Supporting Information

Chlorination of dithienobenzodithiophenes (DTBDT) based polymers to simultaneously improve the V_{OC} , J_{SC} and FF of non-

fullerene organic solar cells

Jialing Zhou^{1,2}, Bao Zhang^{1,3}, Wenjun Zou^{*1,2}, Ailing Tang^{1,2}, Yanfang Geng^{*1,2}, Qingdao Zeng¹, Qiang Guo³, Erjun Zhou^{*1, 2}

¹CAS Key Laboratory of Nanosystem and Hierarchical Fabrication, CAS Center for Excellence in Nanoscience, National Center for Nanoscience and Technology, Beijing 100190, China.

² Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, Beijing 100049, China.

³ Henan Institutes of Advanced Technology, Zhengzhou University, Zhengzhou 450003, China. E-mail: <u>zhouej@nanoctr.cn</u>; <u>zouwj@nanoctr.cn</u>; <u>gengyf@nanoctr.cn</u>

Materials and Synthesis

All the reagents were purchased from commercial sources and used without further purification. Solvents were bought from the Beijing Chemical Plant. The monomers **M1** and **M2** were synthesized according to the reported procedures.^{1, 2} **M3** was obtained as our previous report.^{3, 4}

Synthesis of M1 and M2

2-octylthiophene (1) (3.75 g, 22.6 mmol) or 3-chloro-2-(2-butyloctyl)thiophene (4) (6.5 g, 22.6 mmol) was mixed with 100 mL of tetrahydrofuran (THF) in a 250 mL argon purged flask. n-Butyllithium (n-BuLi) (2.5 M, 9 mL) was slowly added to the solution at 0 °C. The mixture was stirred for 1 hour and subsequently dithieno[2,3-*d*:2',3'-*d*']benzo[1,2-*b*:4,5-*b*']dithiophene (2) (2.3 g, 7.53 mmol) was added quickly. The mixture was then stirred at room temperature for 3 h. A mixture of SnCl₂·2H₂O (11.3g, 50 mmol) in 10% HCl (24 mL) was added into the mixture at 0 °C and stirred for overnight at ambient temperature. The mixture was then poured slowly into ice water and extracted with diethyl ether. The organic phase was dried over anhydrous sodium sulfate and concentrated to obtain the crude product **3** and **5**. Further purification was carried out by column chromatography on silica gel using petroleum ether as the eluent with a yield of 60% and 55%, respectively.

To a solution of compound **3** (8.3 g, 12 mmol) or compound **5** (10.5 g, 12 mmol) in THF (250 ml) was slowly added n-BuLi (18 ml, 36 mmol) at -78 °C by using liquid nitrogen-acetone bath. The mixture was stirred for 4h. Subsequently, trimethyltin chloride solution in THF (40 ml, 1.0 M) was added into the flask in one portion at -78 °C. The solution was stirred for 1 h at room temperature. And then, the solution was poured into water (50 ml) and extracted by 200 ml of ether. After washing with water several times, the solution was dried over Na₂SO₄. The residue was concentrated and purified by recrystallization from isopropyl alcohol to afford the monomer **M1** (11 g, 90%) or **M2** (12.3 g, 86%).

Synthesis of polymers PE64 and PE65

The monomer M1 (243.36 mg, 0.25 mmol) and M3 (166.4 mg, 0.25 mmol) were dissolved in toluene (15 mL) with a 100 mL two-neck round-bottom flask. The mixture

