

Supplementary Information

Disappeared additive: Introducing volatile ethyl acetate into perovskite precursor for fabricating high efficiency and stable device in open air

Pengyun Zhang^a, Ningxia Gu^a, Lixin Song^{a}, Xiang Chen^a, Pingfan Du^a, Leying Zha^a, Wei-Hsiang Chen^b, Jie Xiong^{a*}*

^a College of Textile Science and Engineering, Zhejiang Sci-Tech University, Hangzhou, 310018, China

^b School of Science, Huzhou University, Huzhou, 313000, Zhejiang, China

* **Corresponding Authors:** lsxong12@zstu.edu.cn (LX Song); jxiong@zstu.edu.cn (J Xiong).

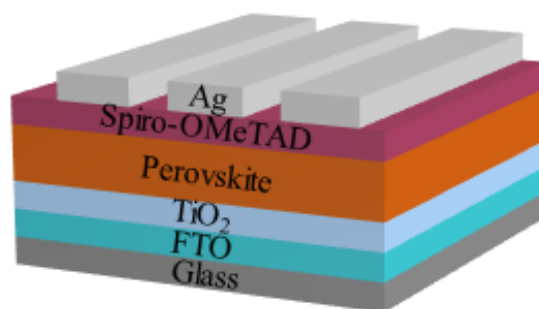


Fig. S1. The complete structure of device is FTO-etched glass/TiO₂/CH₃NH₃PbI₃ (with or without EA)/Spiro-OMeTAD/Ag.

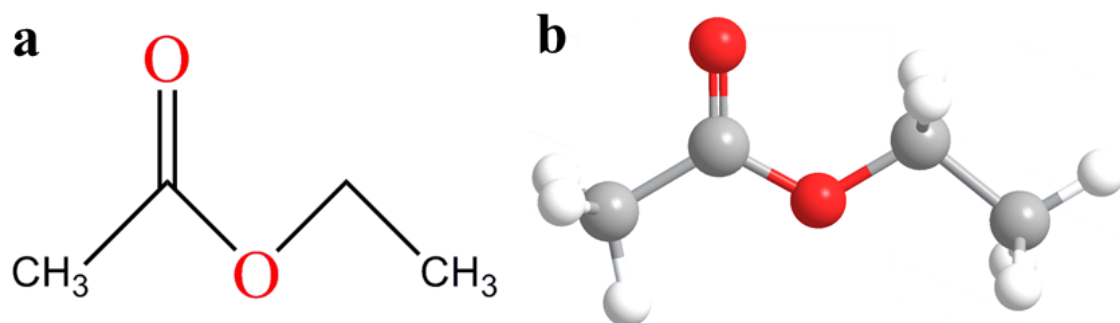


Fig. S2. The chemical structure (a) and the corresponding 3D model (b) of Ethyl Acetate (EA).

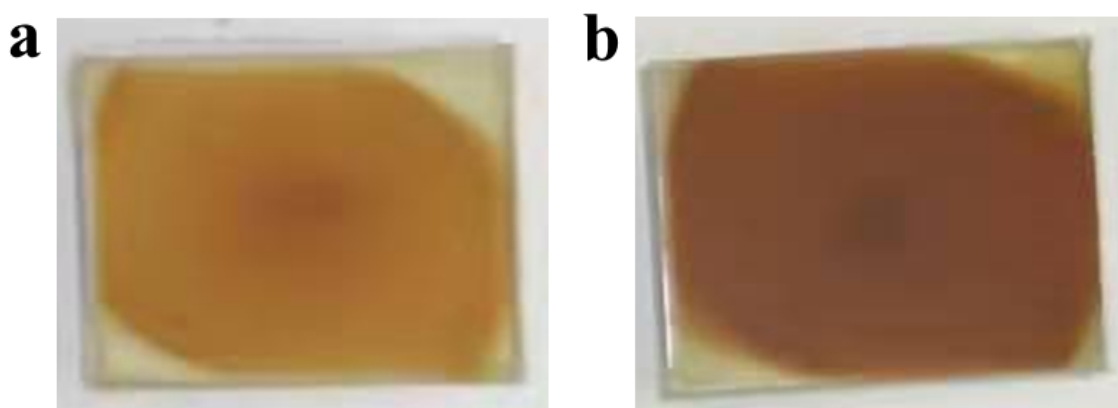


Fig. S3. The optical images of both perovskite films (a) without and (b) with EA additive. These samples just went through the spin-coating step (before annealing).

