

Supplementary Information

The multiple effects of polyaniline additive to improve the efficiency and stability of perovskite solar cells

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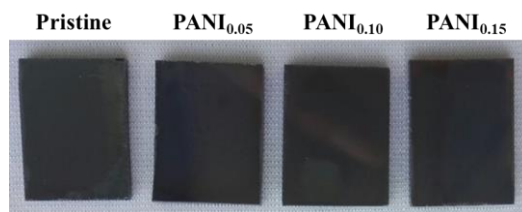


Fig. S1 Images of pristine and perovskite films with different amounts of PANI after annealing.

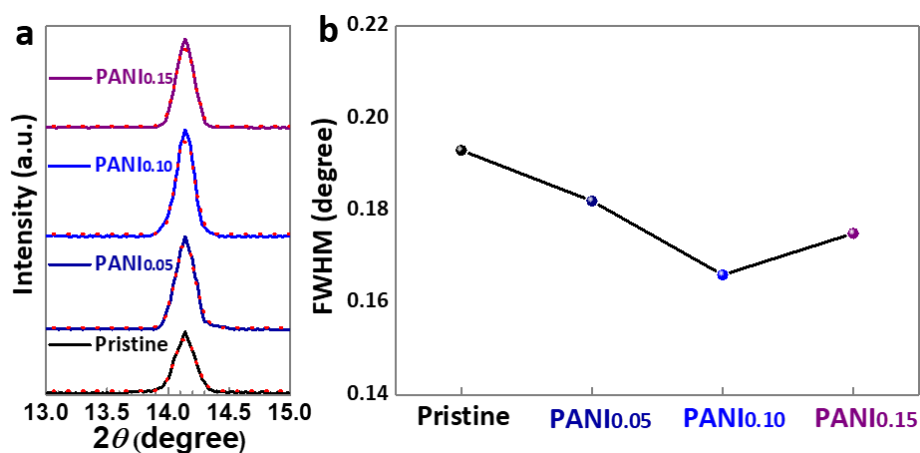


Fig. S2 (a) The magnified XRD patterns with gaussian fit and (b) the dependence of full width at half maximum (FWHM) for the (110) peaks of pristine and perovskite films with different amounts of PANI.

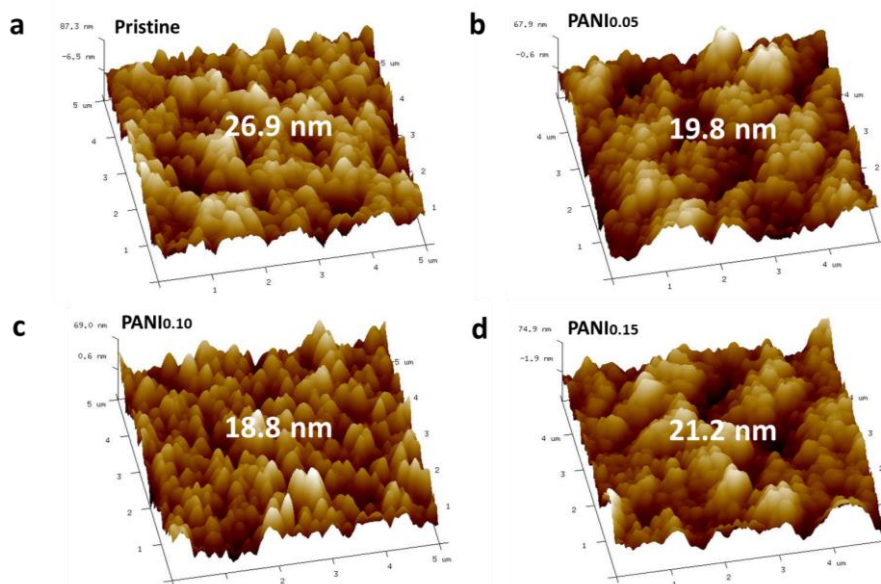


Fig. S3 AFM images of pristine and perovskite films with different amounts of PANI.

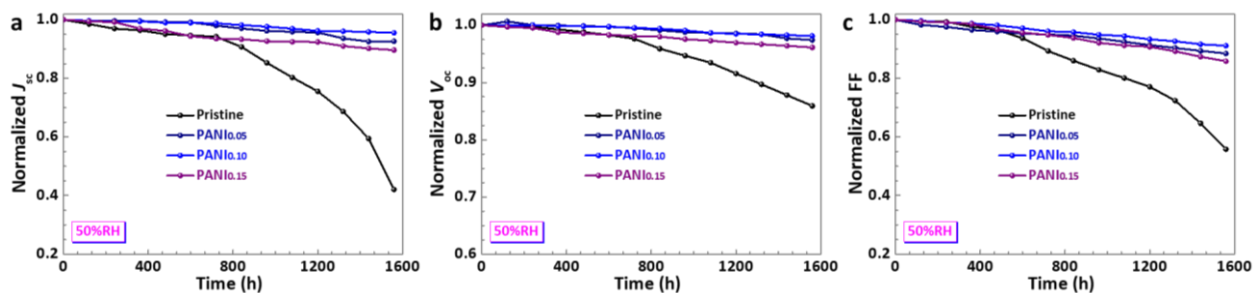


Fig. S4 Normalized (a) J_{sc} , (b) V_{oc} and (c) FF variation curves of unsealed pristine and perovskite devices with different amounts of PANI under 50% RH.

