Electronic Supplementary Information

Improving efficiency of polymer solar cells via a treatment of methanol:water on the active layers

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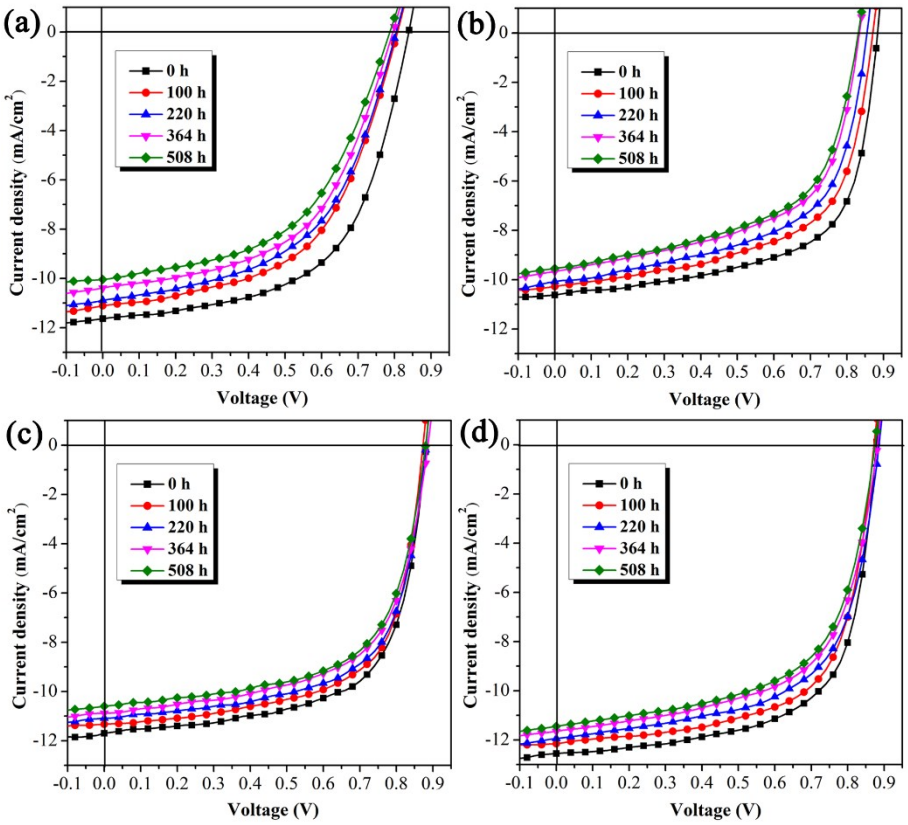

Fig. S1 *J-V* curves of the encapsulated PSCs based on ITO/PEDOT:PSS/PCDTBT:$PC_{71}BM$/Al (a), ITO/PEDOT:PSS/PCDTBT:$PC_{71}BM$/LiF/Al (b), ITO/PEDOT:PSS/PCDTBT:$PC_{71}BM$/methanol/Al (c) and ITO/PEDOT:PSS/PCDTBT:$PC_{71}BM$/M:W=6:1/Al (d).

