

Supporting

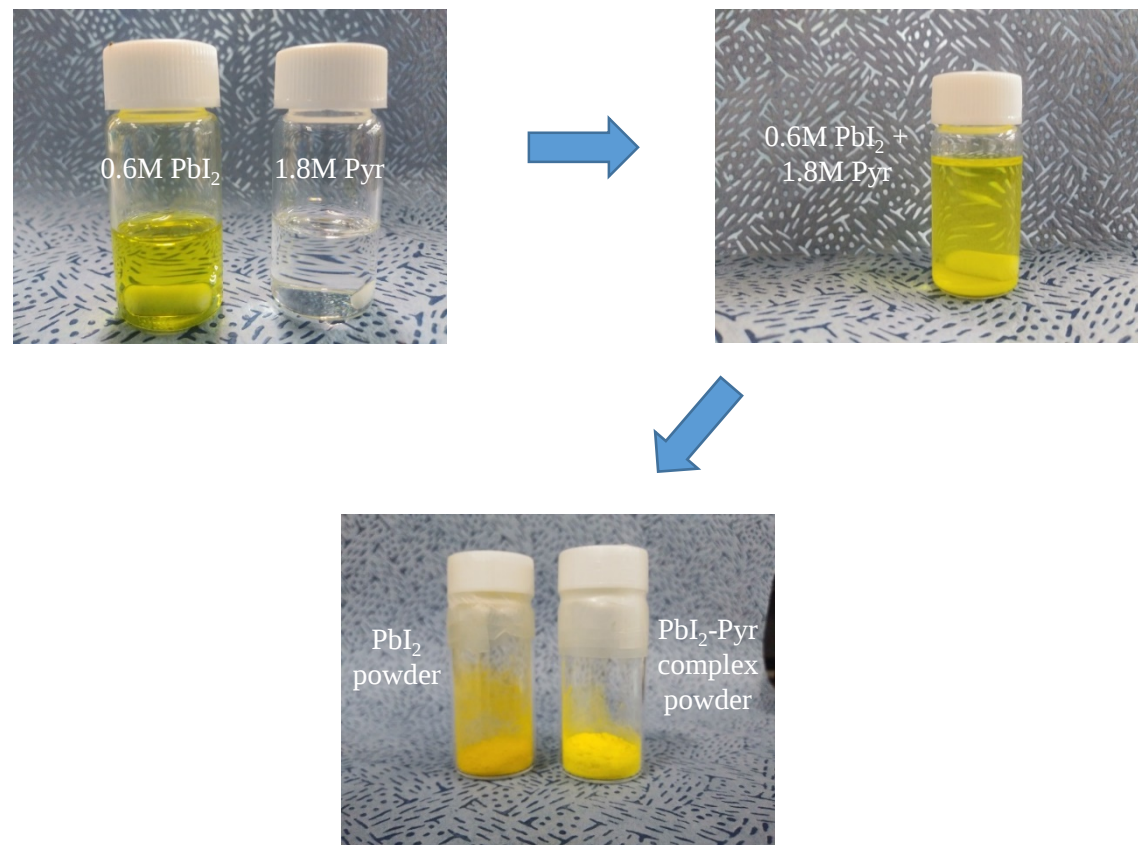


Figure S1. Photographs of the synthesis process and product of PbI_2 -Pyrazine complex.

