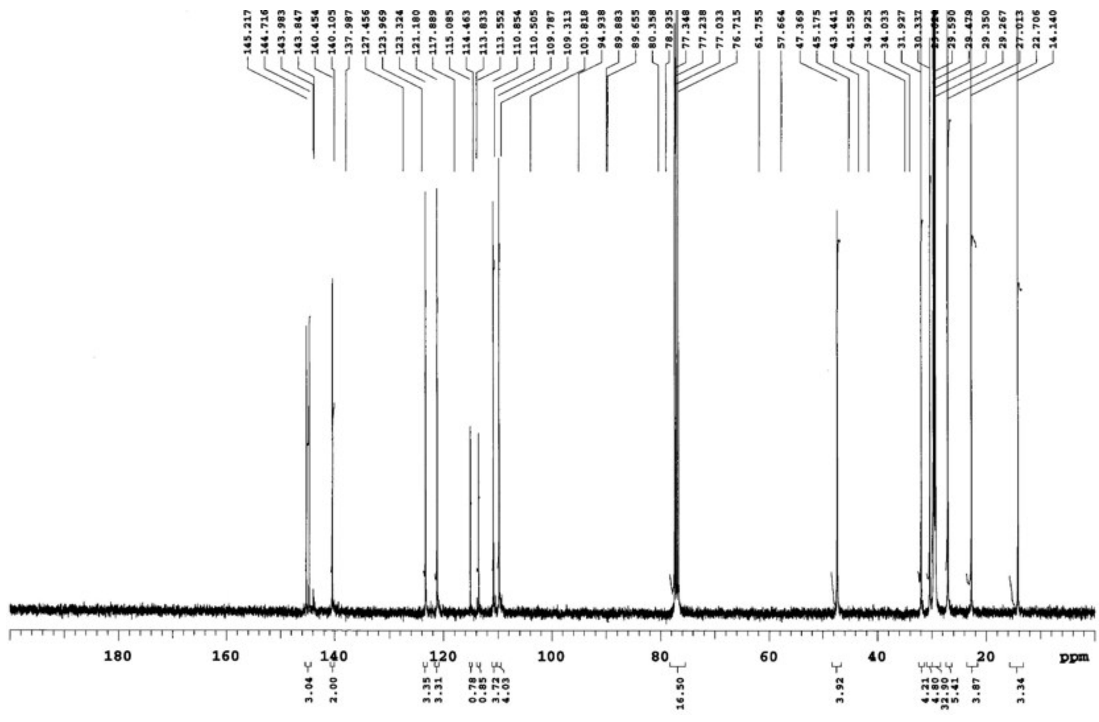

Fig. S2 ^{13}C NMR Spectra of $B(C_{12}\text{-}DTP)V$

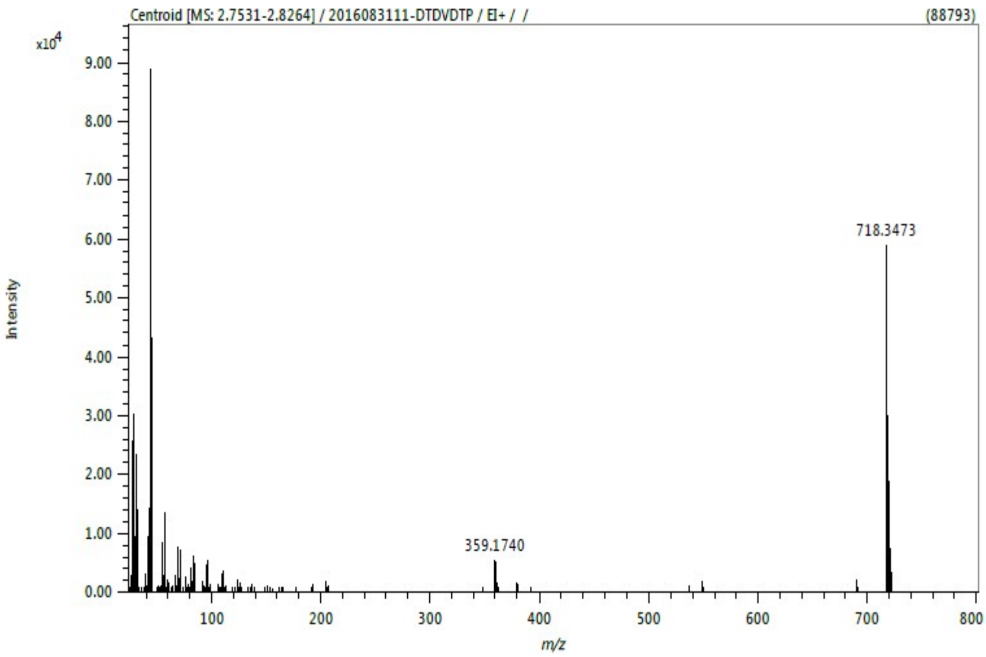

Fig. S3 Mass Spectra of B(C_{12}-DTP)V

2. Characterization of PB(C_{12}DTP)V-DTDPP-C_{12} and PB(C_{12} DTP)V-DTDPP-$C_{12}C_8$.

