

Supporting Information

A Novel Radical-Reaction Interruption Strategy for Enhancing the Light Stability of Perovskite Solar Cells

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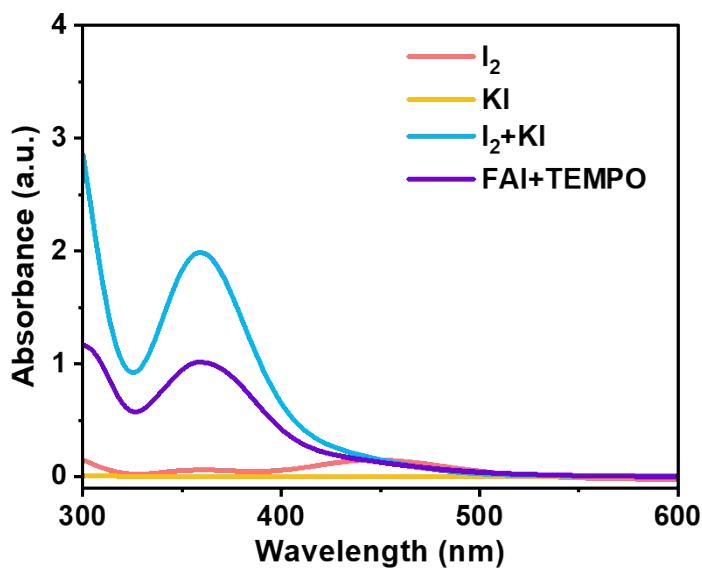


Fig. S1 UV-vis absorption spectra of I_2 , KI , I_2+KI , and FAI+TEMPO solutions in IPA.

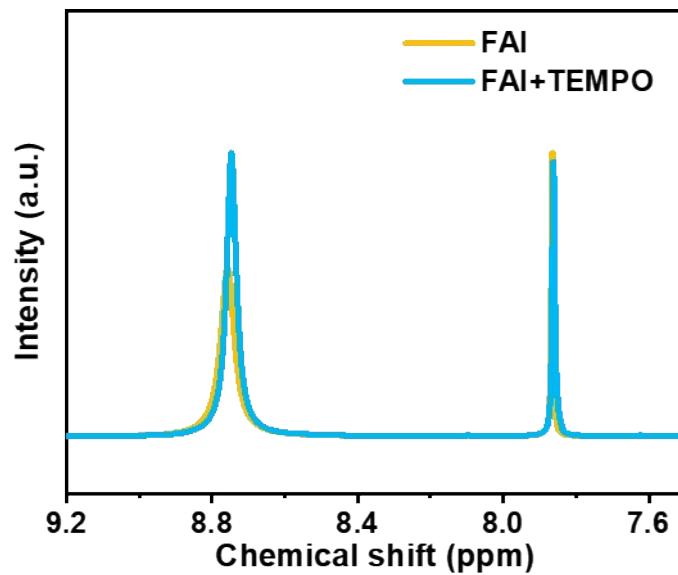


Fig. S2 ^1H NMR spectroscopy of FAI and FAI+TEMPO dissolved DMSO-d_6 .