Supporting

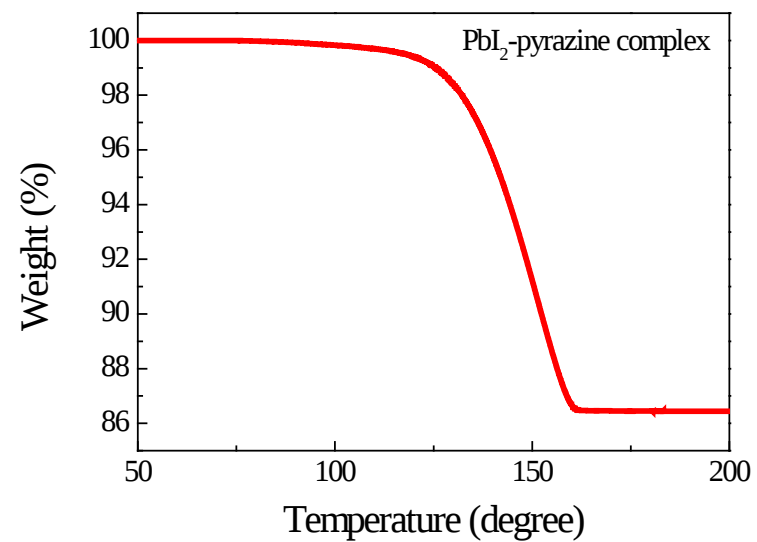


Figure S2. TGA of PbI_2 -(Pyrazine)_x complex powder.

Supporting

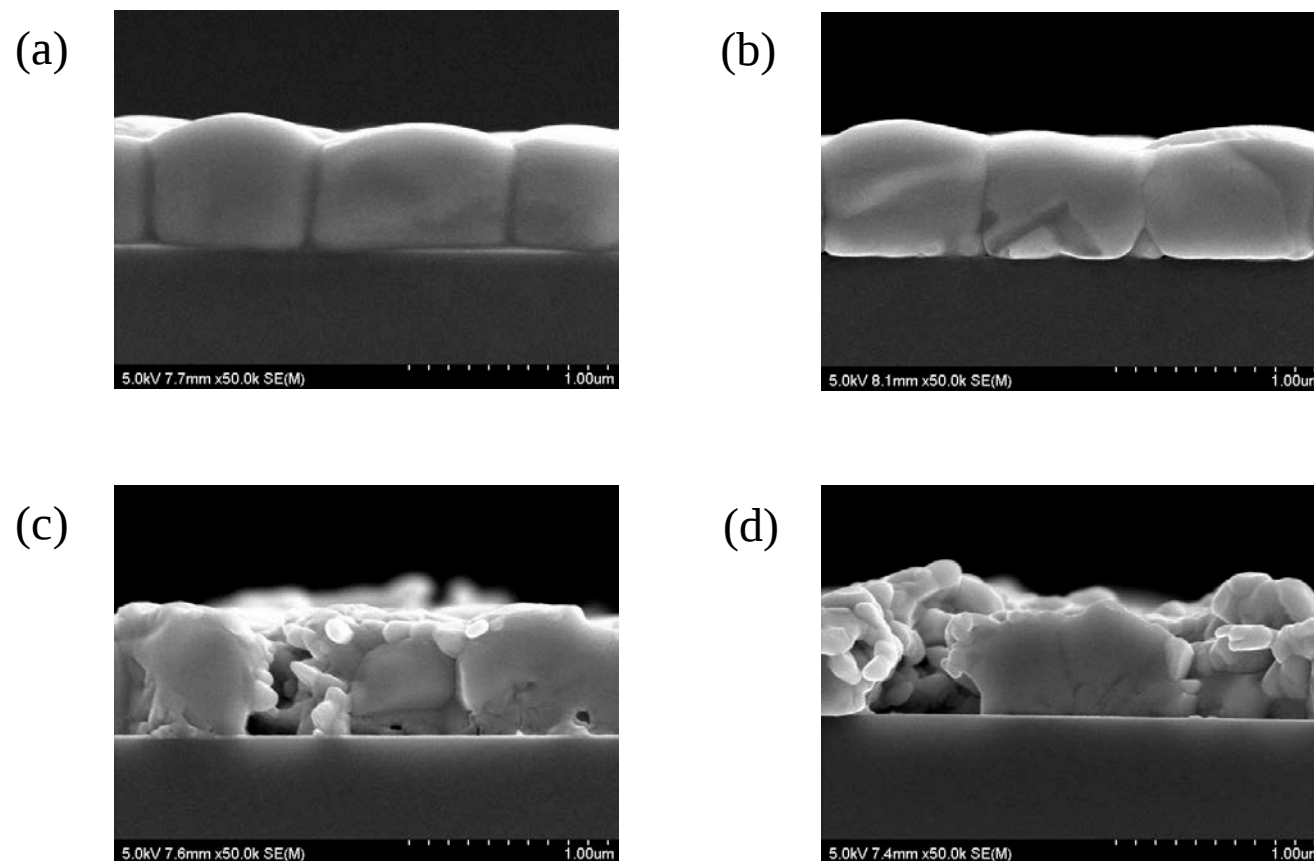


Figure S3. Cross-view SEM images of the pristine and passivated perovskite films : (a) untreated, (b) 1mg Pyr/ml, (c) 20mg Pyr/ml, (d) 50mg Pyr/ml.