2.1 Thermalgravimetric Analysis (TGA)

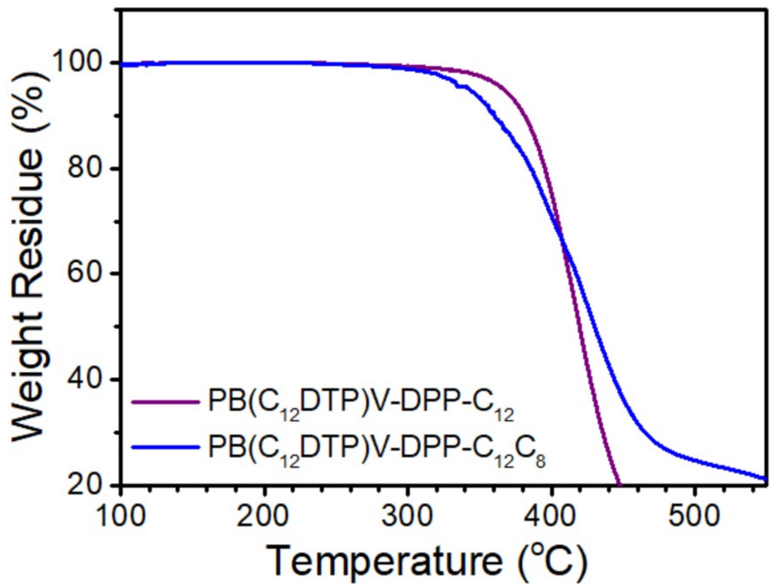

Fig. S4 Thermogravimetric analysis of PB(C_{12}DTP)V-DTDPP-C_{12} and PB(C_{12}DTP)V-DTDPP-$C_{12}C_8$ at a ramping rate of 10 ^{o}C min^{-1}.

