

# Simply Planarizing Nonfused Perylene Diimide Based Acceptor Toward Promising Non-fullerene Solar Cells

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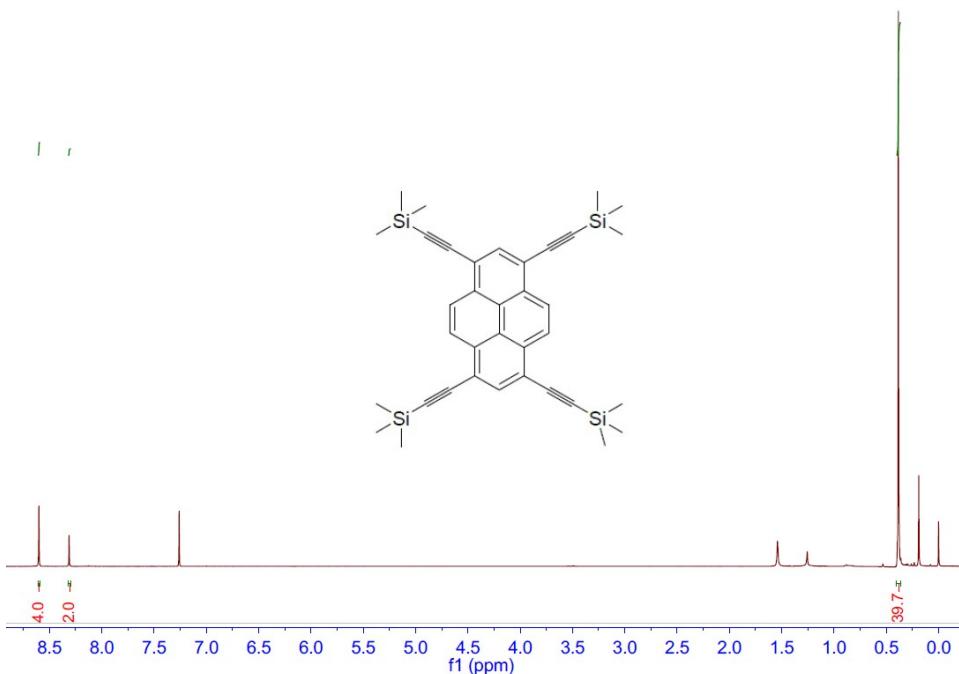
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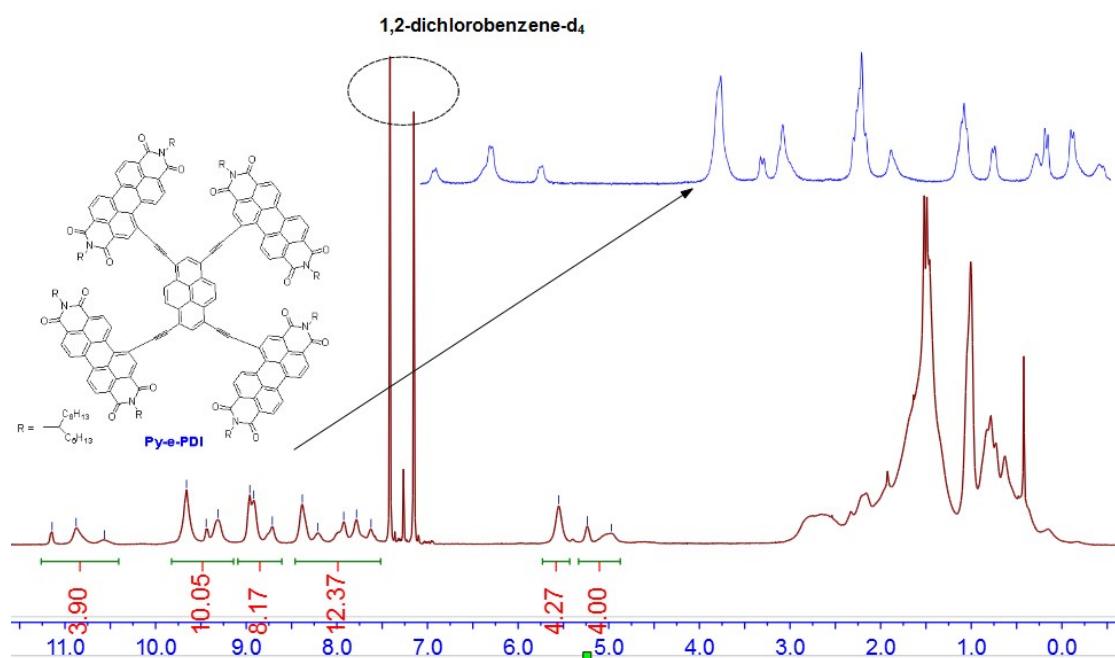
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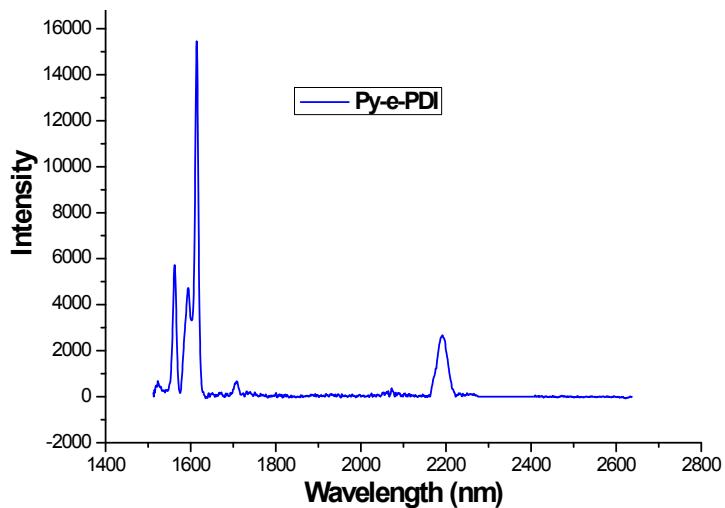
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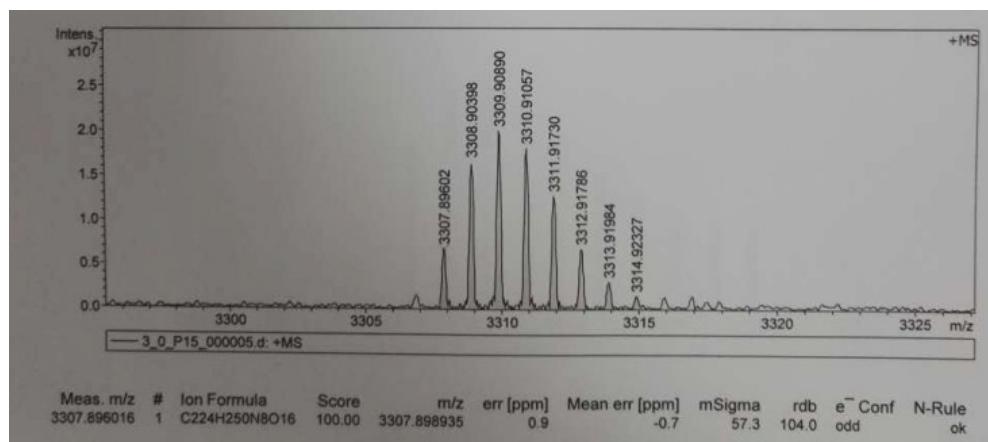
**Fig. S1.**  $^1\text{H}$ NMR spectra for compound **2** in  $\text{CDCl}_3$ .



