Supporting Information

Rapid Efficiency Loss of $FAPbI_3$ Perovskite Solar Cells in 2-Methoxyethanol-based Precursor Solutions

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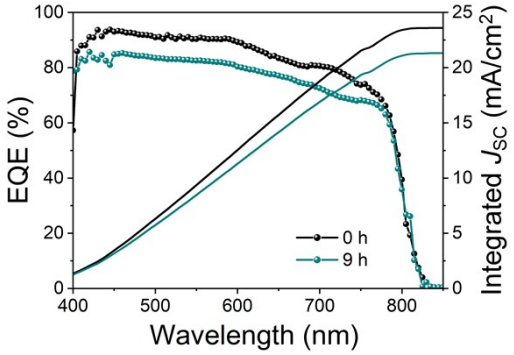

Fig. S1 External quantum efficiency (EQE) curves and integrated current densities of PSCs fabricated from perovskite precursor solution aged at 0 h and 9 h.

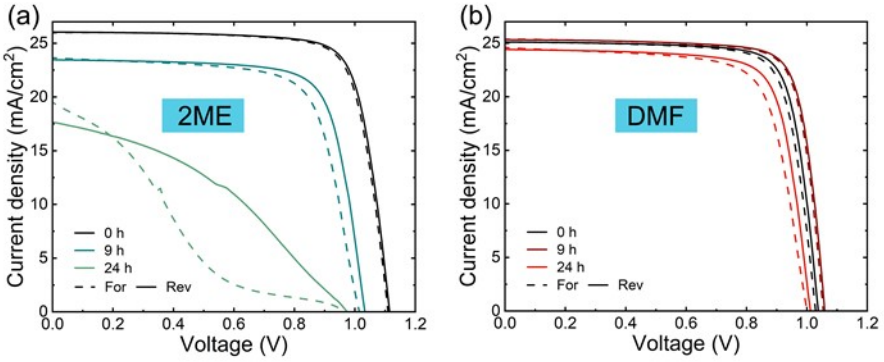

Fig. S2 *J–V* curves of PSCs prepared using 2-ME (a) and DMF (b) precursor solution aged for 0 h, 9 h and 24 h.

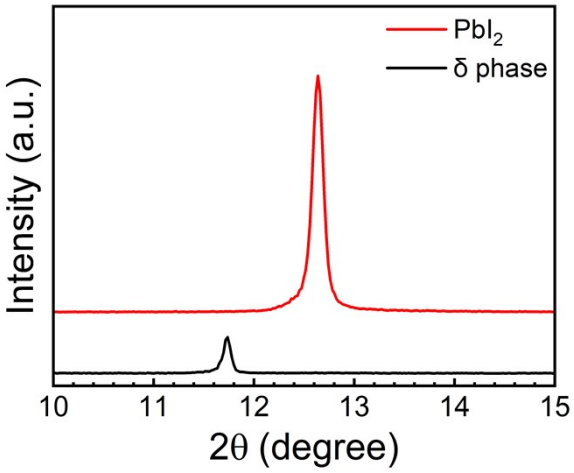

Fig. S3 X-ray diffraction (XRD) patterns of PbI_2 and δ-phase perovskite.

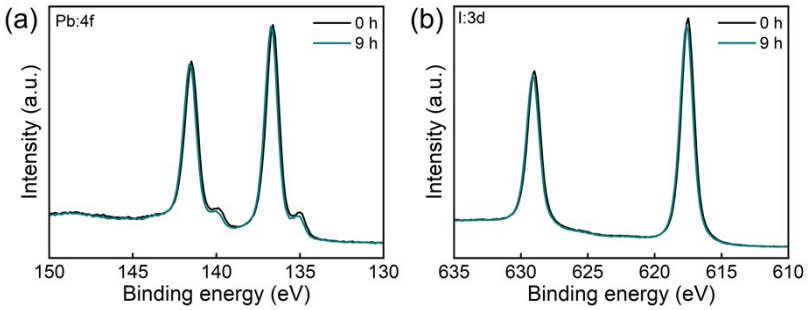

Fig. S4 XPS spectra of perovskite films prepared from the precursor solution aged for 0 h and 9 h.