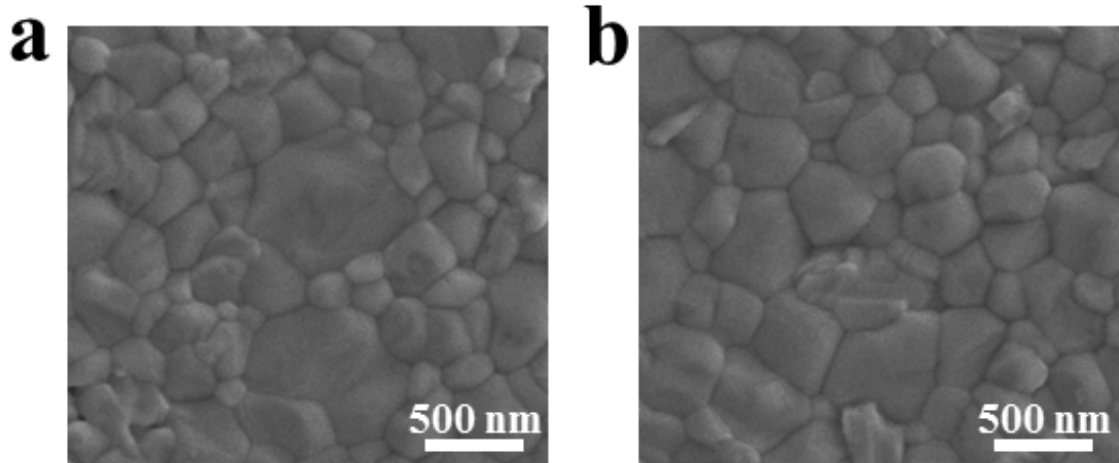


Fig. S4. (a and b) Top-view SEM images of perovskite films doping with different concentration (1 vol% and 10 vol%) of EA.

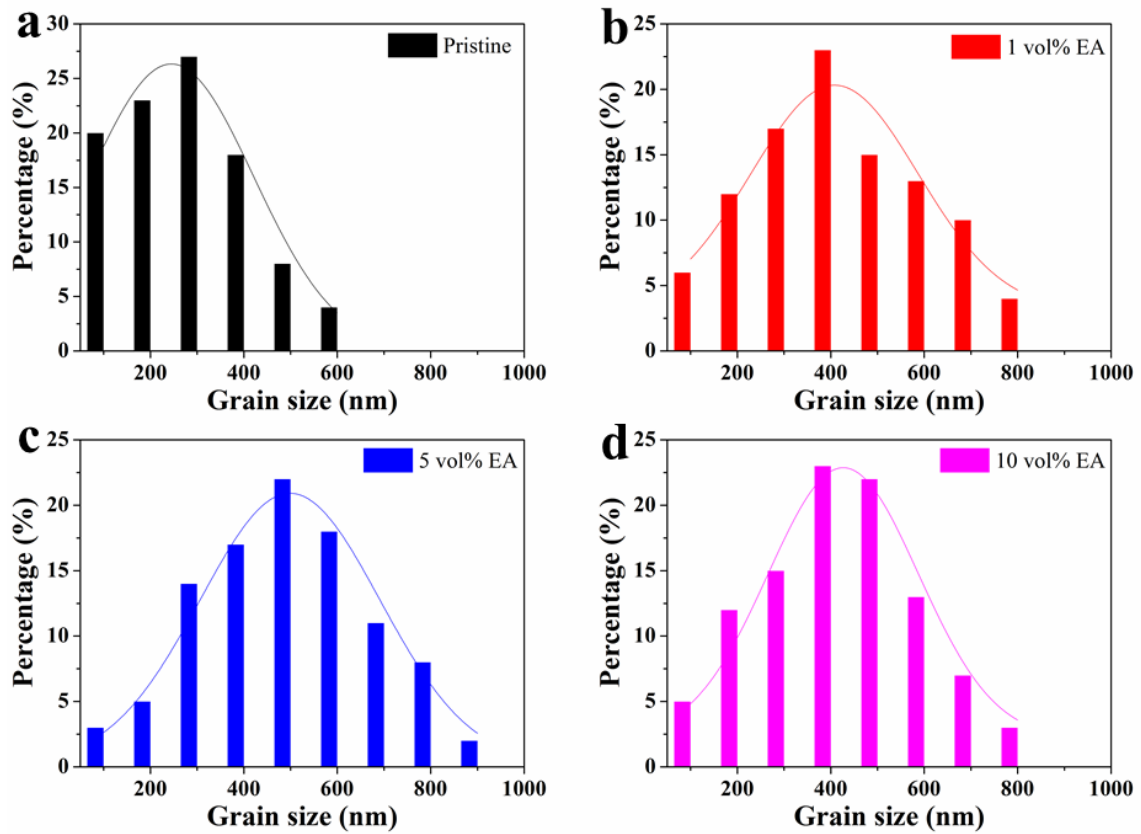


Fig. S5. The grain size distribution histogram of perovskite films with different EA concentration.