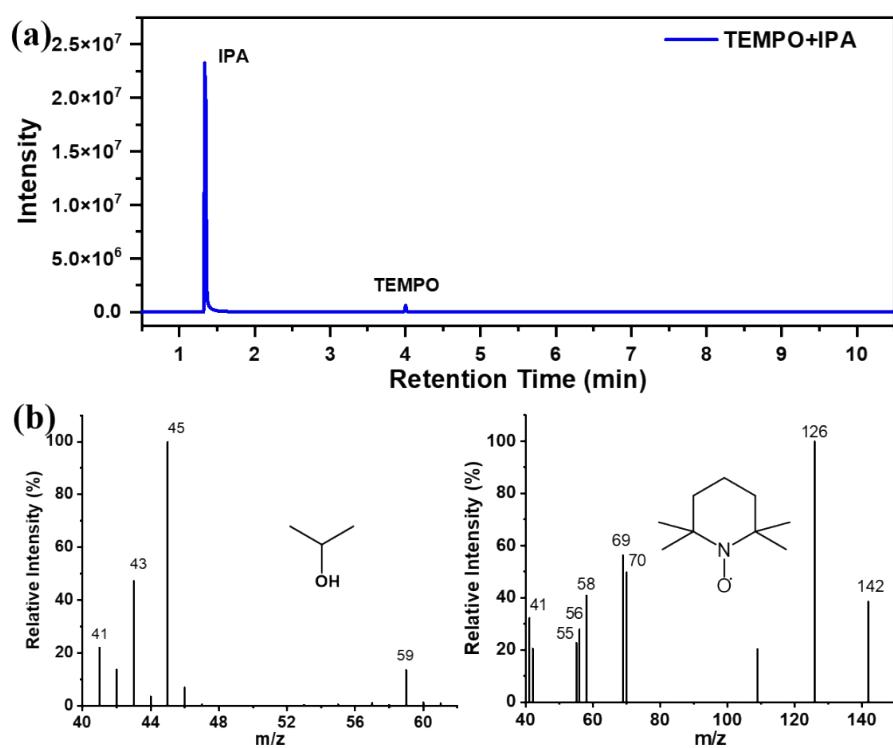


Fig. S3 The gas chromatograms-mass spectrometry (GC-MS) results of TEMPO in IPA (1 mg/ml) annealed at 300 °C for 6 minutes. (a) Gas chromatograms, (b) mass spectra.

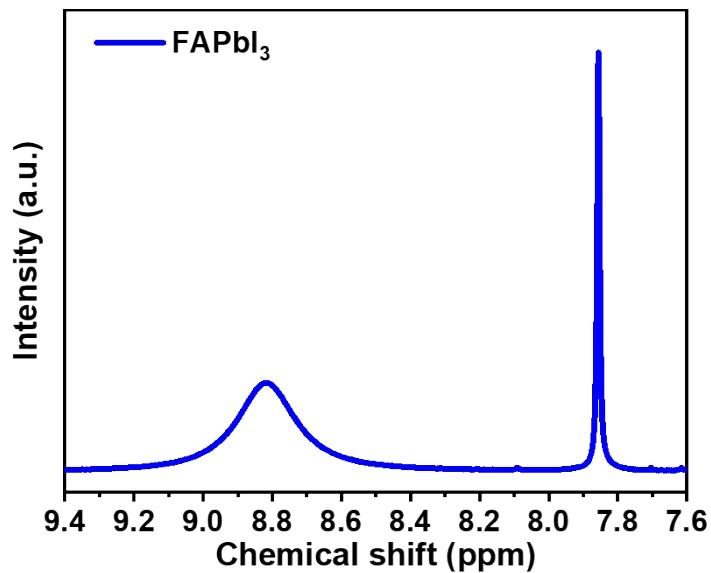


Fig. S4 ^1H NMR spectroscopy of TEMPO-treated FAPbI₃ powders in DMSO-d₆.

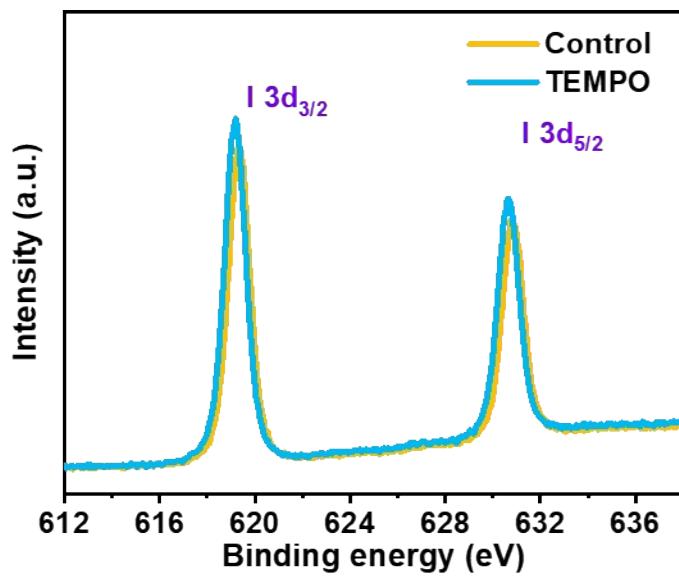


Fig. S5 XPS data for I 3d_{5/2} and I 3d_{3/2} core-level spectra in perovskite films.