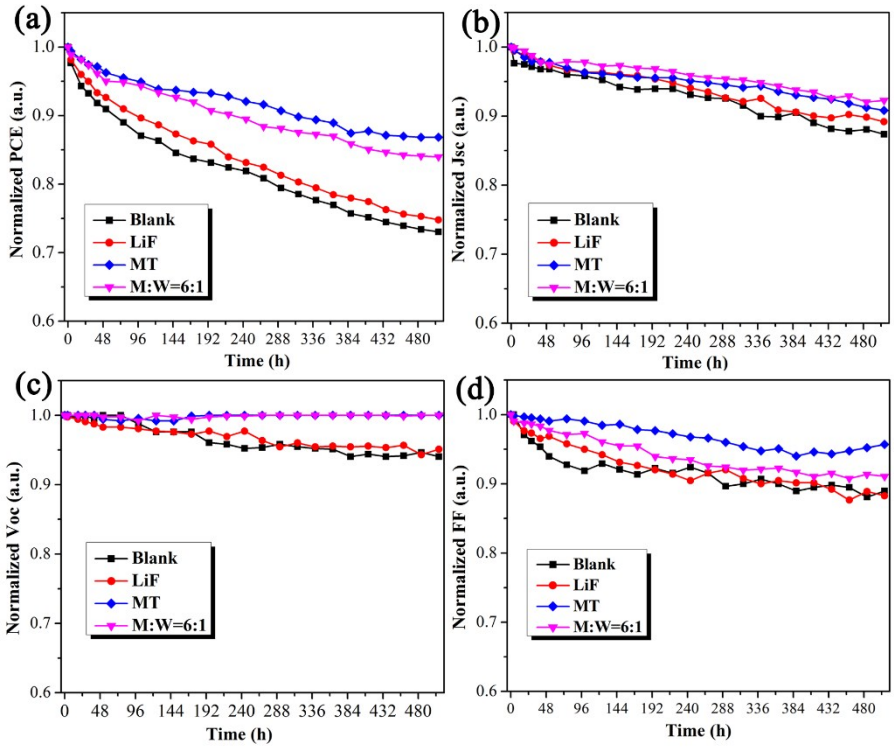

Fig. S2 Normalized PCE (a), Jsc (b), Voc (c) and FF (d) *versus* time of the encapsulated PSCs. Blank: ITO/PEDOT:PSS/PCDTBT:$PC_{71}BM$/Al; LiF: ITO/PEDOT:PSS/PCDTBT:$PC_{71}BM$/LiF/Al; MT: ITO/PEDOT:PSS/PCDTBT:$PC_{71}BM$/methanol/Al; M:W=6:1: ITO/PEDOT:PSS/PCDTBT:$PC_{71}BM$/M:W=6:1/Al .

Table S1 Photovoltaic performance of encapsulated the PSCs obtained from Fig. S1.

interfacial material	PCE (%)		Jsc (mA/ cm^2)		Voc (V)		FF	
	initial	final	initial	final	Initial	final	initial	final
Blank	5.64 ± 0.23	4.12 ±0.11	11.57 ± 0.19	10.11 ± 0.13	0.84 ± 0.01	0.79 ± 0.01	0.58 ± 0.01	0.52 ± 0.01
LiF	5.99 ± 0.14	4.48 ±0.22	10.63 ± 0.09	9.48 ± 0.11	0.88 ± 0.01	0.84 ± 0.01	0.64 ± 0.01	0.57 ± 0.01
MT	6.69 ±0.24	5.81 ±0.10	11.67 ± 0.04	10.60 ± 0.12	0.88 ± 0.01	0.88 ± 0.01	0.65 ± 0.01	0.62 ± 0.01
M:W=6:1	7.24 ± 0.22	6.08 ±0.04	12.44 ± 0.15	11.48 ± 0.05	0.88 ± 0.01	0.88 ± 0.01	0.66 ± 0.02	0.60 ±0.01

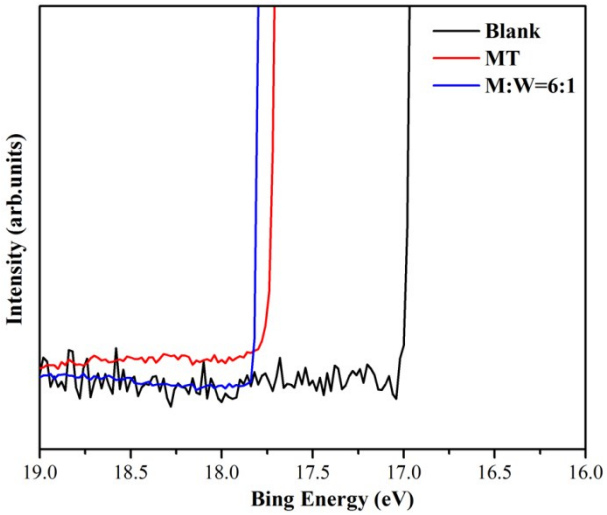

Fig. S3 Ultraviolet photoelectron spectra of bare Al (black line), Al treated by 100% methanol (red line) and Al treated by M:W=6:1 in the secondary electron cutoff range.

