Supporting Information

High Performance Opaque and Semitransparent Organic Solar Cells with Good Tolerance to Film Thickness Realized by a Unique Solid Additives

Xiaoyang Du, Xinrui Li, Hui Lin,* Lei Zhou, Caijun Zheng, Silu Tao*

School of Optoelectronic Science and Engineering, University of Electronic Science and Technology of China (UESTC), Chengdu 610054, P. R. China

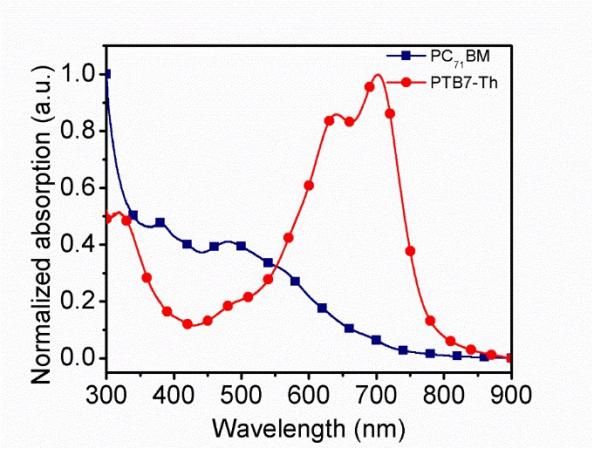

Figure S1. Normalized absorption spectra of PTB7-Th and $PC_{71}BM$

Table S1. Photovoltaic parameters of control OSCs with different active layer thickness

Thickness (nm)	V_{oc} (V)	J_{sc} (mA/cm^2)	FF (%)	PCE (max) [b](%)
300	0.766	14.21	50.71	5.52 (5.79)
200	0.775	18.92	59.76	8.87 (9.14)
120	0.783	18.26	65.49	9.26 (9.44)
60	0.796	13.38	68.16	7.25 (7.53)

[b] Statistical data obtained from 10 devices;

Table S2. Photovoltaic parameters of OSCs with different active areas

Device	Area (mm^2)[c]	V_{oc} (V)	J_{sc} (mA/cm^2)	FF (%)	PCE (max) (%)
Control [a]	2.3	0.783	18.26	65.49	9.26 (9.44)
	11.0	0.782	18.36	63.86	9.16 (9.28)
Optimized [b]	2.3	0.806	20.05	71.30	11.52 (11.64)
	11.0	0.807	20.14	66.99	10.89 (11.15)

[a] Device structure: ITO/ZnO/PTB7-Th:$PC_{71}BM$:3%DIO/MoO_3/Ag;

[b] Device structure: ITO/ZnO/PTB7-Th:$PC_{71}BM$:0.5%DDO: 1%DIO/MoO_3/Ag;

[c] the effective device area, device performance of 11.0 mm^2 obtained from 10 devices;