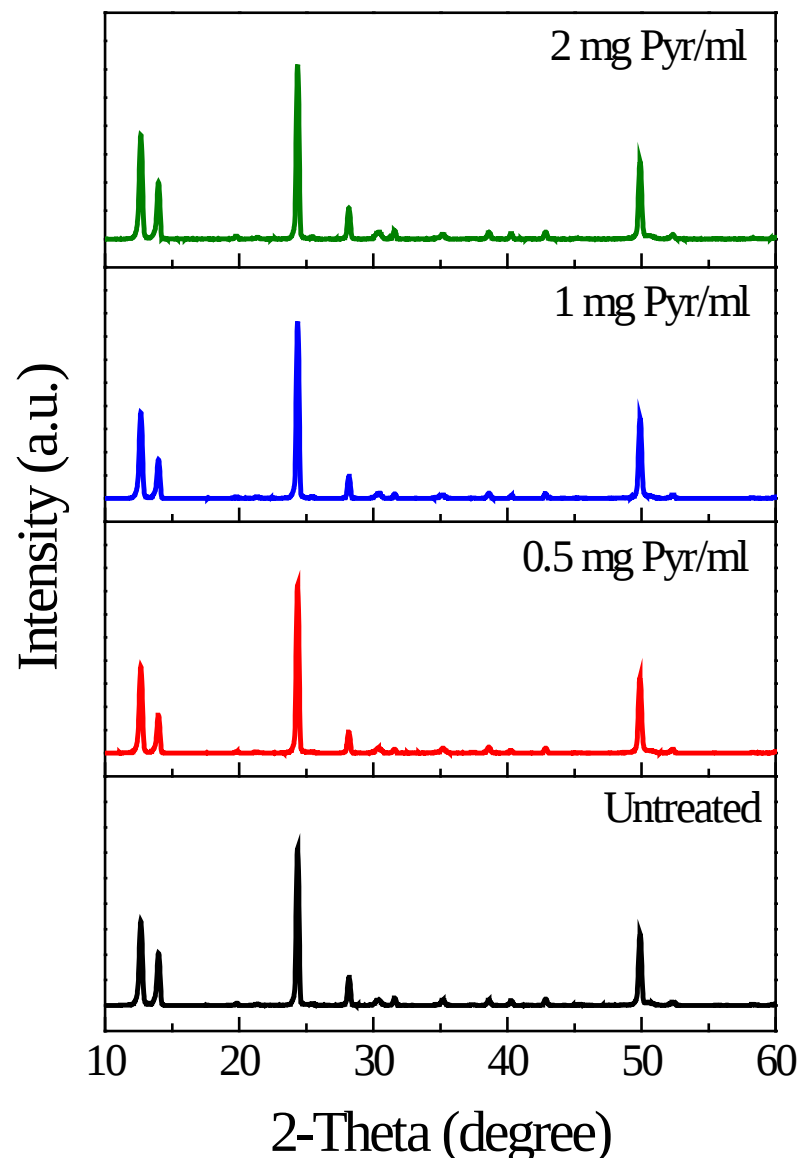


Figure S4. XRD patterns of untreated and Pyr-treated perovskite films.