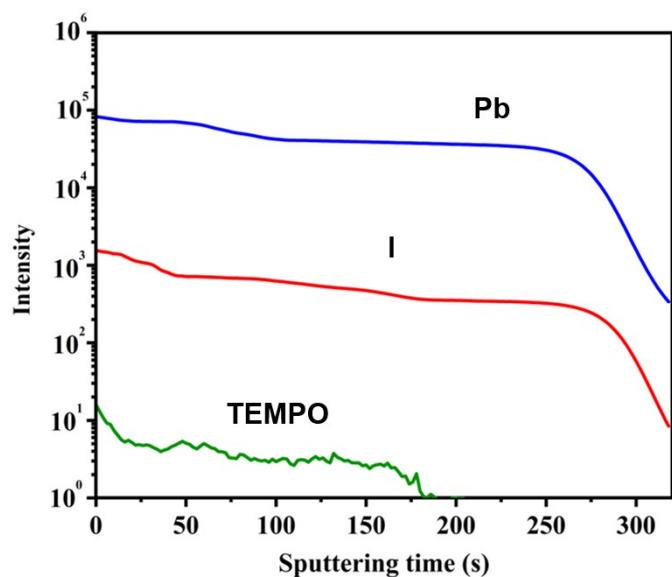


Fig. S6 ToF-SIMS depth profiles for TEMPO-modified perovskite films.

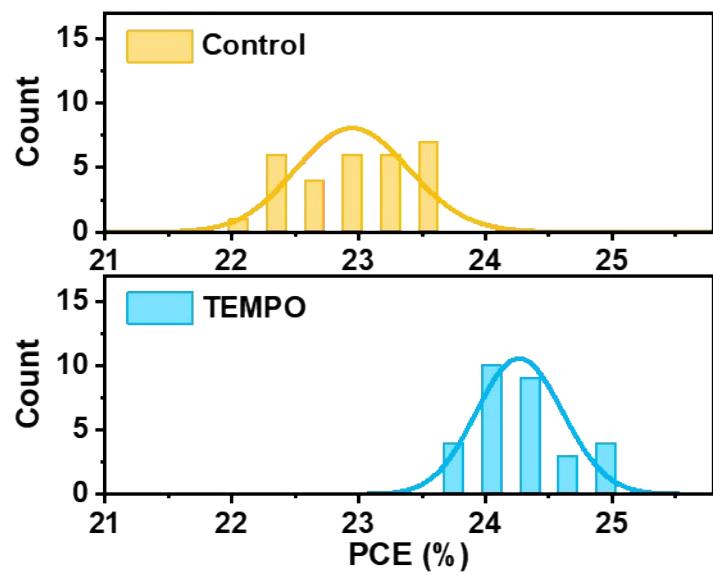


Fig. S7 Histograms of photovoltaic PCEs (30 devices) of the control and TEMPO-added devices.