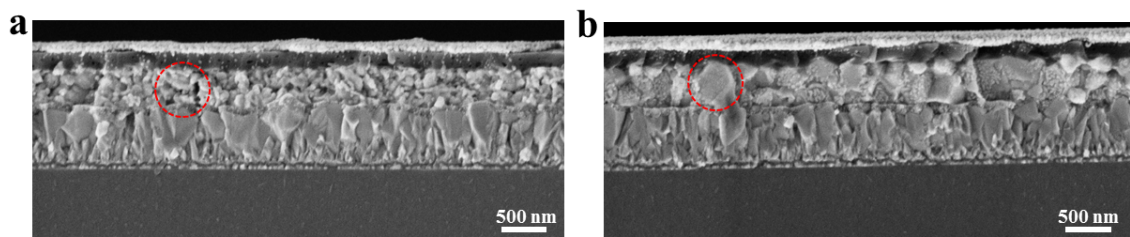


Fig. S6. Cross-sectional SEM images of PSCs with (a) pristine and (b) EA-modified perovskite film. The complete structure of device is FTO-etched glass/TiO₂/CH₃NH₃PbI₃ (with or without EA)/Spiro-OMeTAD/Ag.

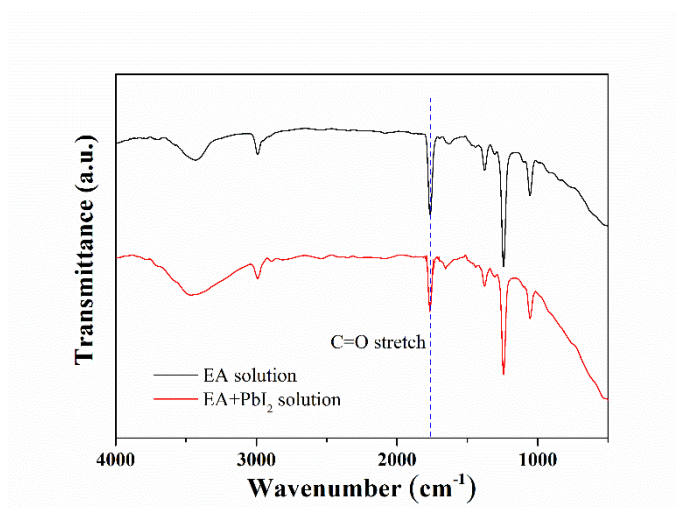


Fig. S7. The FTIR spectra of EA and EA+PbI₂ solution.

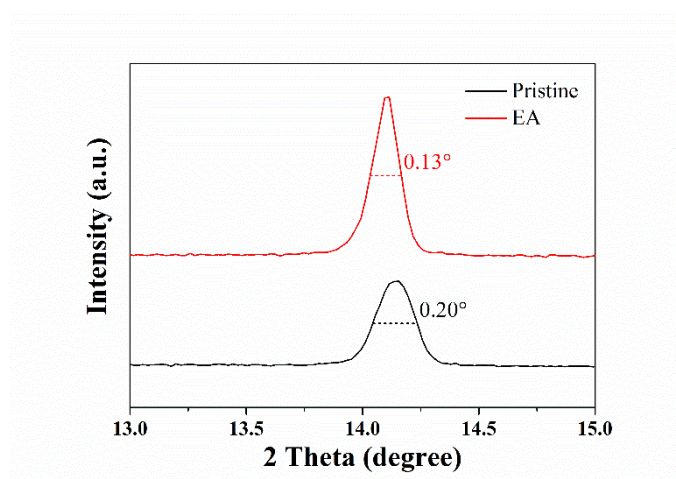


Fig. S8. The higher magnification patterns of XRD analysis around the (110) crystal plane.