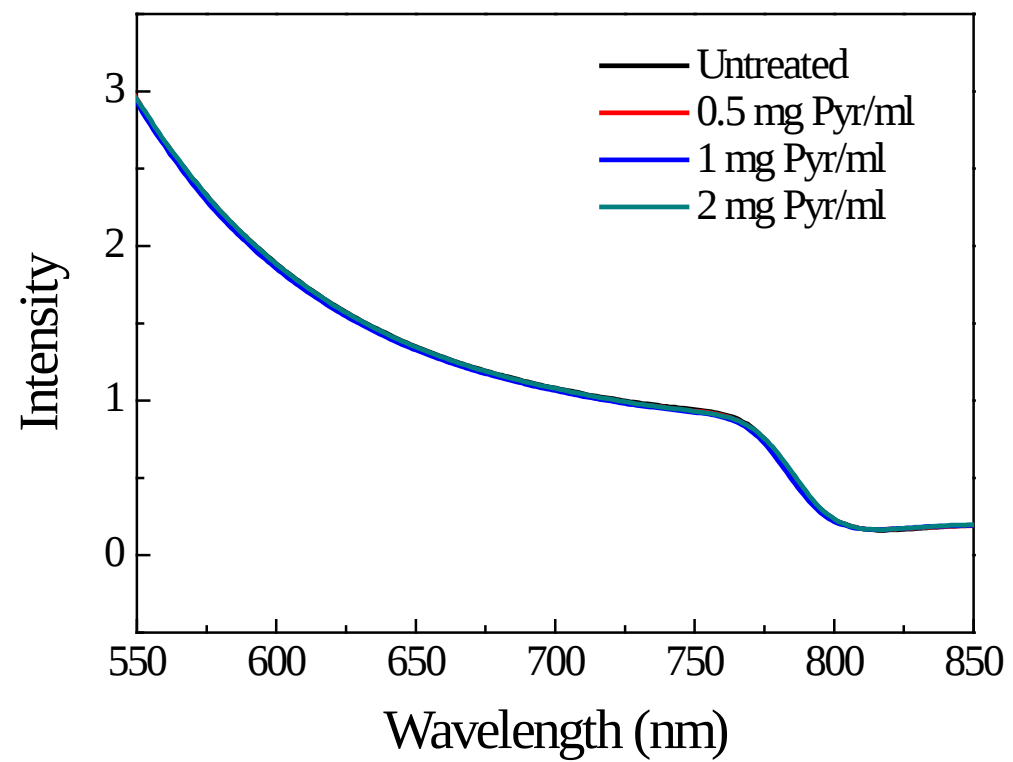


Figure S5. UV-vis absorption spectra of untreated and Pyr-treated perovskite films.

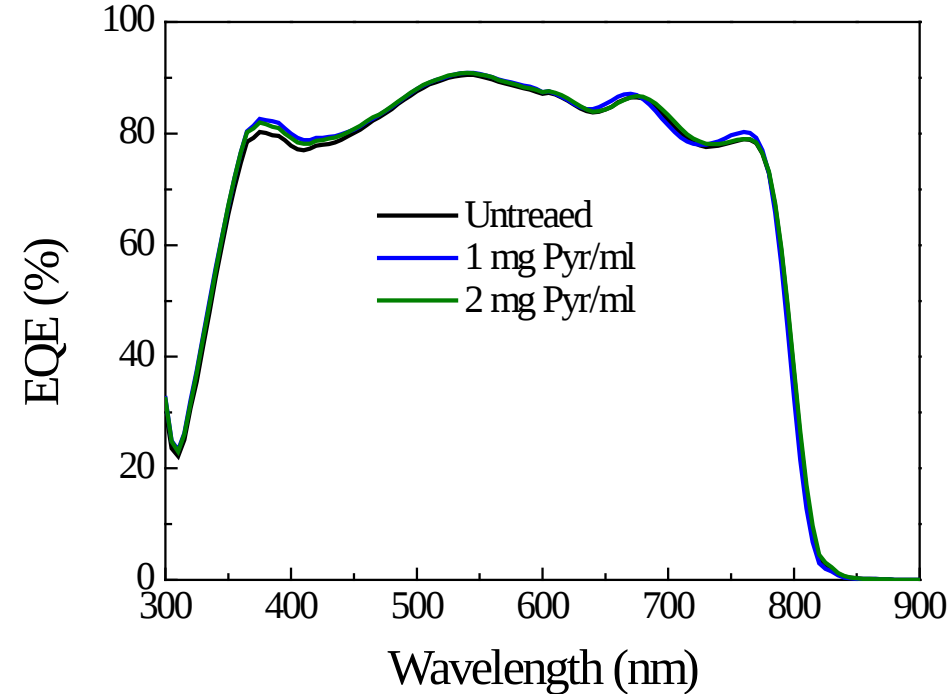


Figure S6. EQE of untreated and Pyr-treated perovskite devices.