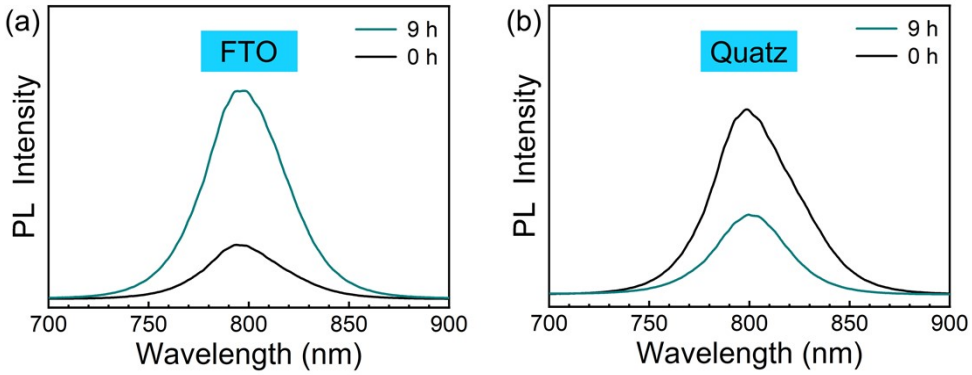

Fig. S5 SSPL of perovskite films prepared from the precursor solution aged for 0 h and 9 h on (a) FTO and (b) quartz substrates.

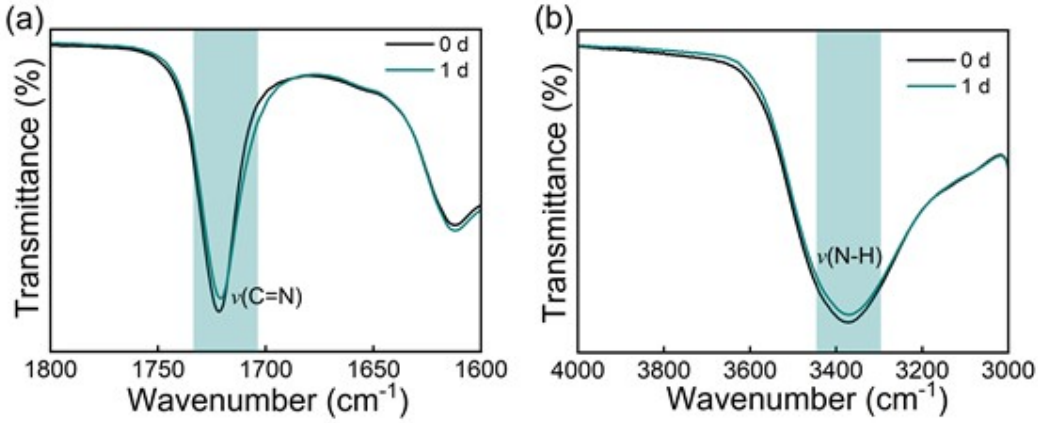

Fig. S6 (a, b) Fourier transform infrared spectroscopy of precursor solution aged for 0 d and 1 d.

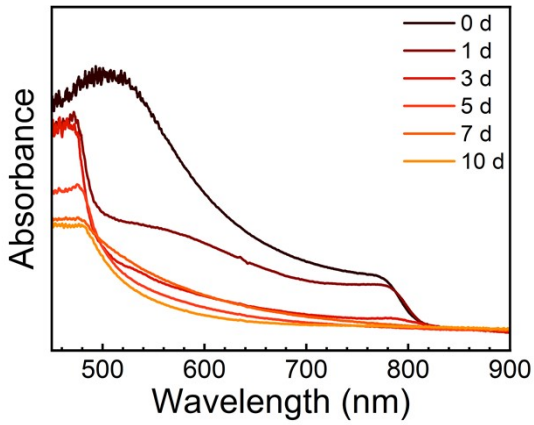

Fig. S7 UV–visible spectra of films prepared from the precursor solution aged in different times.

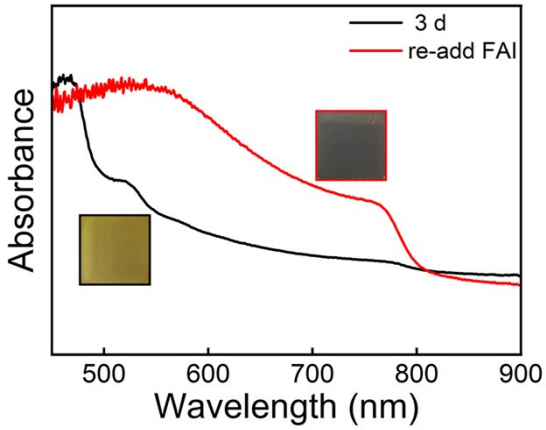

Fig. S8 UV–visible spectra of the films prepared from the solution after 3 d of aging using the M_D strategy and the solution of re-add 0.5 M FAI.

