

Supporting Information

Balanced Cation Exchange Reaction toward Highly Uniform and Pure Phase $\text{FA}_{1-x}\text{MA}_x\text{PbI}_3$ Perovskite Films

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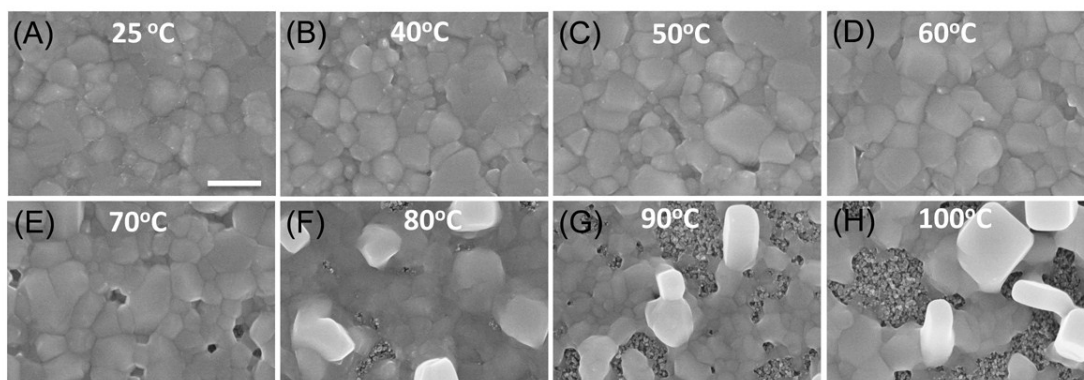


Figure S1. SEM images of $\text{FA}_x\text{MA}_{1-x}\text{PbI}_3$ perovskite films obtained at different exchange temperature for 5 min.

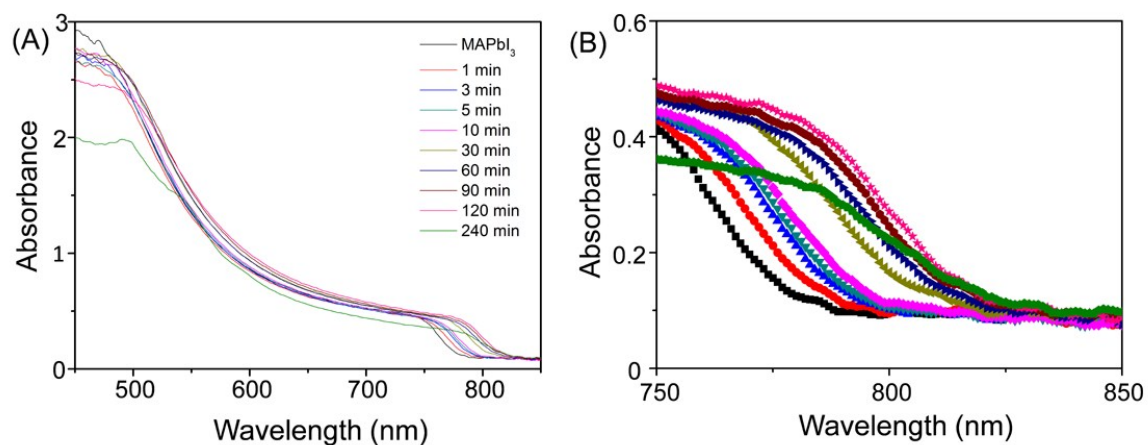


Figure S2. UV-Vis absorption spectra of the $\text{FA}_x\text{MA}_{1-x}\text{PbI}_3$ perovskite film dipped for different time at RT (A) and the detailed absorption property around the absorption edge (B).