Supporting

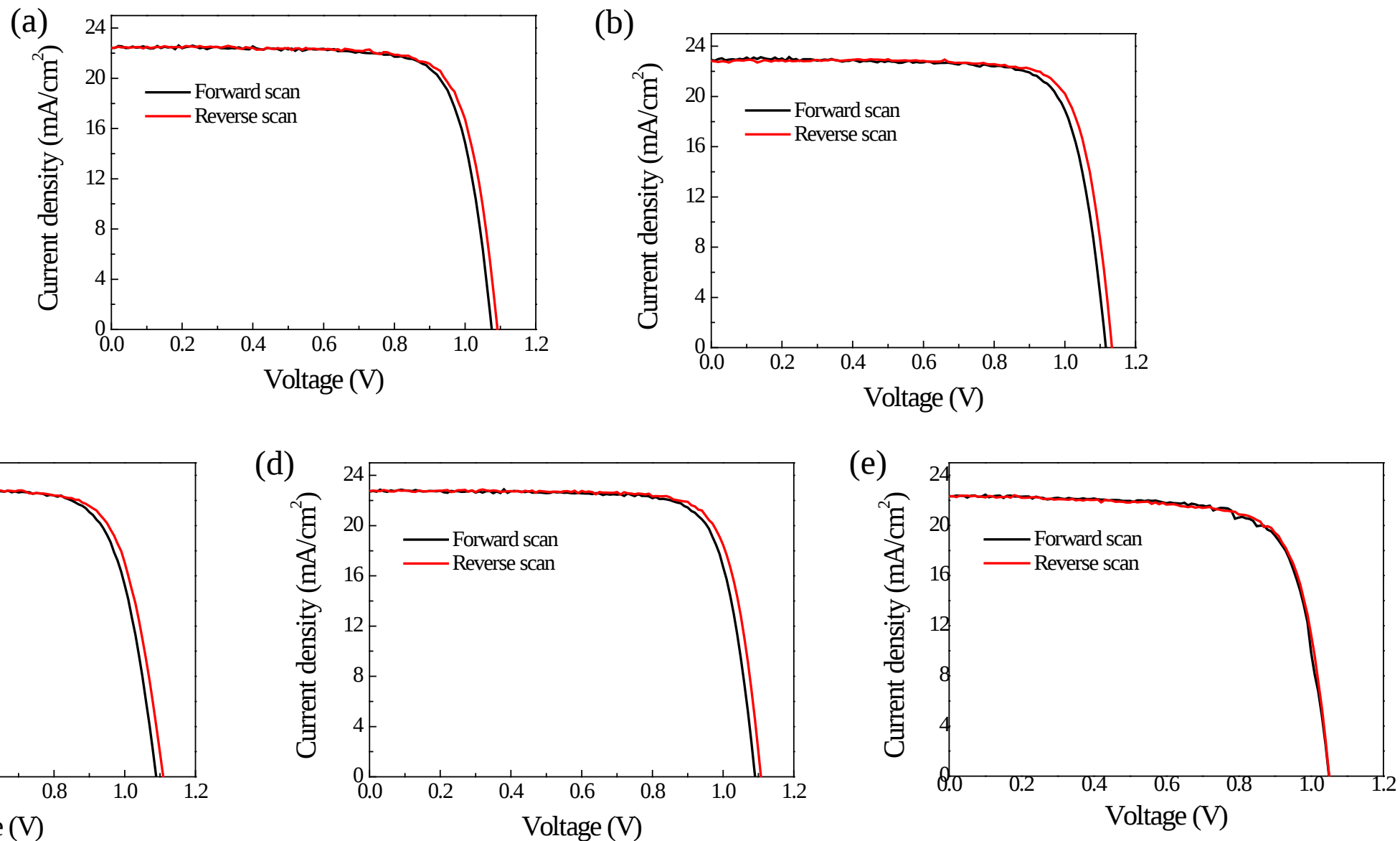


Figure S7. Hysteresis J-V curves of untreated and Pyr-treated perovskite devices : (a) untreated, (b) 0.5mg Pyr/ml, (c) 1mg Pyr/ml, (d) 2mg Pyr/ml, (e) IPA treated.