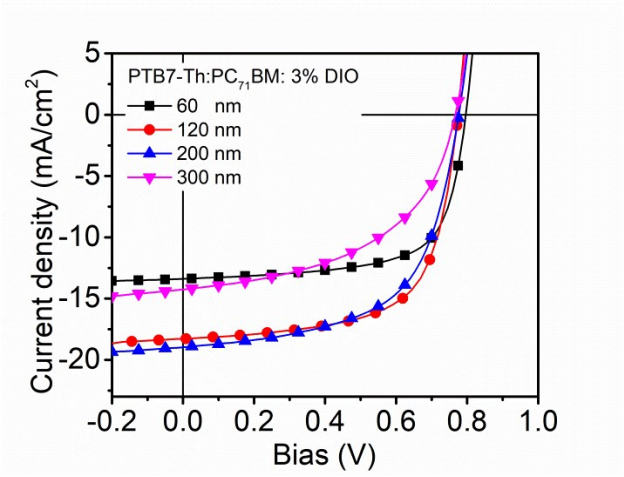

Figure S2. J-V curves of control device with different active layer thickness

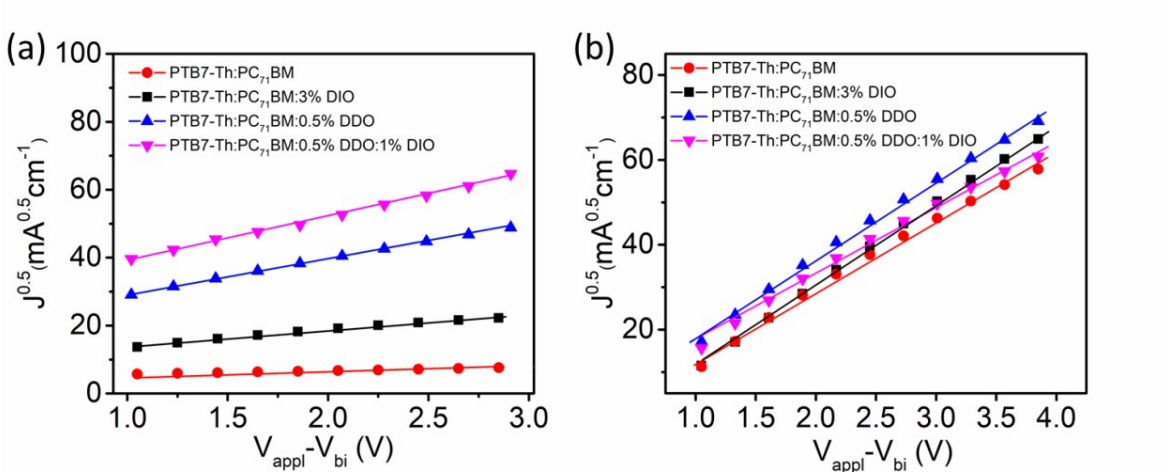

Figure S3. Fitting curves of hole (a) and electron (b) mobility of PTB7-Th: $PC_{71}BM$, PTB7-Th: $PC_{71}BM$: 3%DIO, PTB7-Th: $PC_{71}BM$: 0.5%DDO and PTB7-Th: $PC_{71}BM$: 0.5%DDO: 1%DIO films

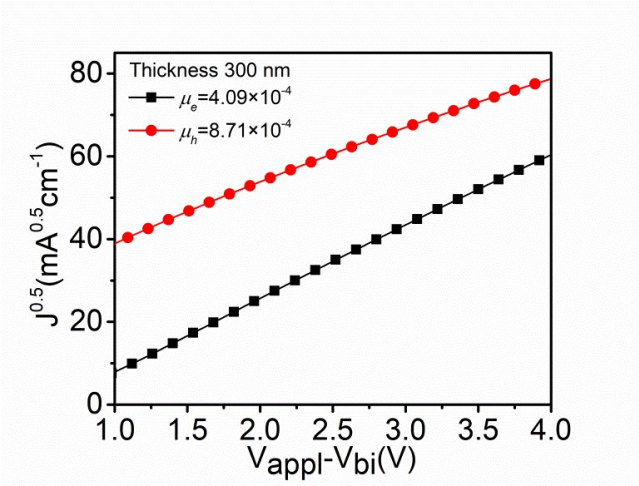

Figure S4. Fitting curves of hole and electron mobility of PTB7-Th: $PC_{71}BM$: 0.5%DDO: 1%DIO film with 300 nm thickness

Table S3. Charge mobilities and balance factor of DDO contained and control devices in this work

DDO	DIO	μ_h ($cm^2 V^{-1}S^{-1}$)	μ_e ($cm^2 V^{-1}S^{-1}$)	μ_h/μ_e
w/o	**w/o**	**2.18×10^{-5}**	**4.34×10^{-6}**	**5.02**
w/o	**3% DIO**	**5.42×10^{-4}**	**3.05×10^{-4}**	**1.78**
0.5% DDO	**w/o**	**1.12×10^{-3}**	**9.56×10^{-4}**	**1.17**
0.5% DDO	**1% DIO**	**1.24×10^{-3}**	**1.05×10^{-3}**	**1.18**

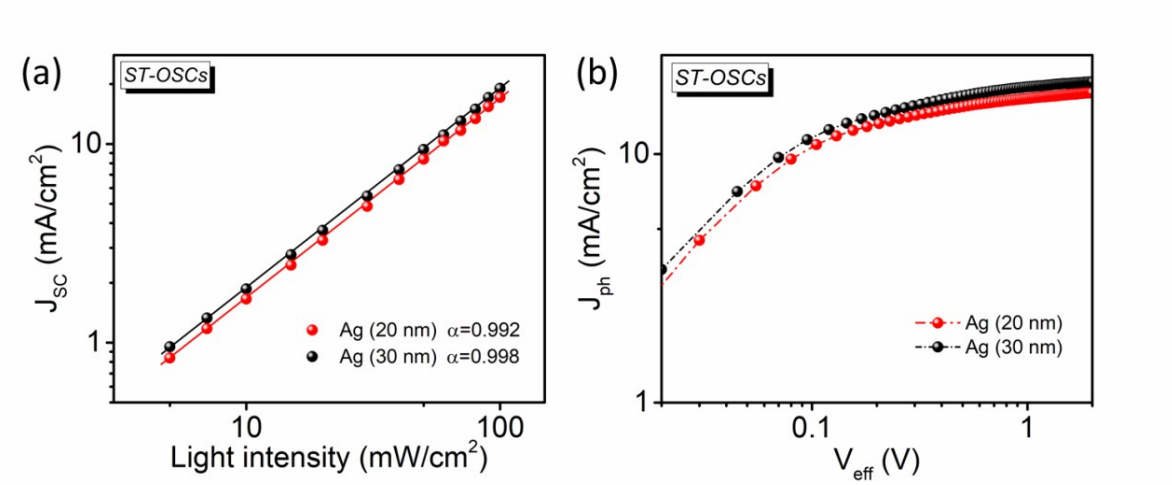

Figure S5. (a) Dependence of J_{SC} on light intensity (100 mW/cm^2 to 5 mW/cm^2) and (b) photocurrent versus effective voltage of ST-OSCs with different Ag thickness