

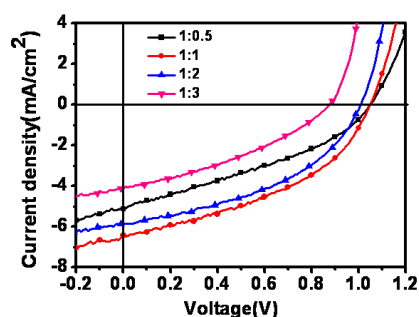
Electronic Supplementary Information for:

## A'-A-D-A-A' type small molecule based on 2,7-Carbazole for solution-processed organic solar cells with high open-circuit voltage

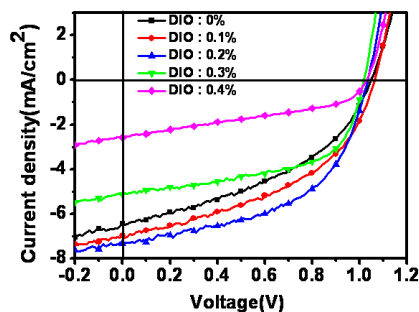
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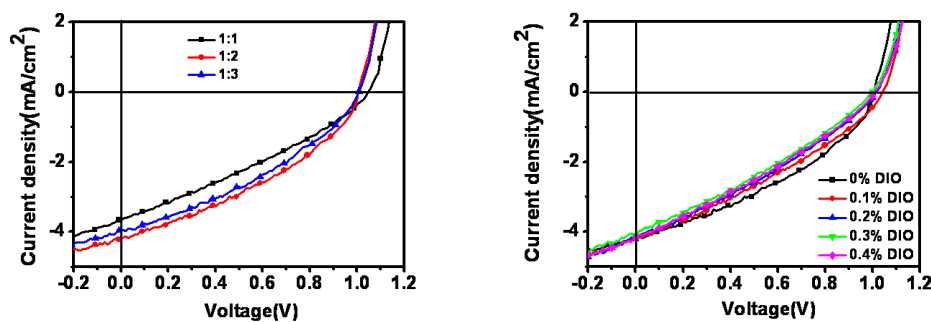
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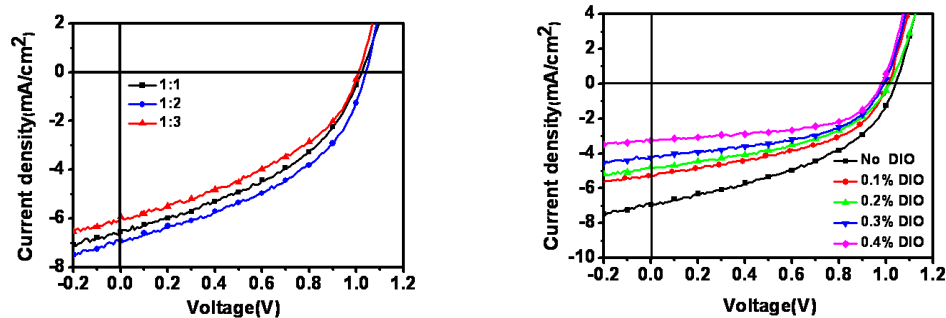
**Figure S1.** *J-V* curves of the devices prepared from Cz-TBT-CAC8/PC<sub>61</sub>BM with different donor/acceptor weight ratios



**Fig. S2.** *J-V* curves of the devices prepared from Cz-TBT-CAC8/PC<sub>61</sub>BM (D/A ratio, 1:1) with different content of DIO as additive



**Fig. S3.** *J-V* curves of the devices prepared from Cz-TBT/PC<sub>61</sub>BM with different D/A ratio (left) and different content of DIO as additive (right) at the optimized D/A ratio (1:2).

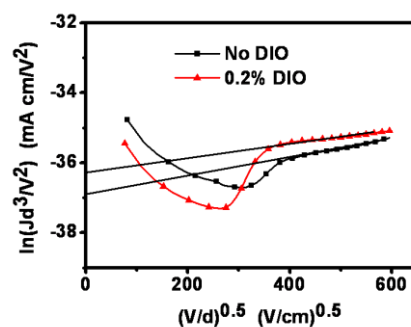


**Fig. S4.** *J-V* curves of the devices prepared from **Cz-TBT-CAC8/PC<sub>71</sub>BM** with different D/A ratio (left) and different content of DIO as additive (right) at the optimized D/A ratio (1:2).

**Table S1** Device performance for BHJ solar cells based on **Cz-TBT-CAC8/PC<sub>71</sub>BM**

D/A ratio	DIO content	$V_{oc}$ (V)	$J_{sc}$ (mA/cm <sup>2</sup> )	FF	PCE
1:1		1.02	6.56	0.42	2.80%
1:2		1.03	6.95	0.42	3.03%
1:3		1.01	5.92	0.41	2.46%
1:2	0.1%	1.01	5.25	0.47	2.50%
1:2	0.2%	1.02	4.78	0.45	2.21%
1:2	0.3%	0.99	4.24	0.50	2.09%
1:2	0.4%	0.98	3.26	0.55	1.77%

The hole mobility of **Cz-TBT-CAC8/PC<sub>61</sub>BM** blends processed from CB and CB-0.2% DIO solvent was measured by the space charge limited current (SCLC) method with a device structure of ITO/PEDOT:PSS/ **Cz-TBT-CAC8:PC<sub>61</sub>BM** (w/w=1:1)/Au.



**Fig. S5.** Plot of  $\ln(Jd^3/V^2)$  versus  $(V/d)^{0.5}$  of **Cz-TBT-CAC8/PC<sub>61</sub>BM** (1:1) blends processed from CB and CB-0.2% DIO solvent for the measurement of hole mobility by the SCLC method