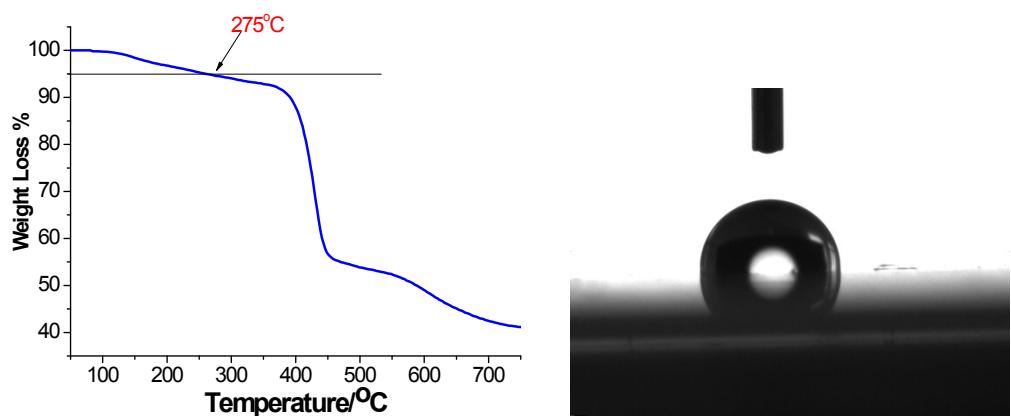
**Fig. S2.**  $^1\text{H}$ NMR spectra for **Py-e-PDI** in 1, 2-dichlorobenzene- $d_4$  at  $60^\circ\text{C}$ .



