Supporting Information for

An Efficient Trap Passivator for Perovskite Solar Cells: Poly (propylene glycol) bis (2-aminopropyl ether)

Ningli Chen[1, 2], Xiaohui Yi[1, 3], Jing Zhuang[1, 2], Yuanzhi Wei[1, 2], Yanyan Zhang[4], Fuyi Wang[2, 4], Shaokui Cao[5], Cheng Li[3], Jizheng Wang[1, 2, *]

[1]CAS Key Laboratory of Organic Solids, Beijing National Laboratory for Molecular Sciences, Institute of Chemistry Chinese Academy of Sciences, Beijing 100190, People's Republic of China

[2]University of Chinese Academy of Sciences, Beijing 100190, People's Republic of China

[3]Department of Physics, Xiamen University, Xiamen 361005, People's Republic of China

[4]CAS Key Laboratory of Analytical Chemistry for Living Biosystems, Beijing National Laboratory for Molecular Sciences, Institute of Chemistry Chinese Academy of Sciences, Beijing 100190, People's Republic of China

[5]School of Materials Science & Engineering, Zhengzhou University, Zhengzhou 450000, People's Republic of China

*Corresponding author. E-mail: jizheng@iccas.ac.cn (Jizheng Wang)

Supplementary Figures

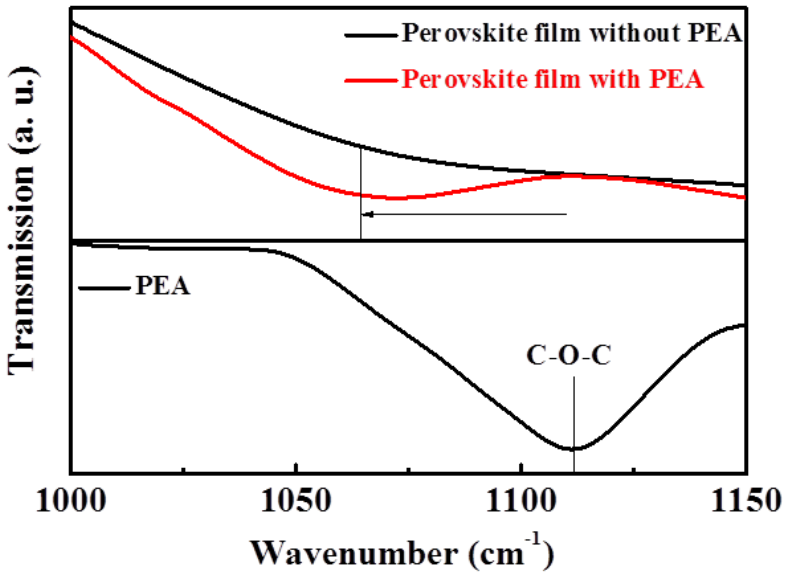

Fig. S1 FITR spectra of PEA and the $MAPbI_3$ films with and without PEA

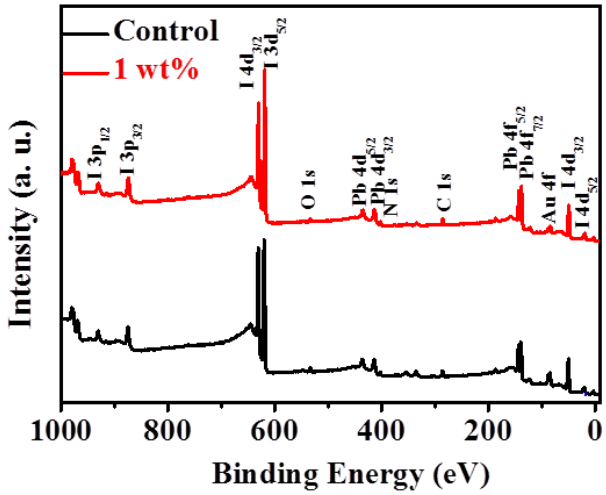

Fig. S2 XPS of the overview spectrum for the $MAPbI_3$ films with and without PEA