Table S2 Electron and hole mobilities from electron-only and hole-only devices.

Active layer treatment	Electron-only devices	Hole-only devices
	μ_e [$cm^2\ V^{-1}\ s^{-1}$]	μ_h [$cm^2\ V^{-1}\ s^{-1}$]
Blank	2.66×10^{-4}	1.77×10^{-5}
MT	3.28×10^{-4}	4.03×10^{-5}
M:W=9:1	4.50×10^{-4}	5.24×10^{-5}
M:W=6:1	5.05×10^{-4}	6.16×10^{-5}
M:W=3:1	4.11×10^{-4}	4.92×10^{-5}

Electron-only device: ITO/Al/LiF/PCDTBT:$PC_{71}BM$/ST/LiF/Al; Hole-only device: ITO/PEDOT:PSS/ PCDTBT:$PC_{71}BM$/ST/MoO_x/Al (ST : solvent treatment).

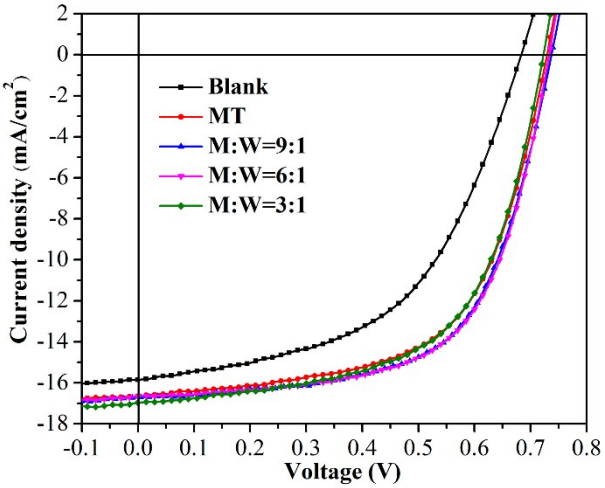

Fig. S4 *J-V* curves of the PSCs based on ITO/PEDOT:PSS/PTB7:$PC_{71}BM$/Al under AM1.5G illumination at intensity of 100 mW cm^{-2}.

Table S3 Performances of the PSCs based on PTB7:$PC_{71}BM$ derived from Fig. S4.

Device[c]	Jsc [mA cm^{-2}]	Voc [V]	FF	PCE [%]		Rs [Ω cm^2]	Rsh [Ω cm^2]
				Max.	Aver.		
1	15.76	0.680	0.53	5.72	5.52	11.29	330.0
2	16.51	0.725	0.62	7.42	7.30	7.38	388.1
3	16.85	0.735	0.63	7.80	7.48	6.50	614.6
4	16.56	0.730	0.64	7.74	7.57	6.62	611.9
5	16.97	0.720	0.61	7.45	7.23	6.90	426.6

[c] Device structure: Device 1: [ITO/PEDOT:PSS/PTB7:$PC_{71}BM$/Al], Device 2: [ITO/PEDOT:PSS/PTB7:$PC_{71}BM$/ Methanol/Al], Device 3: [ITO/PEDOT:PSS/PTB7:$PC_{71}BM$/M:W=9:1/Al], Device 4: [ITO/PEDOT:PSS /PTB7:$PC_{71}BM$/M:W=6:1/Al], Device 5: [ITO/PEDOT:PSS/PTB7:$PC_{71}BM$/M:W=3:1/Al].