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Engineering the intermediate adduct phase to control the crystallization of perovskites for efficient and stable perovskite solar cells

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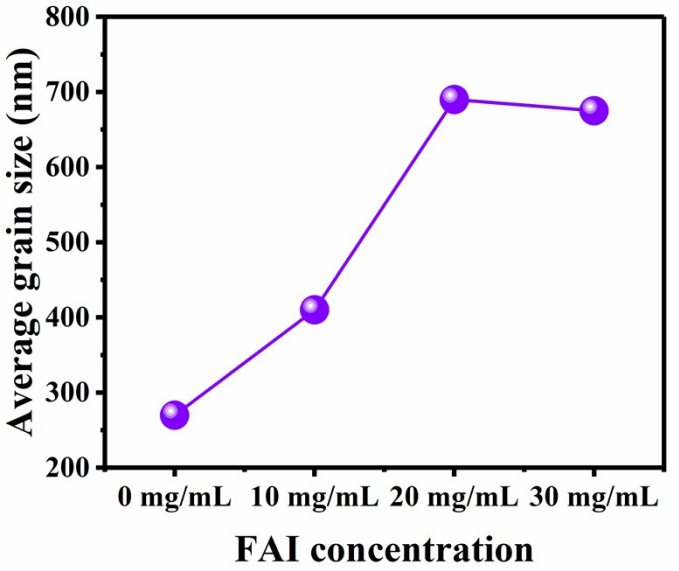

Fig. S1. Estimation of average grain size of the as-prepared perovskite films with different concentrations of FAI.

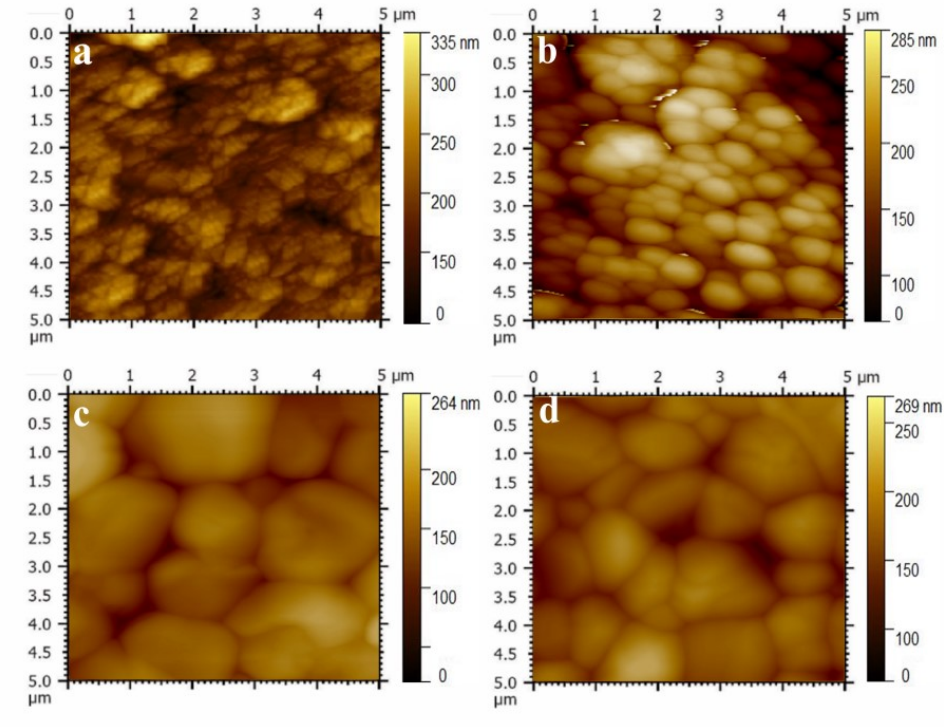

Fig. S2. AFM images of $MAPbI_3$ films treated with different concentrations of FAI. (a) 0 $mg{\cdot}mL^{-1}$, (b) 10 $mg{\cdot}mL^{-1}$, (c) 20 $mg{\cdot}mL^{-1}$, and (d) 30 $mg{\cdot}mL^{-1}$ in IPA solution.

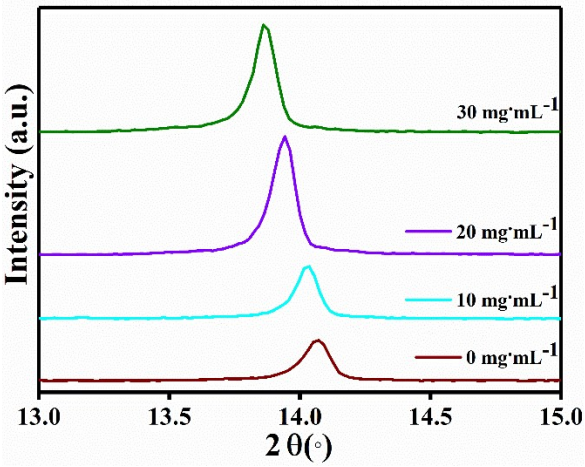

Fig. S3. Zoom in XRD peak (110) patterns of perovskite films processed with varying concentrations of FAI solution (0 mg·mL^{-1}, 10 mg·mL^{-1}, 20 mg·mL^{-1}, and 30 mg·mL^{-1}), which show peak shift of the XRD peak.