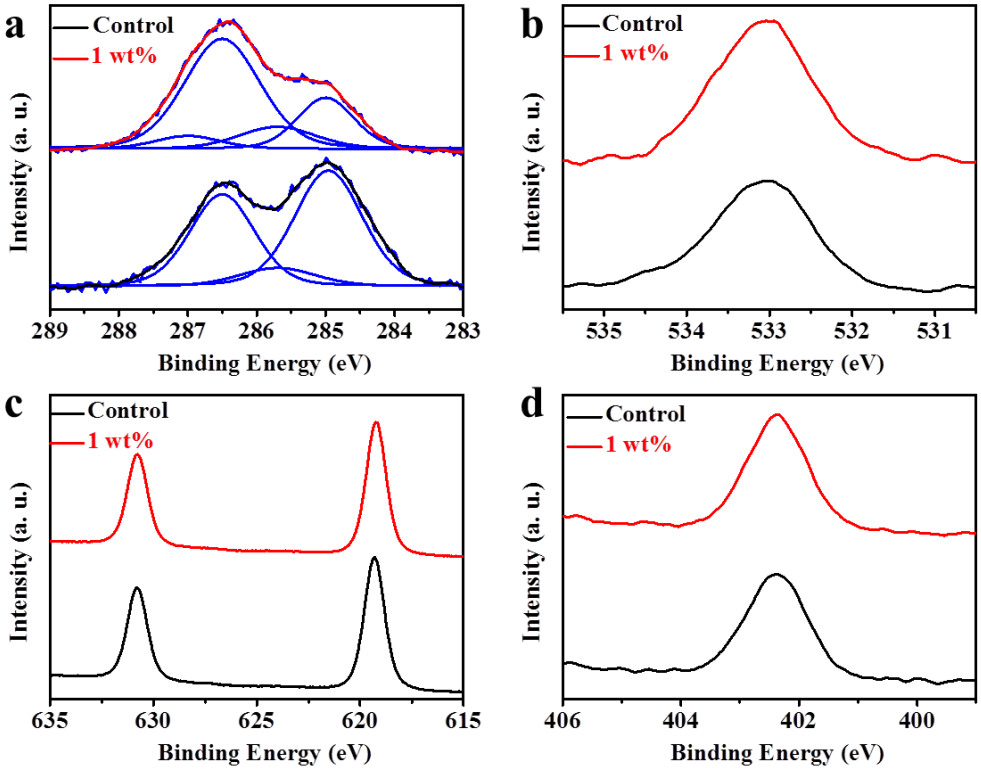

Fig. S3 XPS spectra of (**a**) C 1s, (**b**) O 1s, (**c**) I 3d, and (**d**) N 1s for the $MAPbI_3$ films with and without PEA

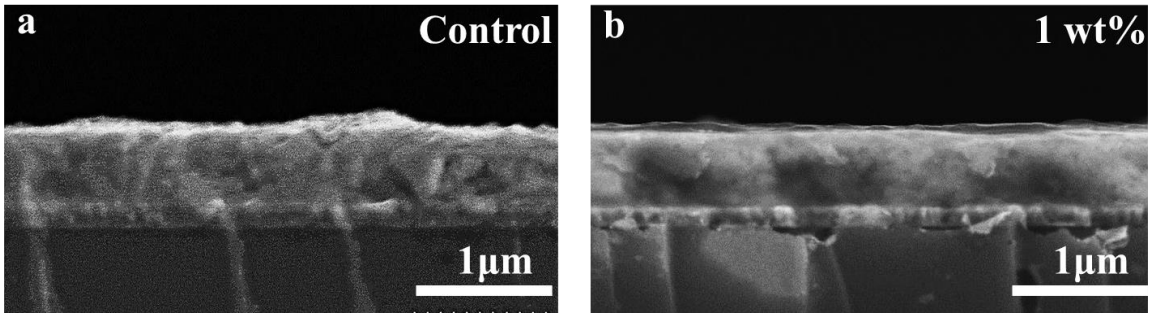

Fig. S4 Cross-section SEM images of the $MAPbI_3$ films (**a**) without and (**b**) with PEA