2.2 Differential Scanning Calorimetry (DSC)

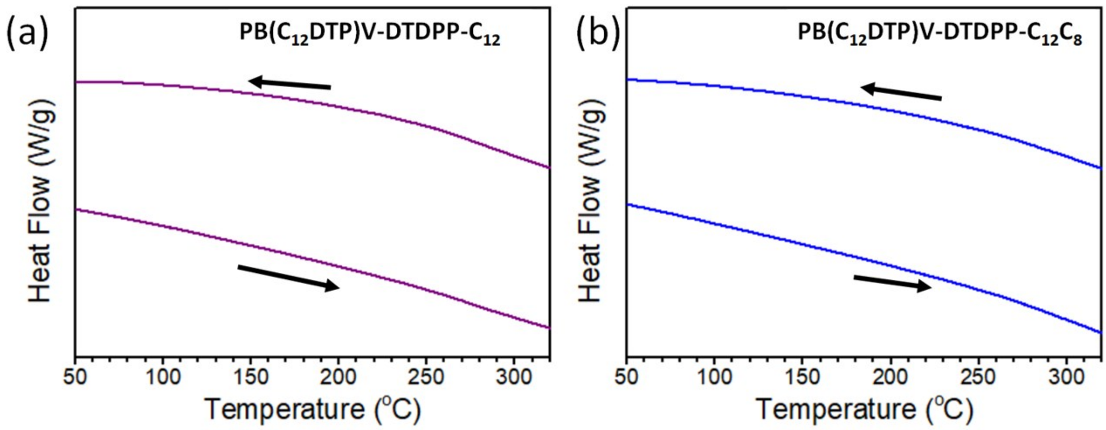

Fig. S5 DSC thermograms of PB(C_{12}DTP)V-DTDPP-C_{12} and PB(C_{12}DTP)V-DTDPP-$C_{12}C_8$ polymers.

2.3 AFM analysis

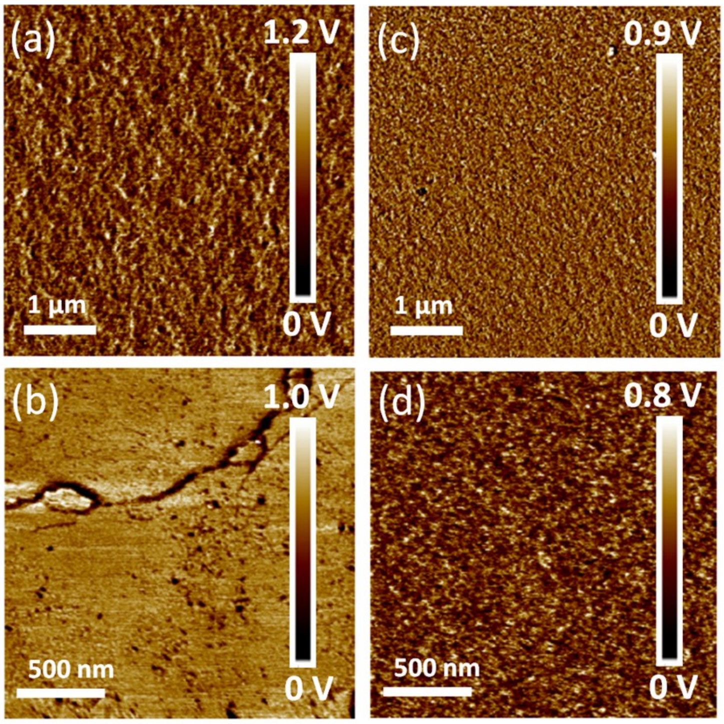

Fig. S6 Tapping-mode AFM phase images of (a, b) PB(C_{12}DTP)V-DTDPP-C_{12} film after annealing at 220 ^oC and (c, d) PB(C_{12}DTP)V-DTDPP-$C_{12}C_8$ film after annealing at 180 ^oC. Thin film was fabricated by 1,2-dichlorobenzene with spin rate 2000 rpm.