was purged by nitrogen for 15 min, then $Pd(PPh_3)_4$ (8.6 mg) was added as catalyst, and the mixture was purged by nitrogen for another 15 min. The reactant was then heated to 105°C and stirred for 48 h. Blocking agent of tributyl(thiophen-2-yl)stannane and 2bromothiophene was injected six hours apart, respectively. After cooled to room temperature, the reactant was precipitated dropwise into 80 mL methanol and the precipitation was filtered and extracted in a Soxhlet extraction with methanol, hexane, and dichloromethane, respectively, in sequence. The solution extracted from dichloromethane was concentrated and then precipitated from ethanol. Finally, the precipitate was dried under vacuum to obtain black compound PE64 (270 mg, yield 66%). Mn = 23.3 kDa, PDI = 2.5. ¹H NMR (400MHz, C₆D₄Cl₂), δ (ppm): 7.86-7.78 (br, Ph-CH, 4H), 7.48-7.42 (br, Ph-CH, 2H, Th-CH, 1H), 7.23-7.20 (br, Th-CH, 4H), 7.01-7.08 (m, Ph-CH, 2H, Th-CH, 1H), 6.96-6.90 (m, Th-CH, 4H), 3.74-3.82 (br, 2CH2, 4H), 2.91-2.84 (br, 2CH2, 4H), 1.74-1.68 (br, 4CH2, 8H), 1.57-1.52 (br, 2CH2, 4H), 1.15-0.99 (br, 18CH2, 36H), 0.74-0.70 (br, 4CH3, 12H). ¹³C NMR (150MHz, C₆D₄Cl₂), δ (ppm): 134.15, 133.19, 132.39, 131.40, 130.90, 130.65, 130.49, 130.28, 130.07, 129.99, 129.59, 129.42, 128.15, 127.95, 127.74, 127.40, 127.19, 127.05, 126.98, 126.78, 126.58, 31.89, 29.05, 26.01, 22.50, 13.76.

The synthesis method for the **PE65** is the same as above. The corresponding reagents are **M2** (292.03 mg, 0.3 mmol), **M3** (217.69 mg, 0.3 mmol) and Pd(PPh₃)₄ (10.4 mg). **PE65** is black solid (340 mg, yield 91%). $M_n = 24.6$ kDa, PDI = 2.6. ¹H NMR (400MHz, C₆D₄Cl₂), δ (ppm): 8.16-8.08 (br, Ph-CH, 4H), 7.65-7.52 (br, Ph-CH, 2H, Th-CH, 2H), 7.23-7.17 (br, Ph-CH, 2H, Th-CH, 5H), 4.13-3.80 (br, 2CH2, 4H), 3.10-2.87 (br, 2CH, 2H), 1.68-1.19 (br, 34CH2, 68H), 0.99-0.78 (br, 6CH3, 18H;). ¹³C NMR (150MHz, C₆D₄Cl₂), δ (ppm): 134.41, 134.15, 133.46, 133.18, 133.05, 132.78, 132.66, 132.39, 132.14, 131.66, 131.39, 131.17, 130.90, 130.55, 130.48, 130.34, 130.25, 130.06, 129.85, 129.69, 129.42, 129.02, 128.22, 128.15, 127.75, 127.31, 127.05, 126.85, 126.77, 126.37, 30.65, 28.12, 25.06, 20.54, 15.03.