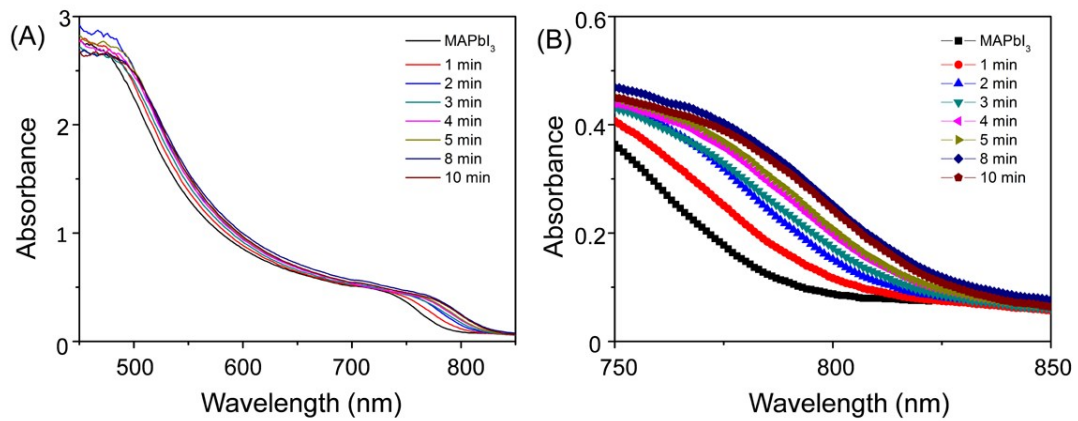


Figure S3. UV-Vis absorption spectra of the FA_xMA_{1-x}PbI₃ perovskite film exchanged for different time at 60 °C (A) and the detailed absorption property around the absorption edge (B).

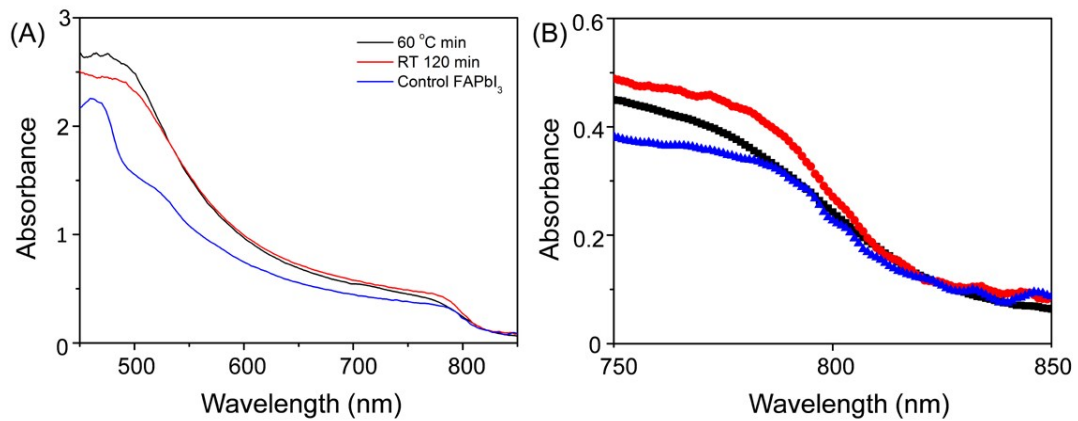


Figure S4. UV-Vis absorption spectra of the FA based perovskite films fabricated with different methods.