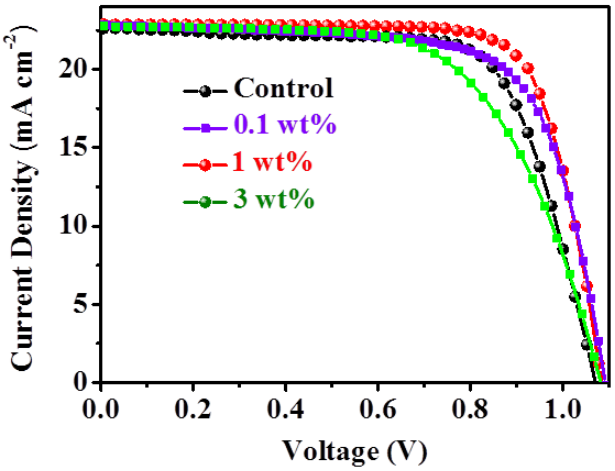

Fig. S5 J-V curves of $MAPbI_3$ solar cells with various PEA concentration

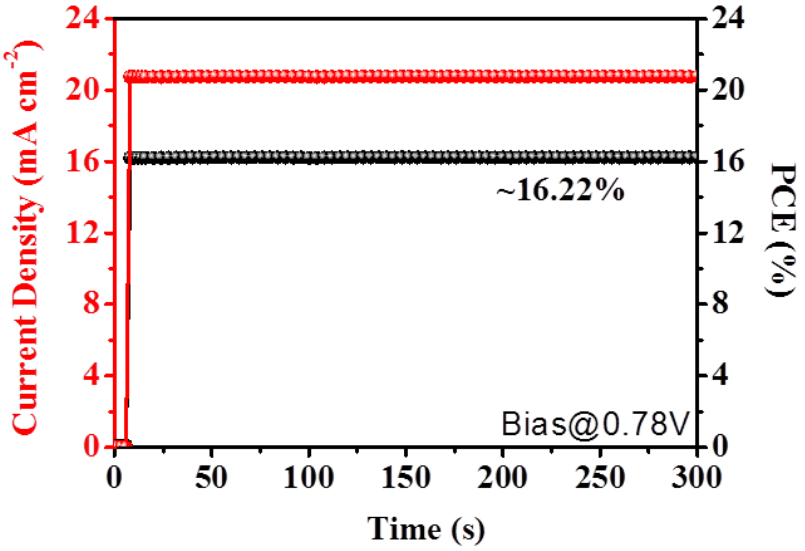

Fig. S6 Steady-state current density and PCE for the $MAPbI_3$ device withou PEA

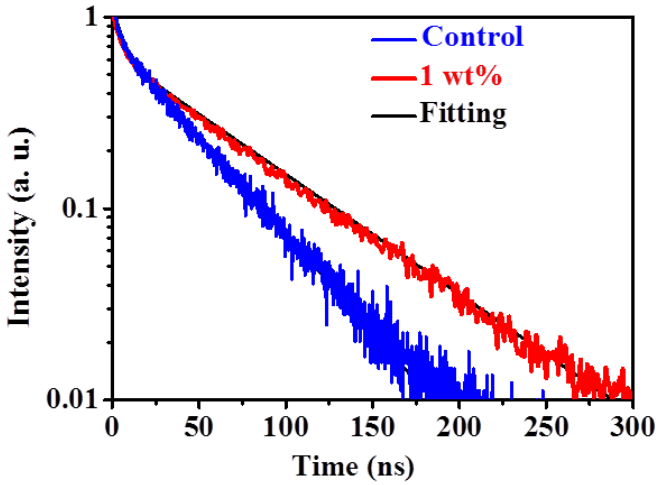

Fig. S7 TRPL spectra of the $MAPbI_3$ films with and without PEA on glass substrates