Measurements and characterizations

¹H NMR (400 MHz) and ¹³C NMR (150 MHz) were recorded with a Bruker

AVANCE 400 spectrometer in deuterated dichloromethane (CDCl₃) and 1,2dichlorobenzene (C₂D₄Cl₂). Molecular weights of the polymers were measured on Angilent Technologies PL-GPC 220 high-temperature-chromatograph at 150 °C using a calibration curve of polystyrene standards. Thermo gravimetric analysis (TGA) was recorded on Diamond TG/DTA under the protection of nitrogen at a heating rate of 10 °C /minute. Differential scanning calorimetry (DSC) was performed using a TA DSC Q2000 instrument under nitrogen at the heating and cooling rates of 10 °C min⁻¹ in two heating/cooling cycles. UV-vis spectra were conducted with Lambda-950 (Perkin Elmer Instruments Co. Ltd., America). Cyclic voltammetry (CV) measurements were carried out using an electrochemical workstation, equipped with a standard three-electrode configuration. Typically, a three-electrode cell equipped with Pt plate which coated with a thin film as working electrode, an Ag/AgCl (0.01 M in anhydrous acetonitrile) reference electrode, and a Pt wire counter electrode was employed. The measurements were done in anhydrous acetonitrile with tetrabutylammonium hexafluorophosphate (0.1 M) as the supporting electrolyte under an argon atmosphere at a scan rate of 100 mV/s. The potential of Ag/AgCl reference electrode was internally calibrated by using the ferrocene/ferrocenium redox couple (Fc/Fc⁺). The highest occupied molecular orbital (HOMO) and lowest unoccupied molecular orbital (LUMO) energy levels of polymers were calculated from the onset oxidation potential φ_{ox} and onset reductive potential φ_{red} , according to the formula of $E_{\text{LUMO/HOMO}} = -e(\varphi_{\text{red/ox}} + 4.8 - \varphi_{\text{Fc/Fc}}^+)$ (eV).

The current density-voltage J-V curves were measured in glove box with a Keithley 2420 source measure unit. The photocurrent was obtained under illumination using an Oriel Newport 150W solar simulator (AM 1.5G), and the light intensity was calibrated with a Newport reference detector (Oriel PN 91150 V). The EQE measurements of the devices were performed in air with an Oriel Newport system (Model 66902). Two-dimensional grazing incidence wide angle X-ray scattering (2D-GIXD) analyses were measured at the XEUSS SAXS/WAXS equipment. The data were obtained with an area Pilatus 100k detector with a resolution of 195 × 487 pixels (0.172 mm × 0.172 mm). The X-ray wavelength was 1.54 Å, and the incidence angle was 0.2°. The samples were

spin-coated onto the poly(3,4-ethylenedioxythiophene): (PEDOT): poly(styrenesulfonate) (PSS) /Si substrate using the optimized device fabrication conditions. Atomic force microscopy (AFM) images were obtained on a Multimode 8 in tapping mode. Transmission electron microscopy (TEM) images were measured with Tecnai G2 F20 U-TWIN (FEI) operated at 200 kV. The TEM specimens were prepared by transferring the spin-coated films to the 200 mesh copper grids. The thickness of the active layer was tested on a Kla-TencorAlpha-StepD-120 Stylus Profiler.

Photovoltaic device fabrication

The OSCs devices were fabricated with a configuration of indium tin oxide (ITO)/ PEDOT: PSS (~30 nm)/polymer: acceptor/perylenediimide functionalized with amino N-oxide (PDINO) (~10 nm)/Al(80 nm). A thin layer of PEDOT: PSS (30 nm, Baytron PH1000) was spin-casted on pre-cleaned ITO-coated glass at 3000 rpm. After baking at 150 °C for 15 min, the substrates were transferred into glovebox. Optimized devices were prepared under the following conditions. The Donor: Acceptor (D:A) ratio of 1:1 (w/w) for PE64:ITIC, PE64:Y6, PE65:ITIC, and 1:1.2 (w/w) for PE65:Y6 were dissolved chloroform (CF) with a total concentration of 16 mg/mL for 1 hour at 50 °C and then the active layers was spin-coated from the above solution. Specially, the optimized device of PE64: ITIC, PE64:Y6, PE65: ITIC, PE65:Y6 are attained with 0.5% (v/v) DIO, 0.5% (v/v) CN, 0.5% (v/v) DPE and 0.5% (v/v) DPE as solvent additive, respectively. The thickness of the photoactive layer is in the range of 50–110 nm. A PDINO layer was spin-coated on the top of all the active layers at 3000 rpm for 30 s. PDINO was dissolved in methanol at a concentration of 1.0 mg/mL. Finally, an Al (80 nm) metal top electrode was thermal evaporated onto the active layer under about 2×10^{-4} Pa. The active area of the device was 0.04 cm² defined by shadow mask.