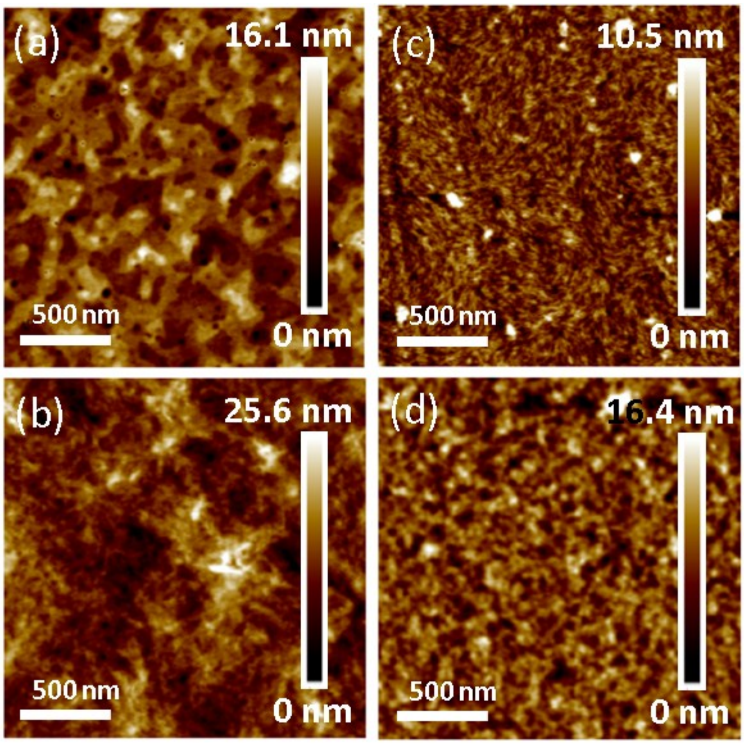

Fig. S7 Tapping-mode AFM height images of (a, b) PB(C_{12}DTP)V-DTDPP-C_{12} film after annealing at 220 ^{o}C and (c, d) PB(C_{12}DTP)V-DTDPP-$C_{12}C_8$ film after annealing at 180 ^{o}C. PB(C_{12}DTP)V-DTDPP-C_{12} film was fabricated by (a) chlorobenzene with spin rate 2500 rpm (R_t = 2.49 nm), and (b) 1,2-dichlorobenzene with spin rate 1500 rpm (R_t = 4.17 nm). PB(C_{12}DTP)V-DTDPP-$C_{12}C_8$ film was fabricated by (c) chlorobenzene with spin rate 2500 rpm (R_t = 1.64 nm), and (d)1,2-dichlorobenzene with spin rate 1500 rpm (R_t = 2.66 nm).

2.4 GIXD measurements

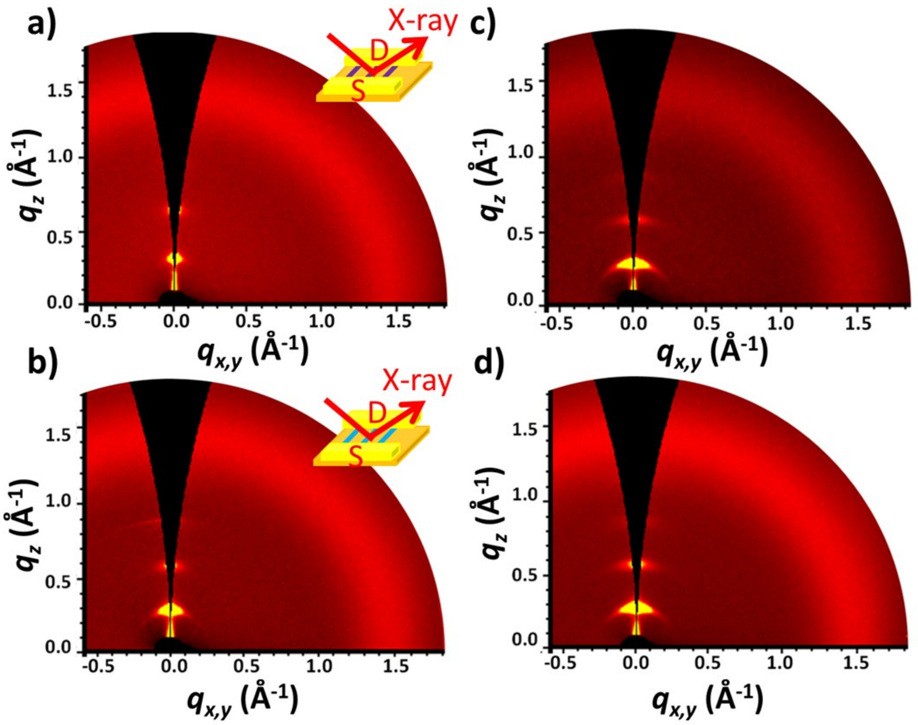

Fig. S8 2D GIXD pattern of (a) the OCSC PB(C_{12}DTP)V-DTDPP-C_{12}, (b) the OCSC PB(C_{12}DTP)V-DTDPP-$C_{12}C_8$, (c) the spin-coated PB(C_{12}DTP)V-DTDPP-C_{12} and (d) the spin-coated PB(C_{12}DTP)V-DTDPP-$C_{12}C_8$ films.