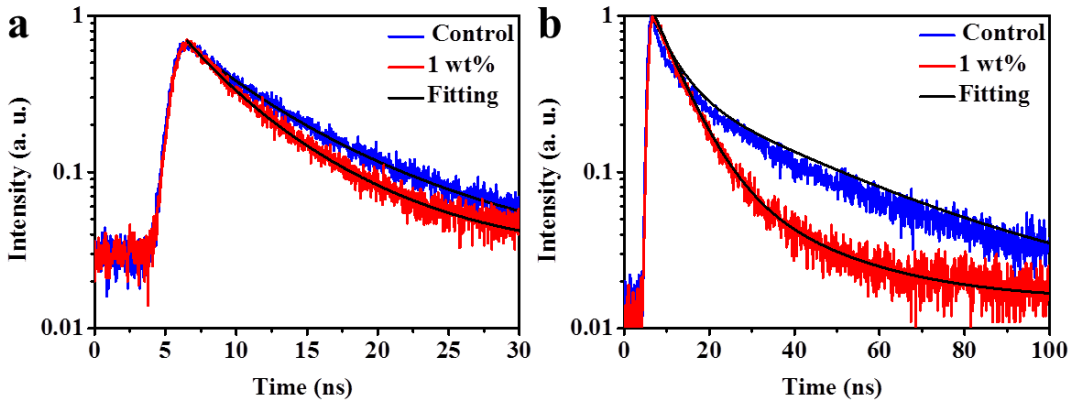

Fig. S8 TRPL spectra of the $MAPbI_3$ films with and without PEA interfaced with (**a**) PCBM and (**b**) Spiro-OMeTAD

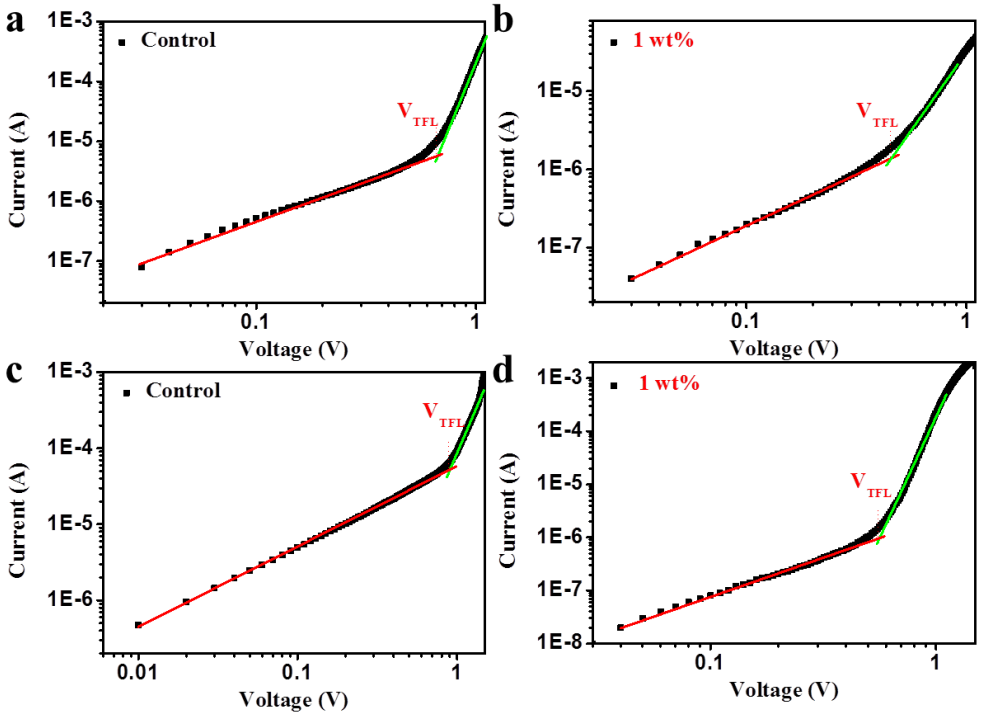

Fig. S9 Dark Current-voltage curves for (**a, b**) hole-only devices and (**c, d**) electron-only devices