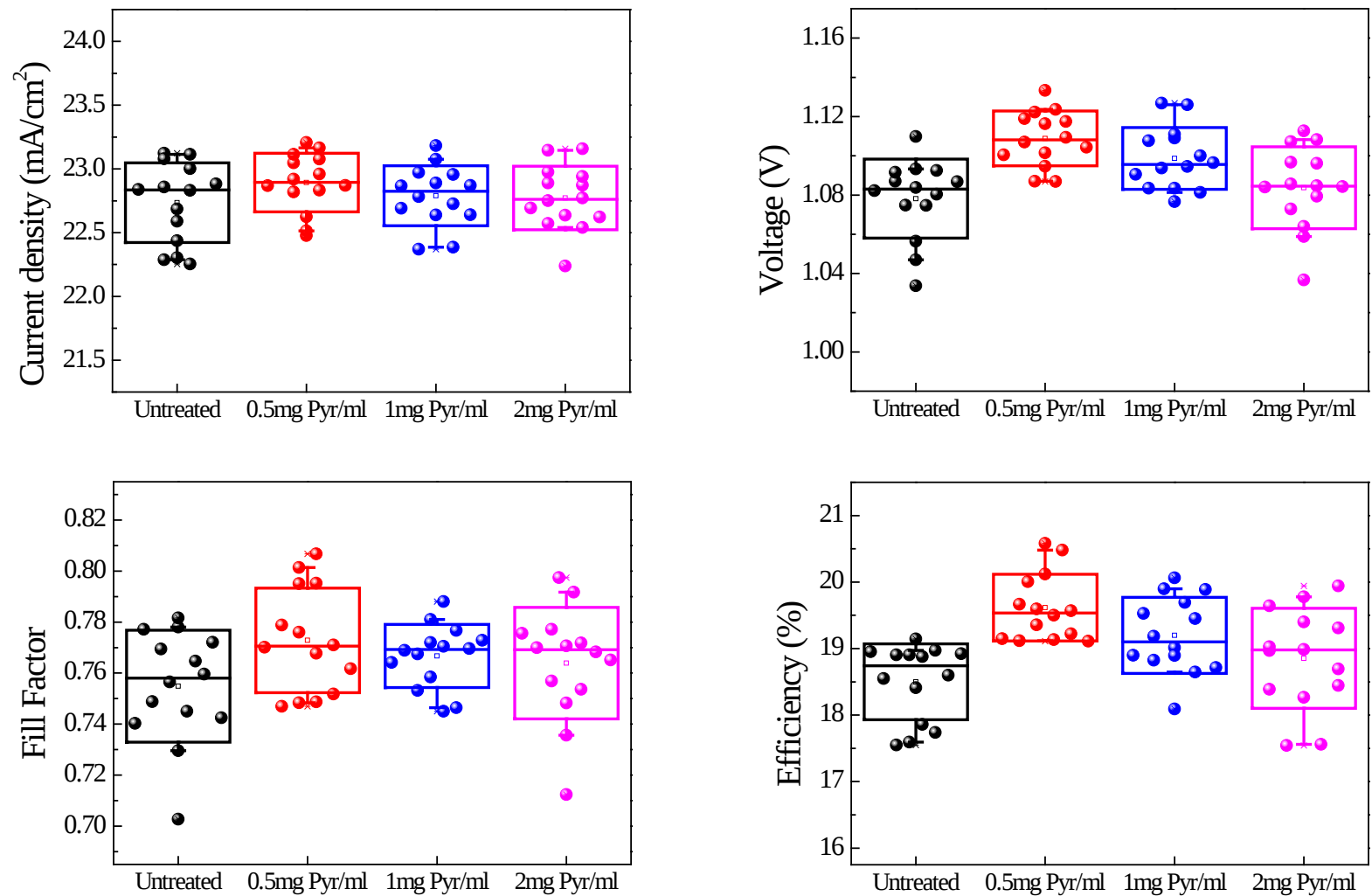


Figure S8. The variation of photovoltaic parameters for the perovskite devices with various amounts of pyrazine.