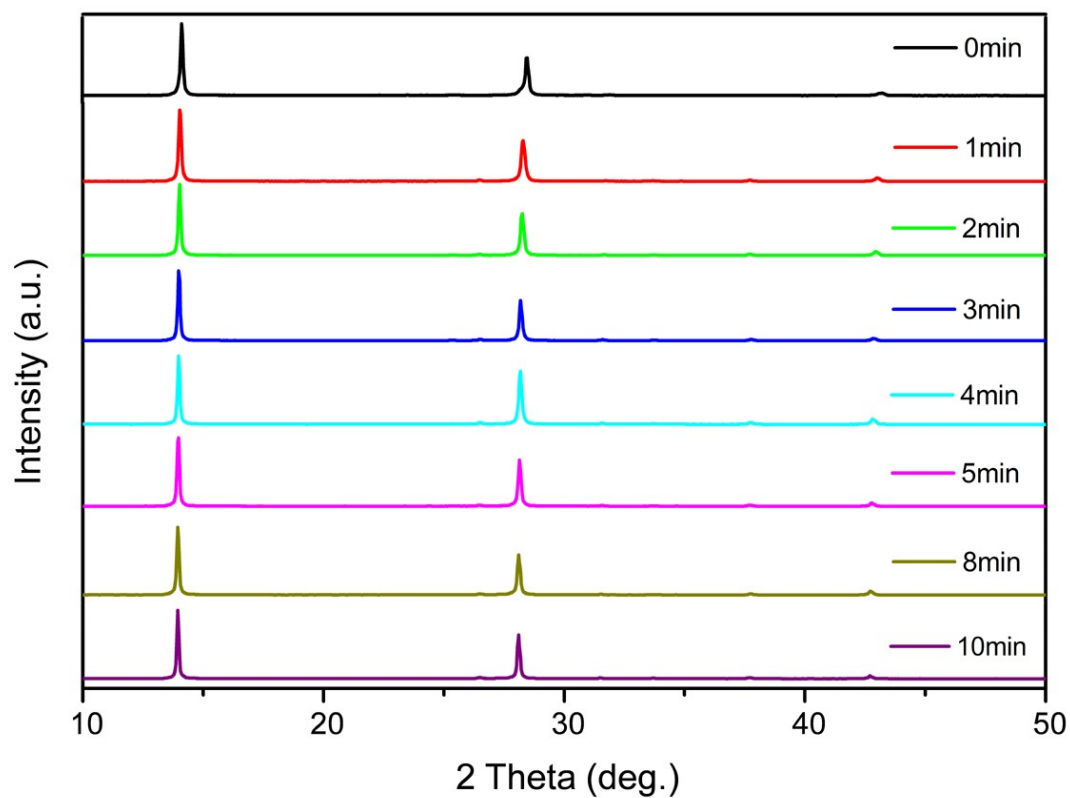


Figure S5. XRD patterns of the FA_xMA_{1-x}PbI₃ perovskite film exchanged at 60 °C for different time.

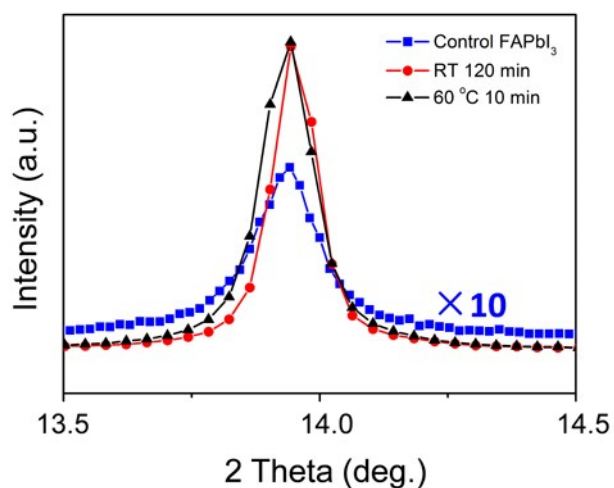


Figure S6. XRD patterns and FA based perovskite films exchanged at RT, 60 °C and the reference FAPbI₃ films, respectively.

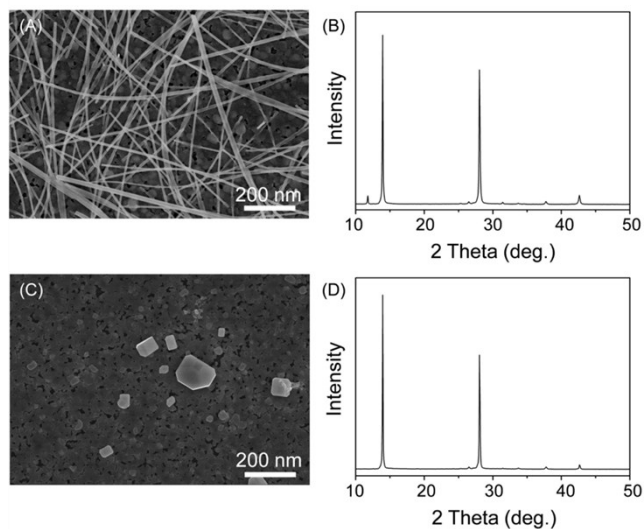


Figure S7. SEM images and corresponding XRD patterns of the $\text{FA}_x\text{MA}_{1-x}\text{PbI}_3$ perovskite film exchanged at RT (A, B) and 60 °C (C, D) for 240 min, respectively.