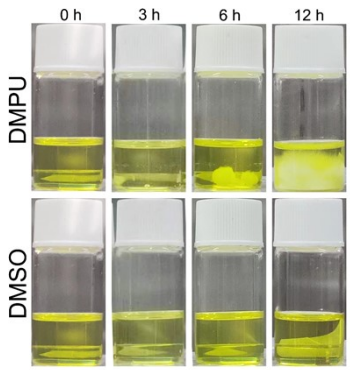

Fig. S9 Images of the solute component extracted from the perovskite precursor solution with the addition of a combination of DMPU and RACl by using EA antisolvent.

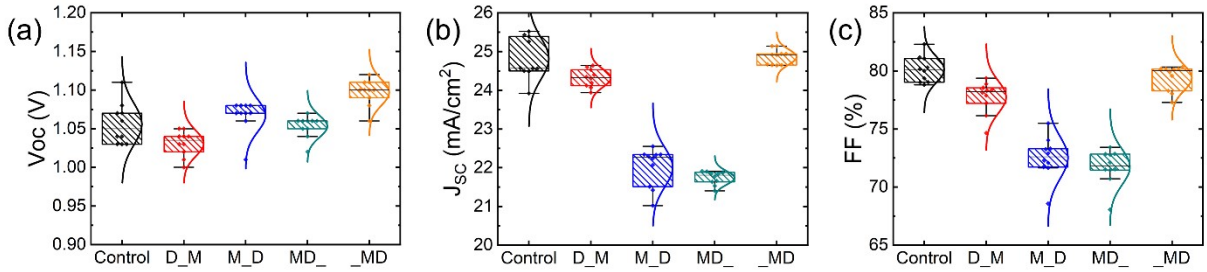

Fig. S10 Statistical photovoltaic parameters of (a) open-circuit voltage (V_{oc}), (b) short-circuit photocurrent density (J_{sc}), (c) fill factor (FF) of perovskite solar cells aged in different sequential addition strategies.

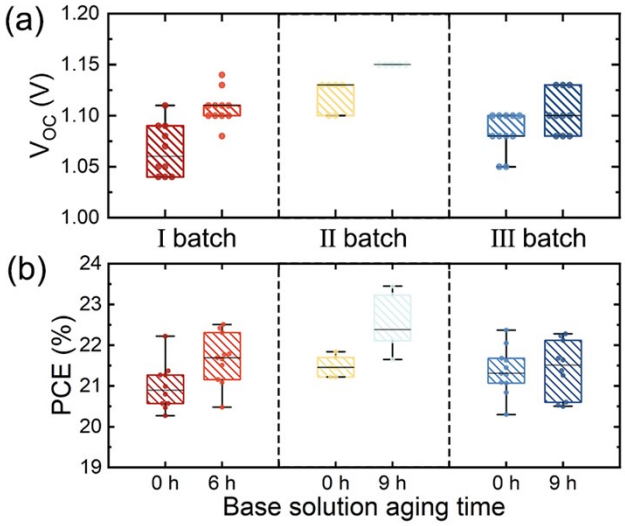

Fig. S11 Changes of (a) V_{OC} and (b) PCE in PSCs prepared from precursor solutions with different base solution aging time.

Table S1. Forward and reverse scan efficiency and hysteresis index of PSCs prepared using 2-ME and DMF precursor solution aged for 0 h, 9 h and 24 h.

Device	2ME 0 h	2ME 9 h	2ME 24 h	DMF 0 h	DMF 9 h	DMF 24 h
PCE_{For}	22.58	17.25	3.96	20.46	21.65	17.98
PCE_{Rev}	22.82	18.41	6.59	20.95	21.76	18.97
HI	1%	6.3%	39.9%	2.3%	0.5%	5.2%

Table S2. Fitted results from TRPL spectra in Fig. 2i, j.

Sample	$\mathbf{A_1}$	$\boldsymbol{\tau_1}$**(ns)**	$\mathbf{A_2}$	$\boldsymbol{\tau_2}$**(ns)**	$\boldsymbol{\tau_{ave}}$**(ns)**
Quartz 0 h	0.427	289.6	0.241	3350.8	2934
Quartz 9 h	0.504	52.4	0.216	2438.7	2325
FTO 0 h	0.879	15.3	0.099	230.4	151
FTO 9 h	0.745	18.43	0.08	653.8	522