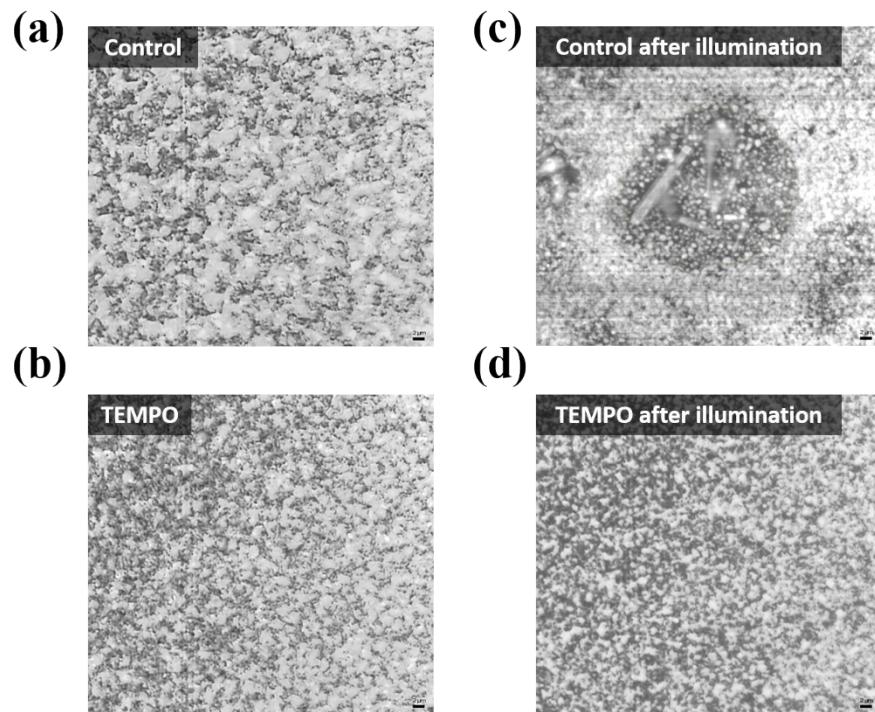


Fig. S8 Micrographs of the (a) the control, (b) TEMPO-modified, (c) the control after illumination, and (d) TEMPO-modified after illumination perovskite films.

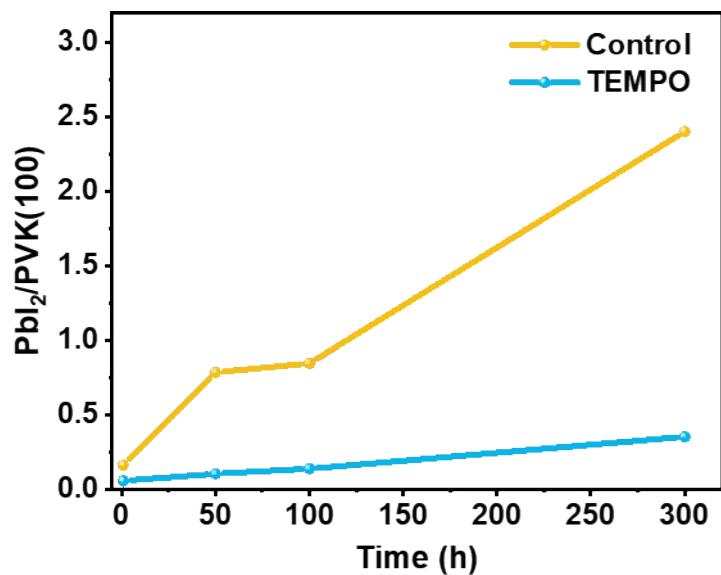


Fig. S9 The change in the PbI₂-perovskite (001) peak intensity ratio over illumination time.

Table S1 The detailed fitting results of TRPL of perovskite films on Quartz. The curve from the Perovskite film was fitted to bi-exponential decay, fitting the formula:

$$A + B_1 * \text{Exp}\left(-\frac{i}{\tau_1}\right) + B_2 * \text{Exp}\left(-\frac{i}{\tau_2}\right)$$

Samples	τ_0 [ns]	τ_1 [ns]	τ_2 [ns]
Control	133.5	50.6	145.7
TEMPO	205.7	70.8	223.8

Table S2 The variation trend of PCE with TEMPO concentration range (0.04 mg/mL ~ 0.12 mg/mL).

Device	V_{OC} [V]	J_{SC} [mA/cm ²]	FF [%]	PCE [%]
Control	1.161	25.92	78.20	23.53
0.04 mg/mL	1.171	26.09	80.24	24.52
0.08 mg/mL	1.184	26.02	81.21	25.03
0.12 mg/mL	1.167	26.22	80.32	24.57