Supporting Information

A Wide-Bandgap Conjugated Polymer for Highly Efficient Inverted Single and Tandem Polymer Solar Cells

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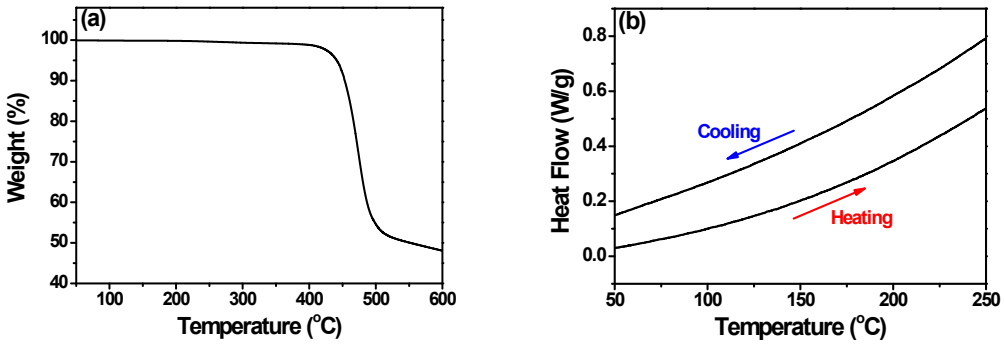

Figure S1. a) TGA plot of **PTZ1** with a heating rate of 10 °C min^{-1} under nitrogen atmosphere. b) DSC plot of **PTZ1** with a scan rate of 2 °C min^{-1} under nitrogen atmosphere.

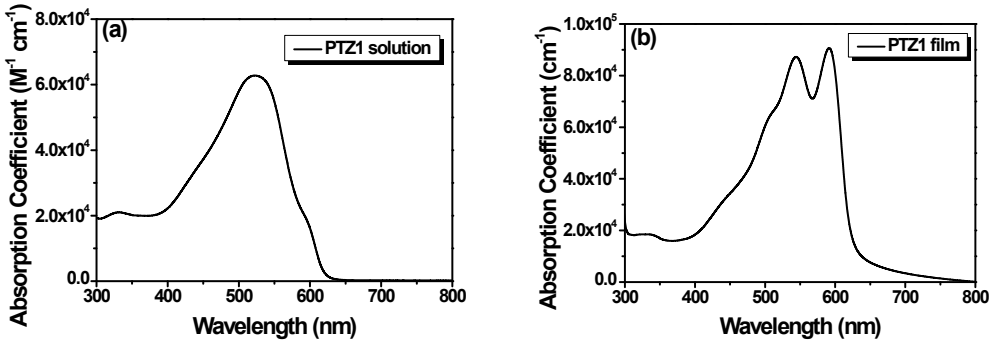

Figure S2. Absorption coefficient of **PTZ1** in a) *o*-dichlorobenzene solution (10^{-5} M) and b) thin film.

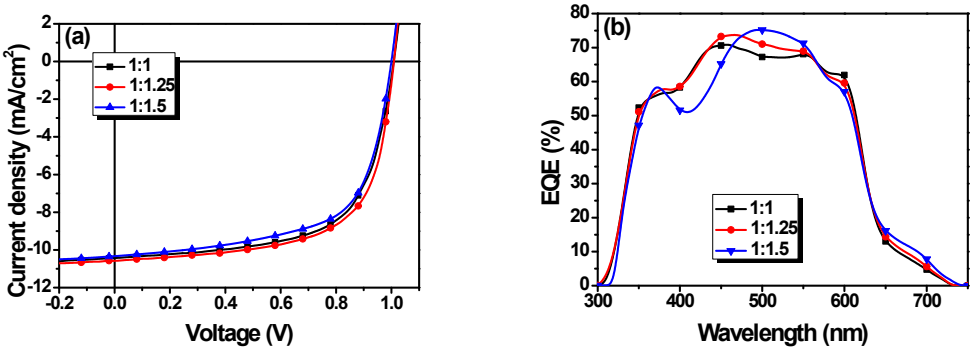

Figure S3. a) *J-V* characteristics and b) EQE curves of solar cells based on **PTZ1**: $PC_{71}BM$ with different weight ratios.

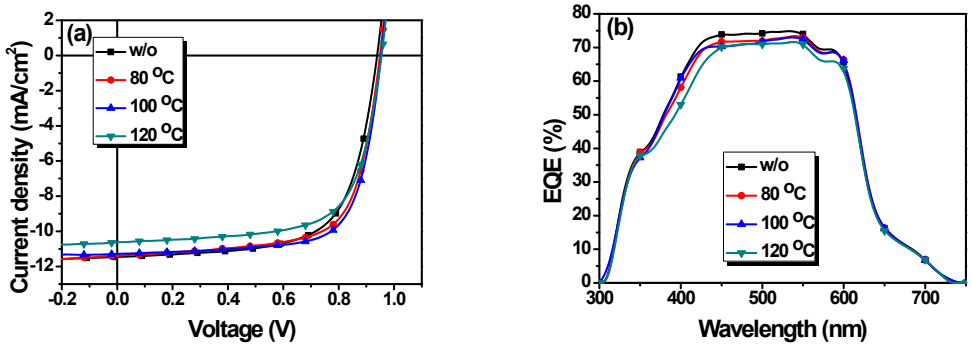

Figure S4. a) *J-V* characteristics and b) EQE curves of solar cells based on **PTZ1**: $PC_{71}BM$ (1:1.25, w/w) with 1% DIO (v/v) additive under different thermal annealing temperatures for 10 min.

