

Improving Crystallization and Stability of Perovskite Solar Cells Using a Low-Temperature Treated A-Site Cation Solution in the Sequential Deposition

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Supplemental items

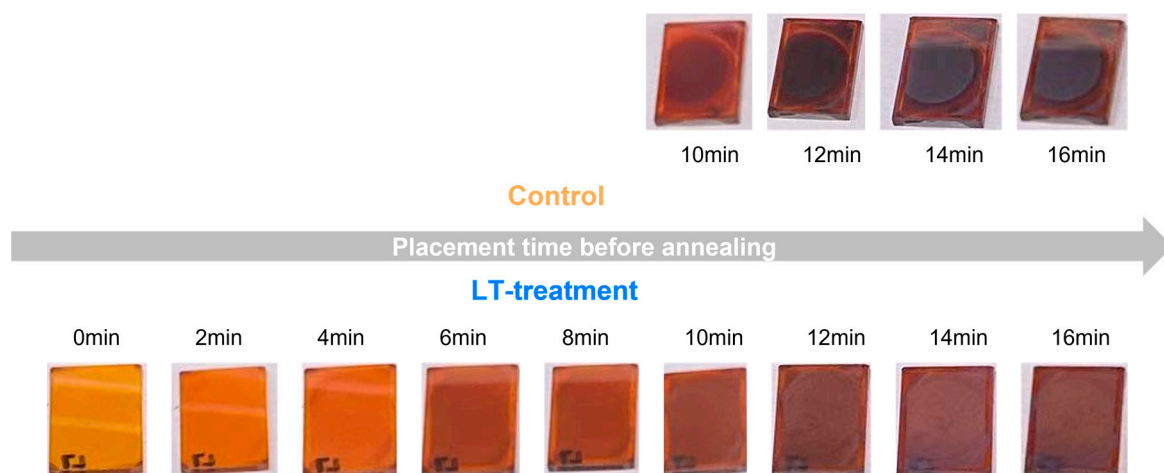


Figure S1. Optical graphs of perovskite films after deposition of organic salts as a function of time.

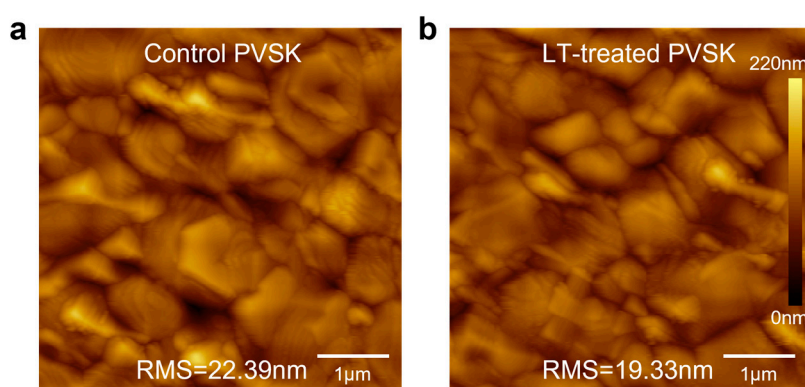


Figure S2. AFM images of perovskite films without (a) and with (b) LT treatment.

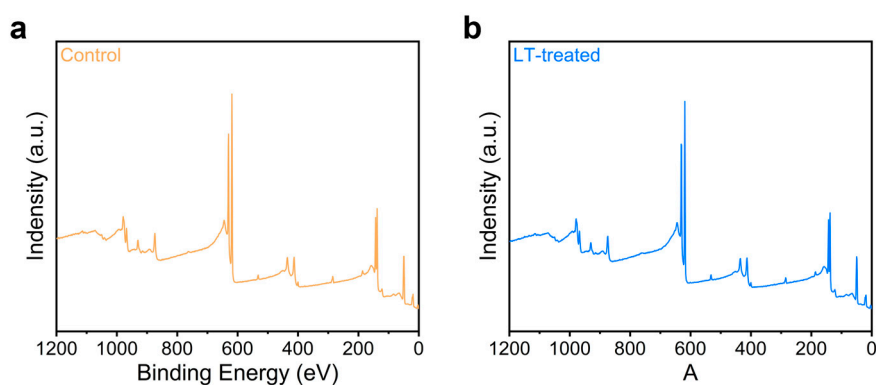


Figure S3. The entire XPS spectra of (a) control and (b) LT-treated perovskite films.