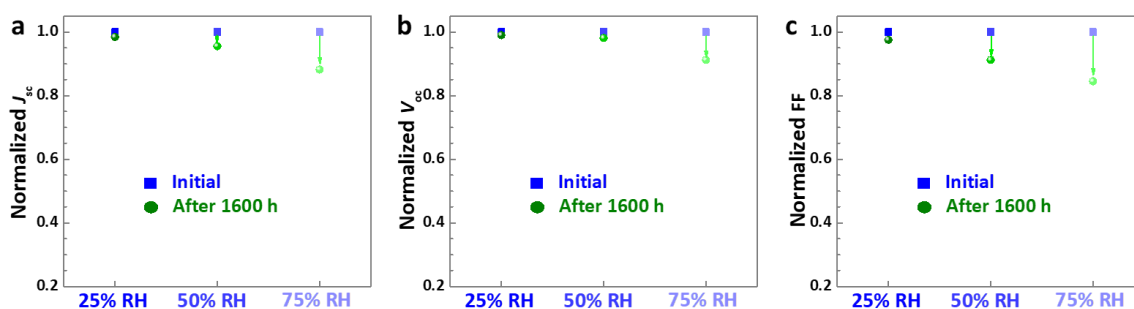


Fig. S5 Normalized (a) J_{sc} , (b) V_{oc} and (c) FF variations of PANI_{0.10} perovskite devices under about 25%, 50% and 75% RH.

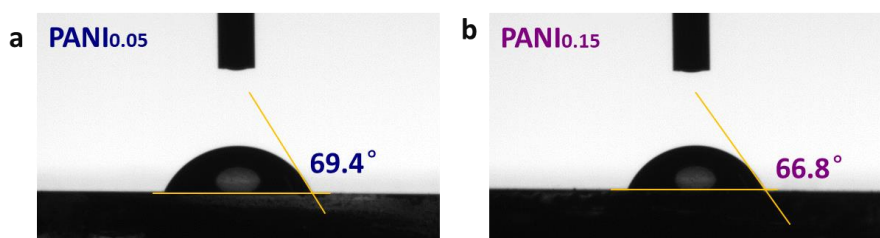


Fig. S6 The water contact angles of PANI_{0.05} and PANI_{0.15} perovskite films.



Fig. S7 Normalized (a) J_{sc} , (b) V_{oc} and (c) FF variations of pristine and perovskite devices with different amounts of PANI at 85 °C.

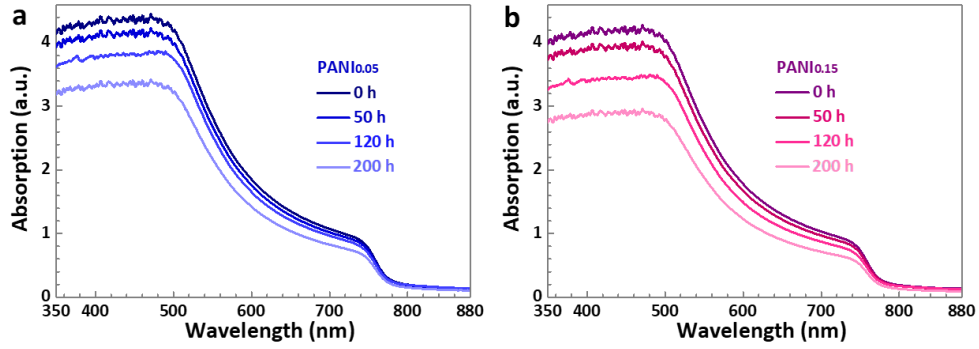


Fig. S8 UV-vis absorption spectra of PANI_{0.05} and PANI_{0.15} perovskite films before and after exposure to 85 °C.

Table S1 Photovoltaic parameters of pristine device and perovskite devices with different amounts of PANI.

Devices	J_{sc} (mA cm ⁻²)	V_{oc} (V)	FF (%)	PCE (%)
Pristine	22.10	1.06	72.37	16.96
PANI _{0.05}	22.46	1.09	74.18	18.17
PANI _{0.10}	22.50	1.10	77.13	19.09
PANI _{0.15}	22.38	1.11	73.32	18.24
PANI _{0.20}	22.39	1.08	73.59	17.73
PANI _{0.25}	22.16	1.07	73.40	17.33

Table S2 Photovoltaic parameters of pristine and PANI_{0.10} perovskite devices under reverse and forward scan directions.

Devices	J_{sc} (mA cm ⁻²)	V_{oc} (V)	FF (%)	PCE (%)
Pristine-Reverse	22.10	1.06	72.37	16.96
Pristine-Forward	22.09	1.06	65.69	15.31
PANI _{0.10} -Reverse	22.50	1.10	77.13	19.09
PANI _{0.10} -Forward	22.44	1.10	74.85	18.48