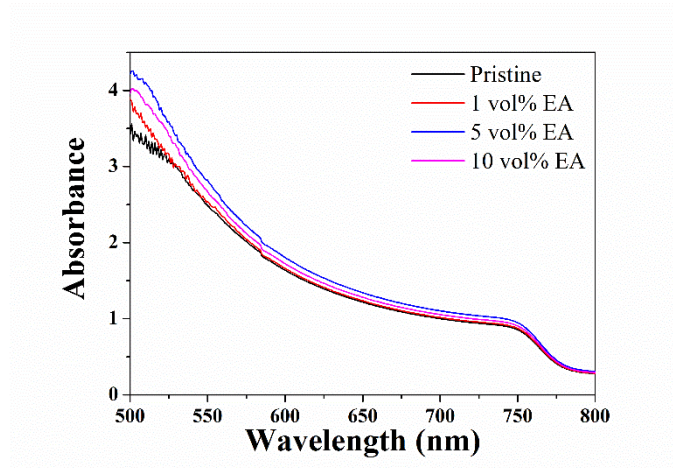


Fig. S9. The UV-Vis absorbance spectra of perovskite films which added different concentration (0 vol%, 1 vol%, 5 vol% and 10 vol%) of EA.

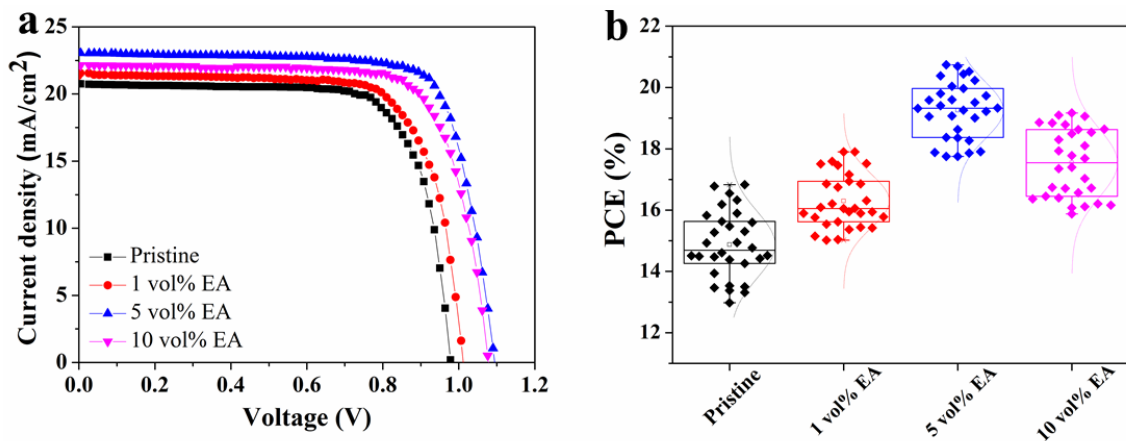


Fig. S10. (a) The J-V curves of PSCs based on different concentration of EA. (b) Thirty individual cells' PCE of all kind PSCs based on different concentration of EA.

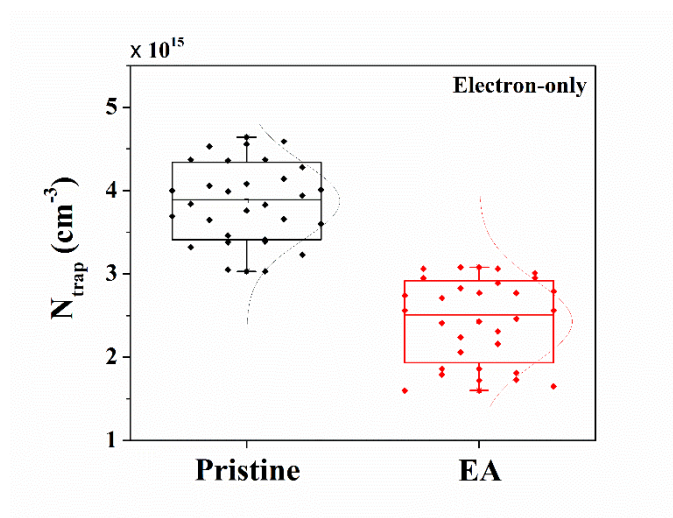


Fig. S11. The statistical collection of data on 30 sets samples of electron-only devices.

Table S1. Detailed photovoltaic parameters of PSCs with different concentrations of EA.

| Samples | J_{sc} (mA/cm ²) | V_{oc} (V) | FF (%) | PCE (%) |
|------------|--------------------------------|--------------|--------|---------|
| Pristine | 20.74 | 0.98 | 74.68 | 15.18 |
| 1 vol% EA | 21.55 | 1.01 | 73.60 | 16.02 |
| 5 vol% EA | 23.05 | 1.10 | 77.01 | 19.53 |
| 10 vol% EA | 22.14 | 1.08 | 75.28 | 18.00 |