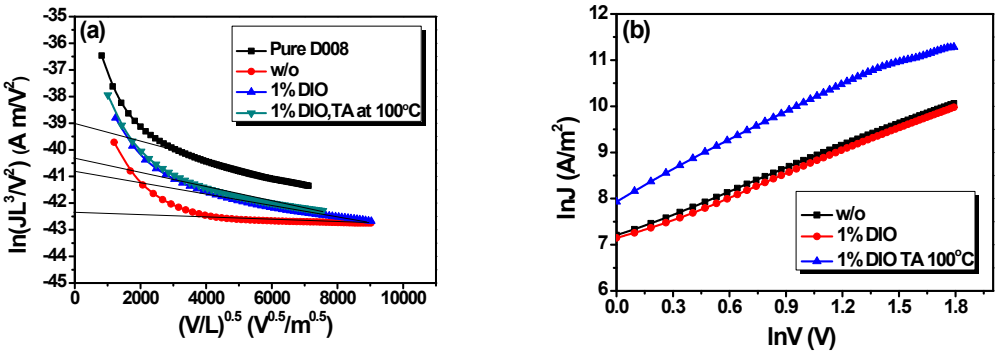

Figure S5. $J^{0.5}$-V plots for pure **PTZ1** and **PTZ1**: $PC_{71}BM$ (1:1.25, w/w)-based a) hole-only and b) electron-only devices.

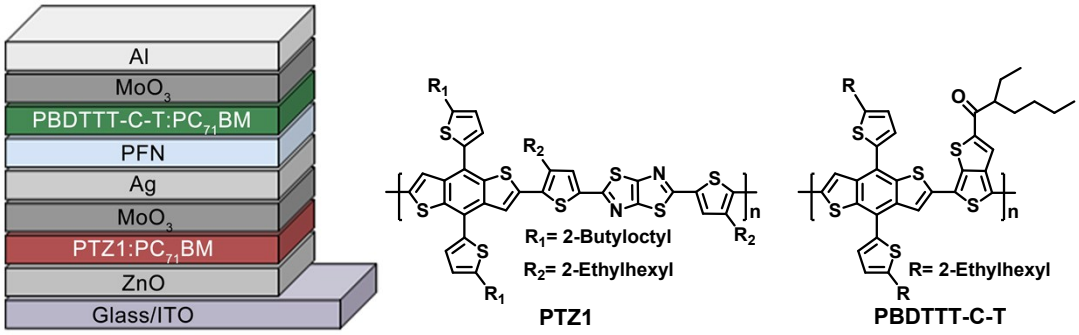

Figure S6. Device structure of the tandem PSCs and chemical structures of the donor materials in the front and rear cells.

Table S1. Photovoltaic performance of solar cells based on **PTZ1**: $PC_{71}BM$ with different weight ratios under the illumination of AM 1.5 G, 100 mW cm^{-2}.

PTZ1: $PC_{71}BM$ (w/w)	V_{oc} (V)	J_{sc} (mA cm^{-2})	FF (%)	PCE_{max} (PCE_{ave}[a)]) (%)	Thickness (nm)
1 : 1	1.01	10.4	64	6.7 (6.5)	95
1:1.25	1.01	10.6	65	7.0 (6.9)	95
1:1.5	1.00	10.3	64	6.6 (6.4)	90

[a)]The average PCE was obtained from more than 8 devices.

Table S2. Photovoltaic performance of solar cells based on **PTZ1**: $PC_{71}BM$ (1:1.25, w/w) with 1% DIO (v/v) additive under different thermal annealing temperatures for 10 min.

Annealing temperature	V_{oc} (V)	J_{sc} (mA cm^{-2})	*FF* (%)	PCE_{max} (PCE_{ave}[a)]) (%)	Thickness (nm)
w/o	0.94	11.5	67	7.2 (7.0)	95
80 °C	0.95	11.4	68	7.4 (7.2)	95
100 °C	0.95	11.3	72	7.7 (7.5)	92
120 °C	0.95	11.0	68	7.1 (7.0)	90

[a)]The average PCE was obtained from more than 8 devices.

Table S3. The hole and electron mobilities of pure **PTZ1** and **PTZ1**: $PC_{71}BM$ (1:1.25, w/w) blended films with different processing contents.

	DIO (v/v %)	Hole mobility ($cm^2 V^{-1} s^{-1}$)	Electron mobility ($cm^2 V^{-1} s^{-1}$)
Pure polymer	--	3.86×10^{-3}	
	--	1.43×10^{-4}	2.18×10^{-4}
Blend films	1	7.06×10^{-4}	2.84×10^{-4}
	1[a)]	1.11×10^{-3}	1.02×10^{-3}

a) Annealing at 100 °C for 10 min.