Carrier mobility measurements

The carrier mobilities of the polymer was investigated by the space charge limited current (SCLC) method. The hole mobility of the blend films was measured with the device structure of ITO/PEDOT: PSS/active layer /Au (80 nm) while the electron

mobility of the blends was measured with the device structure of ITO/isopropanol liquid (TIPD) /active layer/Al (80 nm). The SCLC model is described by modified Mott-Gurney law:

$$J = (9/8) \varepsilon_0 \varepsilon_r \mu (V^2/Z^3)$$

where *J* stands for current density, ε_0 is the permittivity of free space, ε_r is the relative dielectric constant of the transport medium, which is assumed to be around 3 for the conjugated polymers, μ is the carrier mobility, *V* is the internal potential in the device and *L* is the film thickness of the active layer. The thickness of the active layer for **PE64**: **ITIC**, **PE54**:**Y6**, **PE65**: **ITIC**, **PE65**: **Y6** are estimated to be 50, 96, 107 and 88 nm, respectively.





Figure S1. Synthetic routes of monomers and polymers.





Figure S2. ¹H NMR spectra of PE64 and PE65.



Figure S3. (a) TGA curves of polymers with a scanning rate of 10 °C min⁻¹ under an atmosphere of N_2 . (b) DSC curves of polymers obtained from scanning at 10 °C min⁻¹ from 35 °C to 325 °C.

Table.	S1	Photovoltaic	performance	of	OSCs	based	on	the	PE64/PE65:ITIC/Y6)
combin	atio	ns under the i	llumination of	f Al	M 1.5 C	5, 100 r	nW	·cm-2	2.	

Devices	$V_{\rm OC}({ m V})$	$J_{\rm SC}$ (mA·cm ⁻²)	FF	PCE(%)	Jcal ^a (mA·cm ⁻²)
PE64:ITIC	0.76±0.02 ^b (0.77) ^c	11.96±0.37(25.50)	0.49±0.01 (0.48)	4.51±0.10(4.69)	12.31
PE65:ITIC	0.94±0.01 (0.94)	13.91±0.24(14.40)	0.67±0.01 (0.67)	8.88±0.19(9.13)	12.11

PE64: Y6	0.56±0.07 (0.50)	13.45±0.16(14.05)	0.45±0.05 (0.50)	3.48±0.05(3.54)	14.00
PE65: Y6	0.76±0.01 (0.77)	24.60±0.67(25.20)	0.69±0.02 (0.67)	12.96±0.04(13.01)	23.38

^a The calculated Jsc values from EQE curves; ^b The average values are collected from four independent devices; ^c The values of best performance devices.

Table S2. The photovoltaic performance of **polymers**:acceptors under different D:A ratios.

devices	D/A	$V_{\rm OC}$ (V)	$J_{\rm SC}$ (mA cm ⁻²)	FF (%)	PCE (%)
DECA. ITIC	1:1	0.82	9.73	36.19	2.88
$\frac{16ma}{mI}$	1:1.2	0.77	4.77	37.17	1.37
Tonig/InL	1:1.5	0.78	7.08	39.64	2.19
DECA.VC	1:1	0.58	11.52	40.39	2.71
16mg/mI	1:1.2	0.58	10.41	38.80	2.33
Tomg/InL	1:1.5	0.48	10.39	42.02	2.10
DECS. ITIC	1:1	0.95	11.06	68.89	7.10
$\frac{16ma}{mI}$	1:1.2	0.95	9.57	63.68	5.76
Tonig/InL	1:1.5	0.95	10.36	70.14	6.91
PE65:Y6	1:1	0.80	23.65	53.51	10.08
16mg/mL	1:1.2	0.80	22.75	57.26	10.37
	1:1.5	0.79	21.64	57.42	9.85

 Table S3. The photovoltaic performance of polymers:acceptors under different solvent additives.