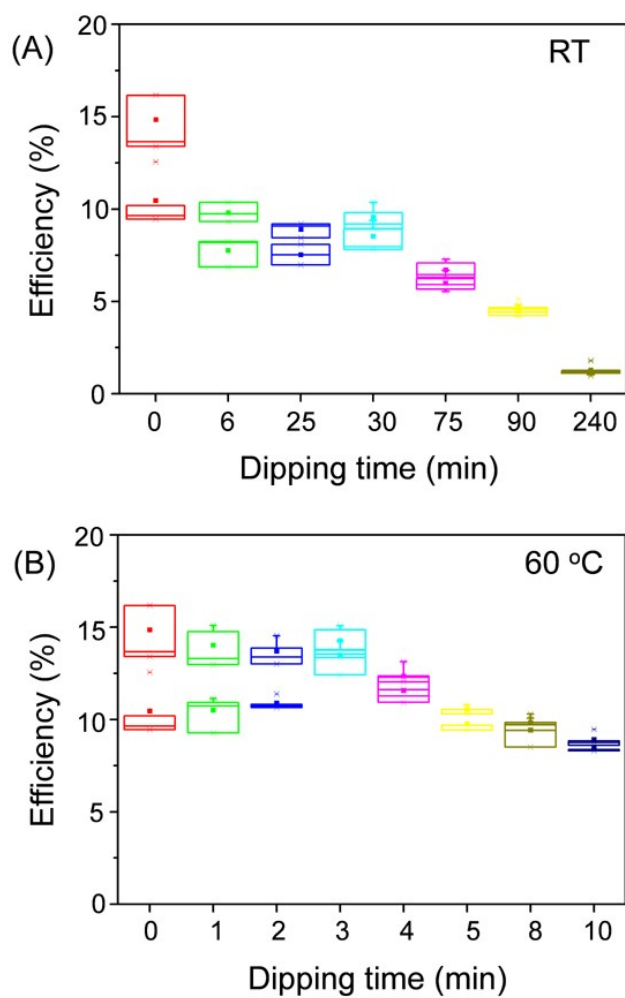


Figure S8. The efficiency distribution of the $\text{FA}_x\text{MA}_{1-x}\text{PbI}_3$ perovskite solar cells fabricated by the exchanging method at RT (A) and 60 °C for different time, respectively. The efficiencies are obtained with both the reverse and forward scan.

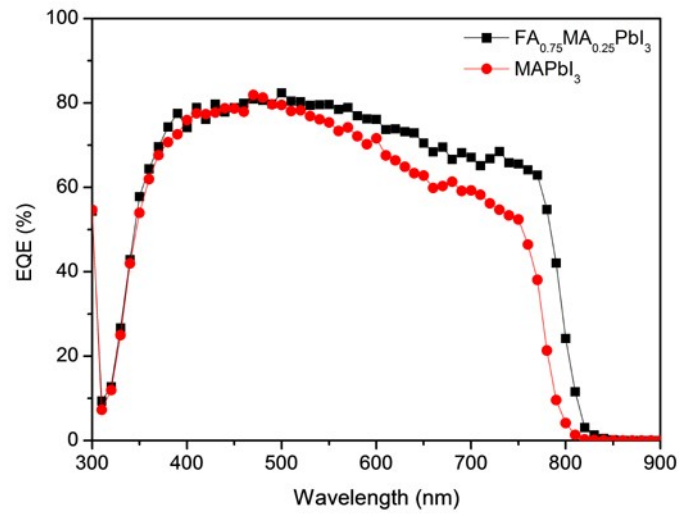


Figure S9. The EQE curves of MAPbI_3 and $\text{FA}_{0.75}\text{MA}_{0.25}\text{PbI}_3$ solar cells.