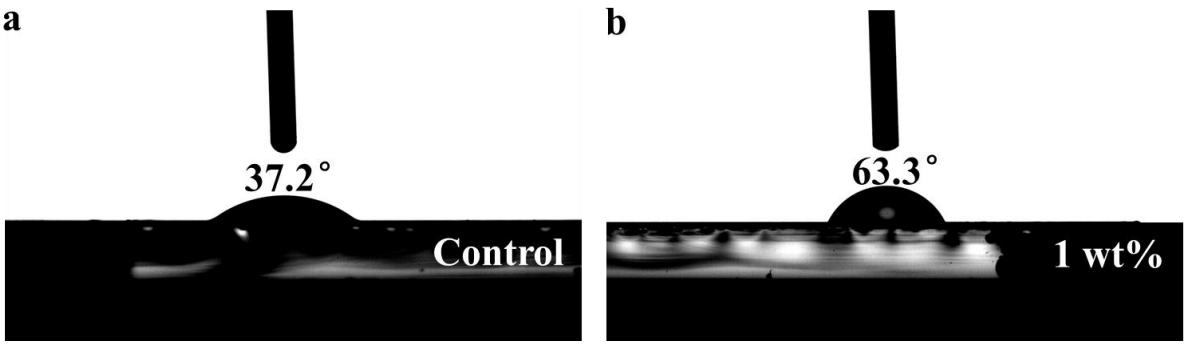

Fig. S10 Water contact angle. (**a**) $MAPbI_3$ film without PEA. (**b**) $MAPbI_3$ film with PEA

Table S1 Device parameters of the $MAPbI_3$ devices with various PEA concentration

Content	J_{SC} (mA cm^{-2})	V_{OC} (V)	FF (%)	PCE (%)
Control	22.63	1.08	70.3	17.18
0.1 wt%	22.82	1.09	70.3	17.49
1 wt%	22.89	1.08	76.3	18.87
3 wt%	22.74	1.08	62.7	15.41

Table S2 Device parameters of the $MAPbI_3$ devices with and without PEA

Device	J_{SC} (mA cm^{-2})	V_{OC} (V)	FF (%)	PCE (%)	HI
Control-Reverse	22.63	1.08	70.3	17.18	0.091
Control-Forward	22.63	1.05	65.7	15.61	
With PEA-Reverse	22.89	1.08	76.3	18.87	0.011
With PEA-Forward	22.89	1.08	75.5	18.67	

Table S3 Fitting parameters for TRPL of the $MAPbI_3$ films with and without PEA

Sample	A_1	τ_1 (ns)	A_2	τ_2 (ns)
Control film	0.35	4.2	0.65	42.5
PEA-$MAPbI_3$ film	0.41	6.0	0.59	69.3

Table S4 Fitting parameters for TRPL of the $MAPbI_3$ films with and without PEA interfaced with PCBM and Spiro-OMeTAD

Sample	A_1	τ_1 (ns)	A_2	τ_2 (ns)
Control film/PCBM	0.70	3.9	0.30	9.4
PEA-$MAPbI_3$ film/PCBM	0.78	2.8	0.22	6.8
Control film/ Spiro-OMeTAD	0.67	5.3	0.33	33.1
PEA-$MAPbI_3$ film/ Spiro-OMeTAD	0.90	6.2	0.10	22.2

Table S5 Device parameters of the $(FAPbI_3)_{1-x}(MAPbBr_3)_x$ devices with and without PEA

Device	J_{SC} (mA cm^{-2})	V_{OC} (V)	FF (%)	PCE (%)	HI
Control-Reverse	23.51	1.13	73.73	19.66	0.154
Control-Forward	23.30	1.09	65.38	16.64	
With PEA-Reverse	24.42	1.15	76.94	21.60	0.020
With PEA-Forward	24.40	1.13	76.49	21.16	