devices	solvent additive	$V_{\rm OC}$ (V)	J _{SC} (mA cm ⁻²)	FF (%)	PCE (%)
DEGA. ITIC	No additive	0.82	9.73	36.19	2.88
ГЕ04: ППС —1.1	0.5%CN	0.83	9.57	39.49	3.13
-1.1 16mg/mI	0.5%DIO	0.78	11.97	47.13	4.41
Tonig/IIIL	0.5%DPE	0.82	9.98	39.21	3.19
	No additive	0.56	10.47	41.01	2.40
PE64:Y6= 1:1	0.5%CN	0.62	12.86	41.72	3.34
16mg/mL	0.5%DIO	0.47	12.08	42.44	2.40
	0.5%DPE	0.52	9.81	38.00	1.95
	No additive	0.95	11.18	59.22	6.29
DE65. ITIC	0.5%CN	0.95	12.57	68.10	8.11
-1.1	1.0%CN	0.95	11.06	68.89	7.10
-1.1	2.0%CN	0.95	10.27	68.36	6.67
10mg/mL	0.5%DIO	0.95	10.80	65.68	6.73
	0.5%DPE	0.94	11.61	64.18	7.01
PE65:Y6 =1:1.2	No additive	0.80	23.65	53.51	10.08

16mg/mL	- 0.5%DPE	0.73	23.60	68.91	11.91
	0.8%DPE	0.72	25.21	63.01	11.43
	1.0%DPE	0.73	24.26	65.77	11.68

Table S4. The photovoltaic performance of **polymers: acceptors** under different thermal annealing temperature.

devices	annealing	$V_{\rm OC}$ (V)	J _{SC} (mA	FF (%)	PCE (%)
	temperature		cm ⁻²)		
	(°C)				
PE64: ITIC	110	0.78	11.97	47.13	4.41
=1:1	130	0.78	11.97	47.13	4.41
16mg/mL	150	0.79	12.43	47.85	4.69
	170	0.78	10.64	42.42	3.52
PE64:Y6= 1:1	90	0.52	10.15	37.78	1.99
16mg/mL	110	0.52	11.71	38.17	2.32
	130	0.51	10.81	39.15	2.17
PE65: ITIC	110	0.96	10.10	60.56	5.88
=1:1	130	0.95	10.53	61.94	6.22
16mg/mL	150	0.94	11.22	65.43	6.92
	180	0.91	10.39	68.13	6.47
PE65:Y6 =1:1.2	rt	0.81	21.54	54.57	9.49
16mg/mL	90	0.80	22.10	54.26	9.60
	110	0.80	23.65	53.51	10.08
	130	0.78	22.42	55.32	9.64
	150	0.76	22.35	54.48	9.31

 Table S5. The photovoltaic performance of polymers: acceptors under different interface layer.

devices	Interface layer	$V_{\rm OC}\left({ m V} ight)$	$J_{\rm SC}$ (mA cm ⁻²)	FF (%)	PCE (%)
PE64:	Ca	0.78	11.97	47.13	4.41
ITIC	PDINO	0.79	12.43	47.85	4.69
PE64:Y6	Ca	0.62	12.86	41.72	3.34
	PDINO	0.50	14.05	50.18	3.54
PE65:	Ca	0.95	12.57	68.10	8.11
ITIC	PDINO	0.94	14.40	67.24	9.13
PE65:Y6	Ca	0.73	23.60	68.91	11.91
	PDINO	0.77	25.20	67.14	13.01

Table S6. In-plane (100) and out-of-plane (010) peaks, lamellar spacing (*d*) and π - π distance (d_{π - π }). The full width at half maximum (FWHM) of (100) peak is obtained by fitting the corresponding curves. Coherence length is estimated by 2π K/FWHM, where the Scherrer constant K is 0.93.