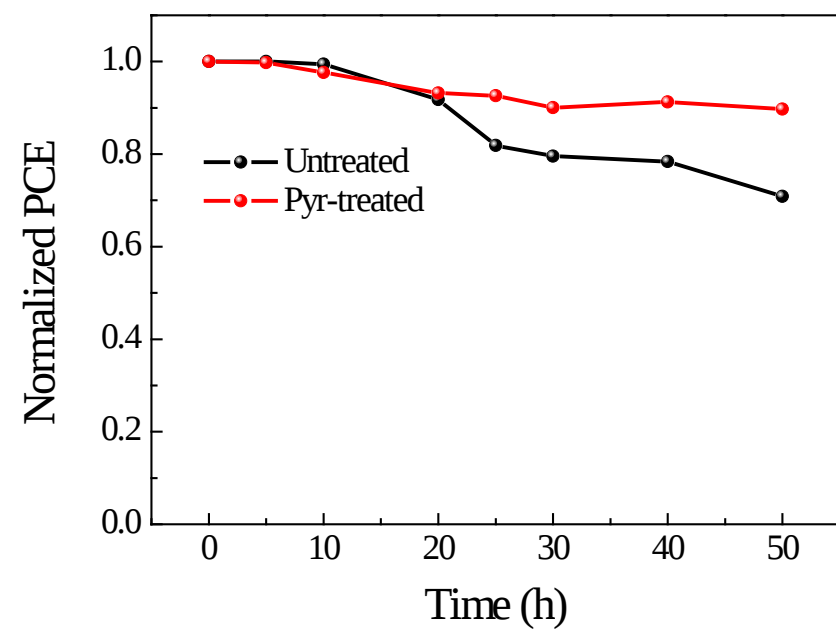


Figure S9. Thermal stability of untreated and Pyr-treated perovskite devices.

Table S1. FWHM for XRD peak of untreated and Pyr-treated perovskite films.

	Untreated	0.5mg Pyr/ml	1mg Pyr/ml	2mg Pyr/ml
FWHM	0.230	0.230	0.227	0.228

Table S2. Composition of untreated and Pyr-treated perovskite films. (Unit : At. %)

	I3d5	N1s	Pb4f
Untreated	41.43	11.21	14.61
0.5mg Pyr/ml	40.43	13.37	13.26
1.0mg Pyr/ml	31.82	16.33	9.72
2.0mg Pyr/ml	33.25	17.6	9.87

Table S3. Photovoltaic parameters of the best performing devices.

		J_{SC} (mA/cm²)	V_{OC}(V)	Fill factor	Efficiency(%)	Hysteresis index
Untreated	Reverse scan	22.43	1.092	0.782	19.14	0.022
	Forward scan	22.43	1.076	0.776	18.71	
0.5mg Pyr/ml	Reverse scan	22.83	1.133	0.795	20.58	0.046
	Forward scan	22.83	1.115	0.771	19.63	
1mg Pyr/ml	Reverse scan	22.96	1.109	0.788	20.06	0.010
	Forward scan	22.97	1.091	0.793	19.85	
2mg Pyr/ml	Reverse scan	22.750	1.107	0.792	19.94	0.030
	Forward scan	22.70	1.090	0.781	19.34	
IPA treated	Reverse scan	22.31	1.050	0.752	17.62	0.014
	Forward scan	22.34	1.049	0.741	17.38	

Table S4. TRPL decay fitting parameters of untreated and Pyr-treated PSCs.

	$A_1(\%)$	$\tau_1(\text{ns})$	$A_2(\%)$	$\tau_2(\text{ns})$	$\tau_{\text{avg}}(\text{ns})$
Untreated	63.88	90.76	36.12	338.51	258.83
0.5mg Pyr/ml	8.28	24.72	91.72	1053.61	1051.44
1mg Pyr/ml	12.73	18.49	87.27	785.67	783.05
2mg Pyr/ml	47.66	92.25	52.34	221.53	185.99