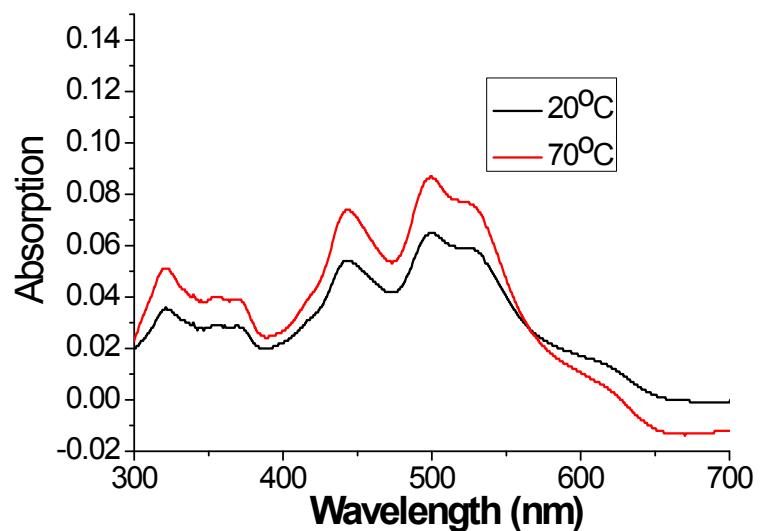
**Fig. S3.** The Raman spectra of Py-e-PDI.



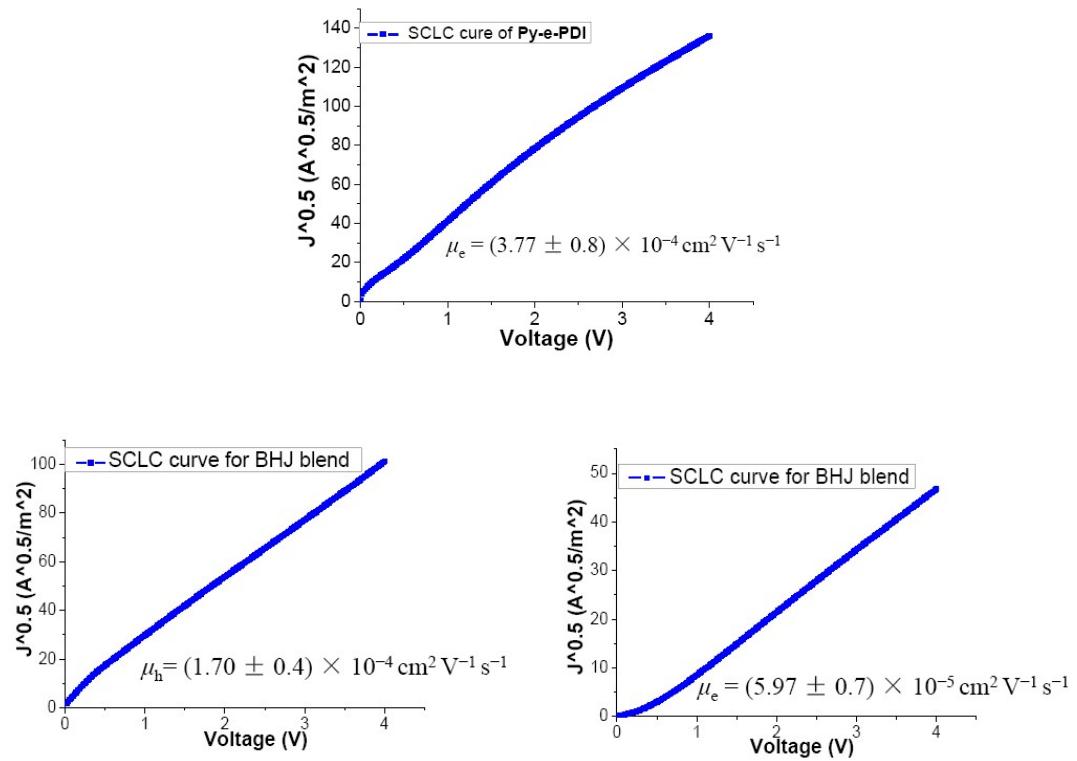
**Fig. S4.** The high-resolution MALDI-TOF mass for Py-e-PDI.