		In-pl	ane	Out-of- plane		
Films	(100) (Å ⁻¹)	d (Å)	Coherence length (Å)	(010) (Å ⁻¹)	<i>d</i> _{π-π} (Å)	Coherence length (Å)
ITIC ⁵	0.37	16.8	31.0	1.74	3.6	
Y6	0.28	22.4	154.0	1.74	3.6	29.61
PE64:ITIC	0.27	23.3	81.0	1.70	3.70	12.23
PE64:Y6	0.27	23.3	73.2	1.70	3.70	18.21
PE65:ITIC	0.27	23.3	75.0	1.70	3.70	13.82
PE65:Y6	0.27	23.3	126.7	1.72	3.65	31.08

 Table S7. Voc, Jsc, FF, PCE for various DTBDT-based polymer solar cells.

Polymer: Fullerene	Voc (V)	Jsc (mA·cm ⁻²)	FF(%)	PCE (%)	References
PDTT: PC ₇₁ BM	0.68	9.85	54.0	3.64	6
PDT-S-T: PC ₇₁ BM	0.73	16.63	64.13	7.79	7
PTDBD2: PC ₇₁ BM	0.89	13.0	65.3	7.6	8
PTDBD3: PC ₇₁ BM	0.88	10.7	52.1	4.9	
PTDBD2: PC ₆₁ BM	0.87	9.7	63.0	5.3	
PTDBD3: PC ₆₁ BM	0.87	7.5	59.4	3.9	
PDTBAT-BZ:	0.80	9.38	67.81	5.10	9
PC ₇₁ BM					
PDTBDOR-BZ:	0.62	6.36	48.10	1.91	
PC ₇₁ BM					
PTDBD: PC ₇₁ BM	0.77	13.0	69.1	7.3	10
PBT-HD-DPP-C16:	0.62	6.41	60.9	2.42	11
PC ₇₁ BM					
PBT-T-DPP-C12:	0.65	12.61	63.4	5.19	
PC ₇₁ BM					
PBT-TIPS-DPP-	0.75	13.9	61.3	6.39	
C16: PC ₇₁ BM					
PDPPDTBDT:	0.745	9.80	65.0	4.75	12
PC ₇₁ BM					

PDTBDT-IT:	0.70	12.58	50.28	4.43	13
PC ₇₁ BM					
PDTBDT-DTNT:	0.65	17.51	66.0	7.52	14
PC ₇₁ BM					
PDBT-T1: PC ₇₀ BM	0.92	14.11	75.0	9.74	15
PDTP-DTBDT:	0.79	8.8	45.1	3.14	16
PC ₇₁ BM					
pDTBDT-TTEH:	0.72	15.77	59.4	6.74	17
PC ₇₁ BM					
pDTBDT-DTPD:	0.79	6.64	53.9	2.83	
PC ₇₁ BM					
PDTBDT-BZ:	0.83	10.28	64.9	5.54	18
PC ₇₁ BM					
PDTBDT-BZF:	0.88	11.47	73.5	7.42	
PC ₇₁ BM					
PDTBDT-BZF ₂ :	0.90	10.02	60.5	5.46	
PC ₇₁ BM					
P1: PC ₆₁ BM	0.77	4.68	46.6	1.68	19
P1: PC ₇₁ BM	0.77	6.61	40.0	2.04	
P2: PC ₆₁ BM	0.76	5.43	58.3	2.41	
P2: PC ₇₁ BM	0.76	6.76	61.4	3.15	
P2: IC ₆₀ BA	0.93	7.87	64.6	4.73	
PDTBDT-T-3T:	0.67	10.12	61.93	4.20	20
PC ₇₁ BM					
PDTBDT-FBTz:	0.95	9.32	62.7	5.55	21
PC ₇₁ BM					
PDTBDT-FBT:	0.98	12.76	59.6	7.45	
PC ₇₁ BM					
PDTBDT-BT:	0.82	15.20	68.50	8.54	22