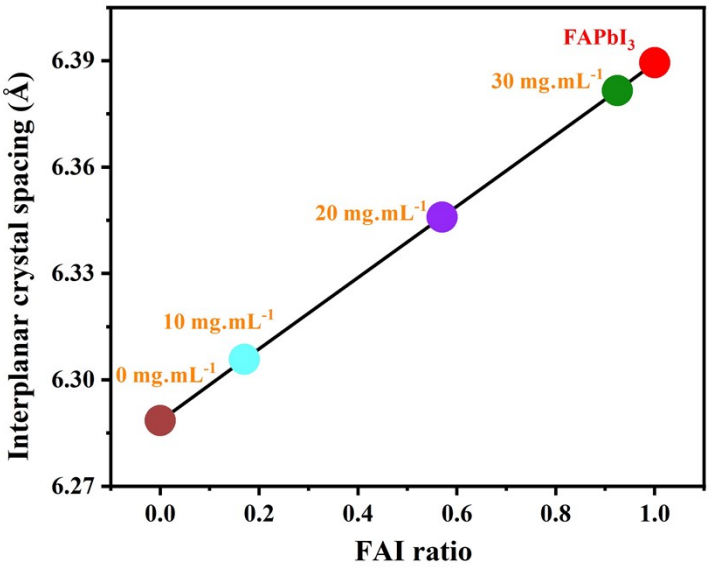

Fig. S4 The interplanar crystal spacing of the perovskites treated with different FAI contents. The interplanar crystal spacing is calculated from the Bragg equation: $2d\sin\theta = n\lambda$ (λ = 1.5406 Å). The line is a linear fitting of the interplanar crystal spacing.

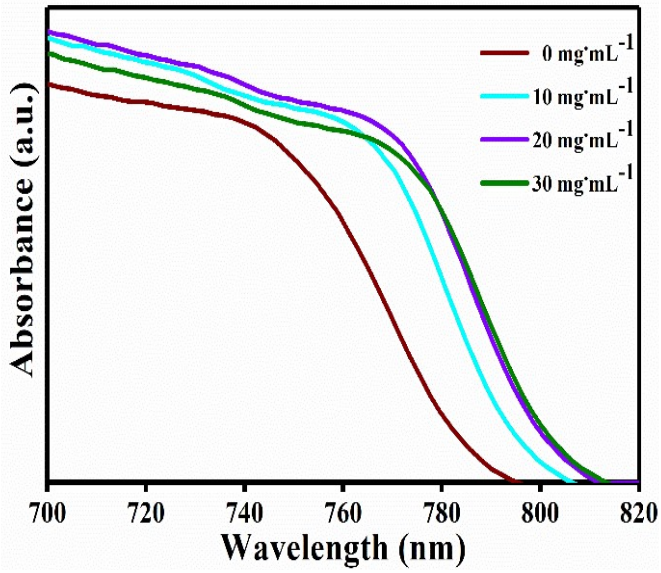

Fig. S5. Expand UV−vis absorption spectra of the prepared films processed with varying concentrations of FAI solution (0 mg·mL^{-1}, 10 mg·mL^{-1}, 20 mg·mL^{-1}, and 30 mg·mL^{-1})

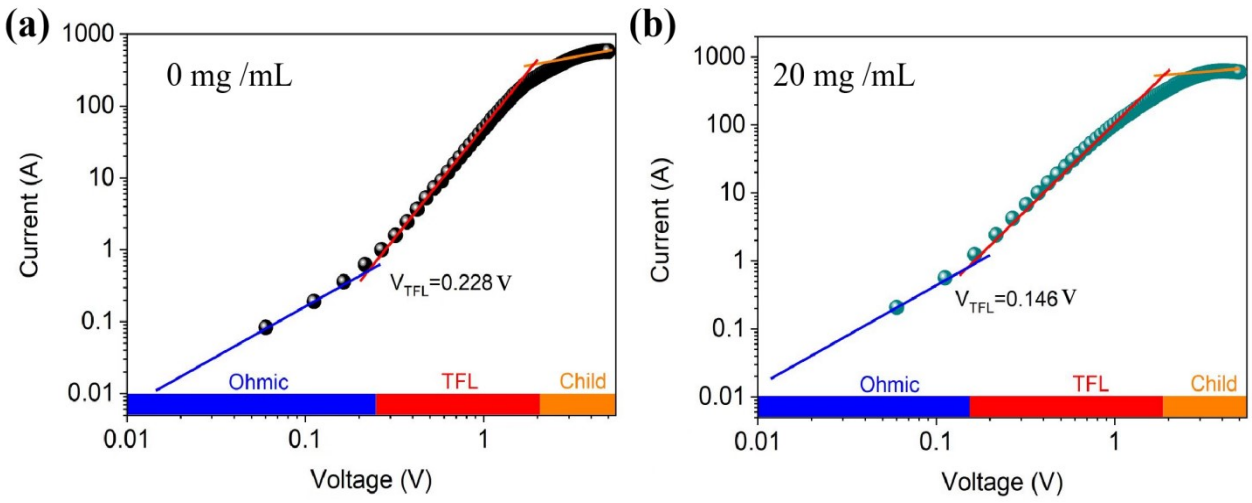

Fig. S6. Space charge limited current (SCLC) of perovskite films prepared with (a) 0 mg·mL^{-1}, and (b) 20 mg·mL^{-1} FAI.

Table S1. The decay time and the relative decay amplitude time parameters are derived from the TRPL decay curves.

device	τ_1 (ns)	A_1 (%)	τ_2 (ns)	A_2 (%)	τ_{ave} (ns)
0 mg·mL^{-1}	22.53	37.50	80.12	49.55	70.01
20 mg·mL^{-1}	14.36	30.39	93.25	70.42	88.33