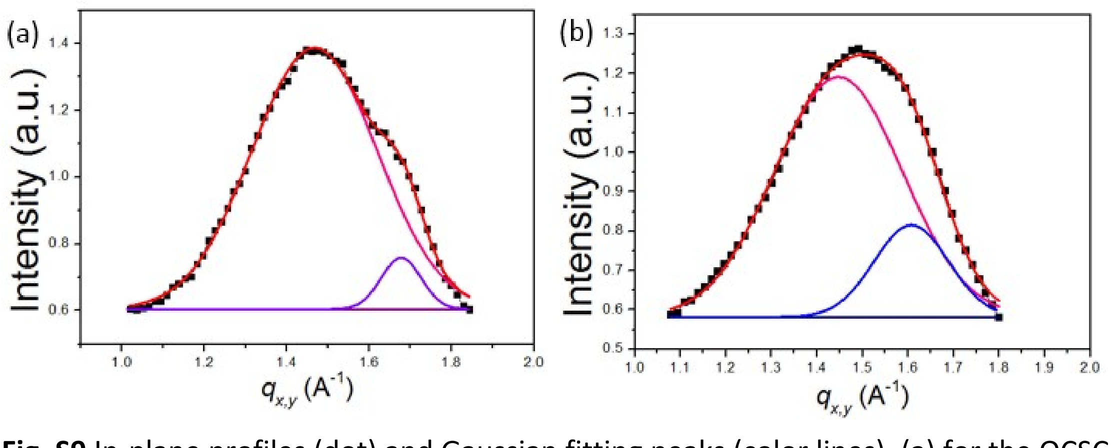

Fig. S9 In-plane profiles (dot) and Gaussian fitting peaks (color lines), (a) for the OCSC PB(C_{12}DTP)V-DTDPP-C_{12}, and (b) for the OCSC PB(C_{12}DTP)V-DTDPP-$C_{12}C_8$ films.

2.5 OTFT device performances

Table S1. Off-centre spin coated OTFT device performances for B(DTP)V-DTDPP polymers measured under nitrogen

Polymers	Solvent	Spin rate (rpm)	Coating direction	T_a (°C)[a]	$\mu_{h,\,adv}$ ($\mu_{h,\,max}$) ($cm^2V^{-1}s^{-1}$)[b]	V_{th}[c] (V)	I_{on}/I_{off}
PB(DTP)V-DTDPP-C_{12}	ODCB	2000	parallel	RT	0.073 (0.086)	-22	10^1-10^2
	ODCB	2000	parallel	50	0.092 (0.10)	-24	10^1-10^2
	ODCB	2000	parallel	240	0.008 (0.011)	-22	10^1-10^2
	ODCB	1500	parallel	220	0.091 (0.16)	-12	10^1-10^2
	CB	2500	parallel	220	0.13 (0.19)	-29	10^1-10^2
	CB	2000	parallel	220	0.051 (0.064)	-15	10^1-10^2
PB(DTP)V-DTDPP-$C_{12}C_8$	ODCB	2000	parallel	RT	0.098 (0.11)	-18	10^1-10^2
	ODCB	2000	parallel	50	0.13 (0.26)	-25	10^1-10^2
	ODCB	1500	parallel	180	0.55 (0.78)	-21	10^1-10^2
	CB	2500	parallel	180	0.18 (0.24)	-20	10^1-10^2
	CB	2000	parallel	180	0.062 (0.083)	-32	10^1-10^2

[a]Ta indicates annealing temperature. [b]Average mobilities and maximum values of hole mobility are shown in parentheses (more than 20 devices were tested for each polymer). [c]Averaged vale of 20 devices. ODCB and CB indicate 1,2-dichlorobenzene and chlorobenzene, respectively.