PC ₇₁ BM					
PDTBDT-FBT:	0.91	14.89	64.50	8.74	
PC ₇₁ BM					
P1: PC ₇₁ BM	0.77	6.22	40.0	1.92	23
P2: PC ₇₁ BM	0.75	7.30	52.0	2.86	
PDBT-DTT:	0.84	13.5	60.7	7.01	24
PC ₇₁ BM					
PDBT-TT: PC ₇₁ BM	0.51	10.5	56.3	3.09	
PDTBDT-TPTI:	0.81	9.02	65.5	4.79	25
PC ₆₁ BM					
PDTBDT-TPTI:	0.81	11.96	62.5	6.05	
PC ₇₁ BM					
PDTBDT-TIPS-	0.80	3.62	50.96	1.47	26
DTBT-OD: PC ₇₁ BM					
PDTBDT-TIPS-	0.93	2.19	53.59	1.09	
DTFBT-OD:					
PC ₆₁ BM					
PDTBDT-TIPS-	0.88	7.21	52.99	3.37	
DTNT-OD: PC ₇₁ BM					
DTBDT-TzVTz:	0.79	13.17	64.0	6.73	27
PC ₇₁ BM					
PDTBDT-TE-	0.60	10.15	65.16	3.97	28
DTNT: PC ₇₁ BM					
PDTBDT-T-DTNT:	0.70	16.09	67.19	7.57	
PC ₇₁ BM					

Polymer:	Voc (V)	$Jsc (mA \cdot cm^{-2})$	FF(%)	PCE (%)	References
Non-Fullerene					
PDBT-T1:	0.89	15.05	0.63	8.71	29

IC-C6IDT-IC					
PDBT-T1:	0.92	13.39	60.0	7.39	30
IC-11DT-IC					
PDBT-T1:	1.02	5.28	48.0	2.58	
IC-2IDT-IC					
PDBT-T1:	0.85	15.85	68.0	9.20	
IC-C61DT-IC					
PDBT-T1: IDIC	0.834	16.98	73.2	10.37	31
PDBT-T1:	0.95	10.32	67.6	6.71	32
SdiPBI-BT					
PDBT-T1: diPBI-BT	0.99	9.67	59.8	5.84	
PDBT-DTT:	0.79	15.6	68.2	8.74	24
ITCPTC					
PDBT-TT: ITCPTC	0.50	11.2	37.6	2.17	
PDTBDT-TPTI:	0.86	13.34	60.0	6.91	25
ITIC					
PDBT-F: IT-M	0.97	17.02	63.71	10.52	33
PDBT-F: IDIC	0.87	17.65	71.50	11.02	
PDBT(E)BTz-p:	0.98	14.38	48.2	6.96	34
IT-4F					
PDBT(E)BTz-d:	0.95	14.68	54.5	7.81	
IT-4F					
PDTBDT-BZ:	0.884	13.29	55.4	6.50	35
BDTD-Ph					
PDTBDT-BZ:	0.864	12.86	44.5	4.95	
BDTD-Na					
PDTBDT-BZ:	0.913	13.41	51.8	6.20	
TBDB-Ph					
PDTBDT-BZ:	0.879	11.24	54.4	5.38	

TBDB-Na			
PDBT-T1:		8.15	36
SdiPBI-Se			
PDBT-T1: ITIC-Th		6.43	

Polymer in Ternary	Voc (V)	$Jsc (mA \cdot cm^{-2})$	FF(%)	PCE (%)	References
OSCs					
PTB7-Th: PDBT-T1:	0.81	18.1	70.1	10.2	37
PC ₇₀ BM					
PDBT(E)BTz- <i>p</i> :	0.86	19.90	72.5	12.5	34
PBDB-T: IT-4F					
PDBT(E)BTz-d:	0.86	20.59	74.9	13.4	
PBDB-T: IT-4F					
PDBT-T1:	0.94	15.40	71.3	10.3	36
SdiPBI-Se: ITIC-Th					

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