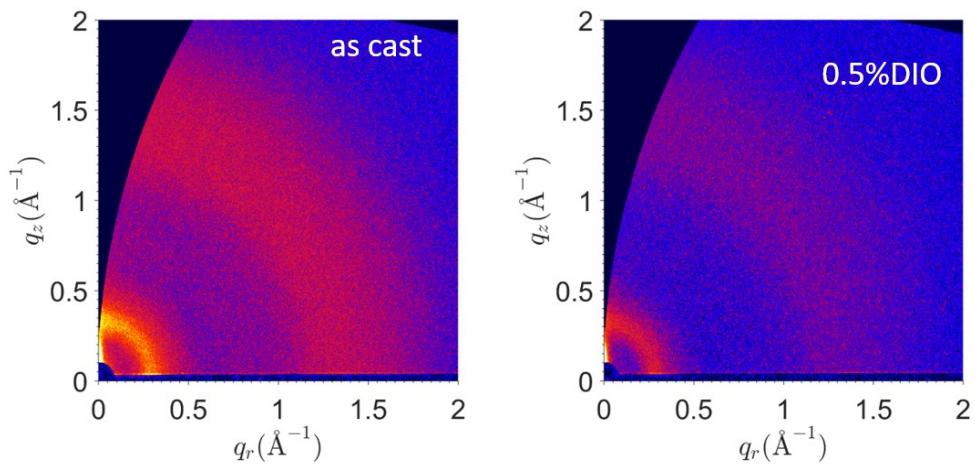
**Fig. S5.** (Left) TGA curves of the **Py-e-PDI** acceptor with a heating rate of 10 $^{\circ}\text{C}/\text{min}$  under N<sub>2</sub>. (Right) The contact angle between **Py-e-PDI** film and water.



**Fig. S6.** Temperature-dependent absorption spectra.



**Fig. S7.** SCLC  $J$ - $V$  plots.



**Fig. S8.** (a) 2D GIWAXS scattering patterns of PTB7-Th/Py-e-PDI blend films as cast (left) and with 0.5% DIO (right).

**Table S1.** Photovoltaic parameters of the OSCs based on PTB7-Th/**Py-e-PDI** blends.

D/A ratio	Spin-coating Rpm	Anael					PCE/% <sup>a</sup>
		Tem/° C	$V_{oc}$ /V	$J_{sc}$ /mA cm <sup>-2</sup>	FF/%		
1:1	1200	w/o	0.77	13.1	39.4	3.80±0.12(3.92)	
1.5:1	1200	w/o	0.77	9.0	37.6	2.53±0.04(2.57)	
1:1.5	1200	w/o	0.79	15.2	45.9	5.12±0.24(5.36)	
1:1.5	1200	100	0.72	14.9	53.5	4.43±0.14(4.57)	
1:1.5	800	w/o	0.77	11.4	36.1	2.99±0.11(3.10)	
1:1.5	1600	w/o	0.80	15.8	49.8	5.85±0.25(6.10)	
1:1.5	2000	w/o	0.79	14.1	46.4	4.85±0.26(5.11)	

<sup>a</sup>Average value from seven devices.