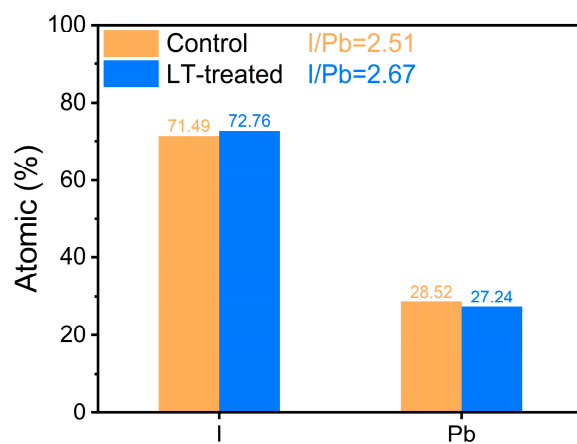


Figure S4. Ratio of I/Pb of control and LT-treated perovskite films from XPS spectra.

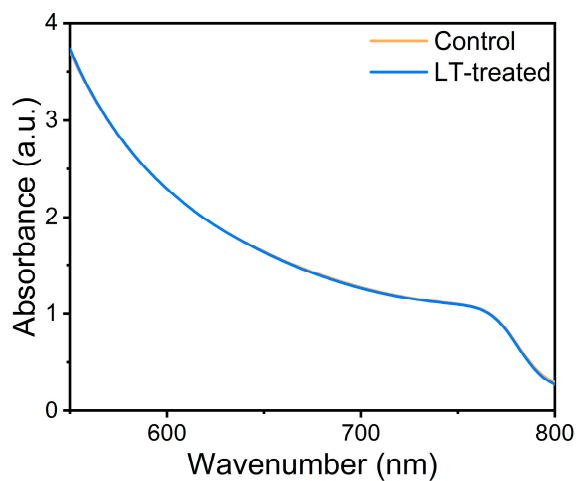


Figure S5. UV-visible absorption of control and LT-treated perovskite films.

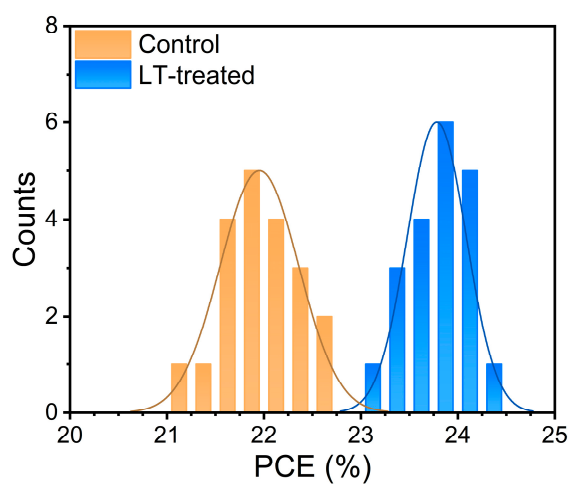


Figure S6. PCE histogram of PSCs without and with LT-treatment based on 20 individual PSCs in each batch.

Table S1. The fitted lifetime and parameters deduced from the bi-exponential decay kinetic.

Samples	τ_1 (ns)	A_1	τ_2 (ns)	A_2	τ_{AVE} (ns)
Control	19.03	0.70	238.50	0.26	199.69
LT-treated	23.50	0.64	322.70	0.31	283.88

Table S2. The fitting results of EIS spectra of PSCs.

Samples	R_s (Ω)	R_{ct} (Ω)	R_{rec} (Ω)	C ($10^{-8}F$)	$CPE-T$ ($10^{-6}F$)	$CPE-P$
Control	7.47	56217	456980	1.09	1.47	0.64
LT-treated	8.55	54514	806620	1.02	2.51	0.70

Table S3. Photovoltaic parameters of the best-performing PSCs with 0.1cm^2 active area.

Devices	V_{OC} (V)	J_{SC} (mA/cm^2)	FF (%)	PCE (%)	HI
Control RS	1.121	25.07	80.59	22.65	0.045
Control FS	1.103	24.89	78.73	21.62	
LT-treated RS	1.136	25.30	83.88	24.10	0.042
LT-treated FS	1.126	25.20	81.29	23.07	

Table S4. Photovoltaic parameters of the best-performing PSCs with 1cm^2 active area.

Devices	V_{OC} (V)	J_{SC} (mA/cm^2)	FF (%)	PCE (%)	HI
Control RS	1.126	24.21	74.46	20.29	0.043
Control FS	1.096	24.30	72.89	19.41	
LT-treated RS	1.147	24.33	77.21	21.56	0.039
LT-treated FS	1.138	24.27	74.99	20.71	