

Electronic Supplementary Information

Water and oxygen co-induced microstructure relaxation and evolution in



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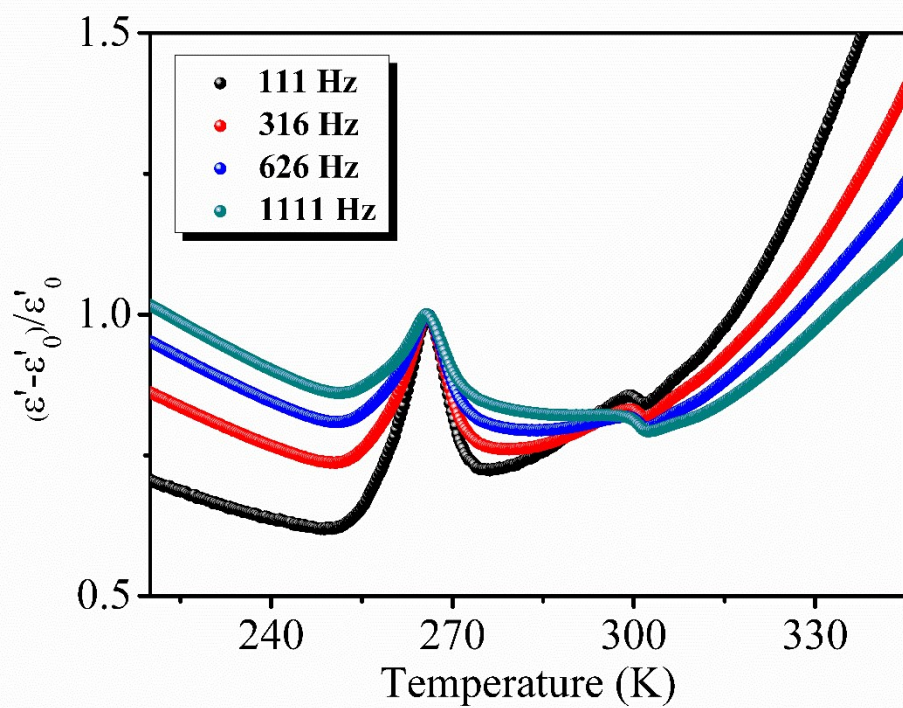


Figure S1. The normalized spectrum of permittivity measured under frequencies at 111 Hz, 316 Hz, 626 Hz and 1111 Hz. The sample were treated by oxygen exposure.

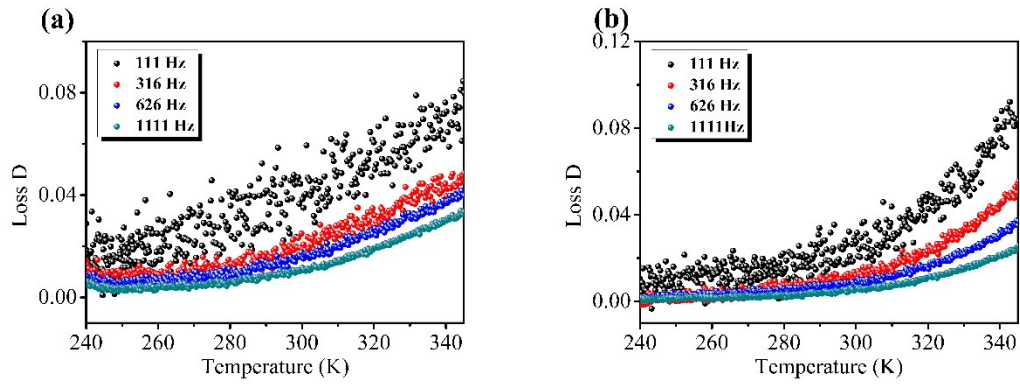


Figure S2. The DL measurement for (a) MAI, and (b) PbI₂.

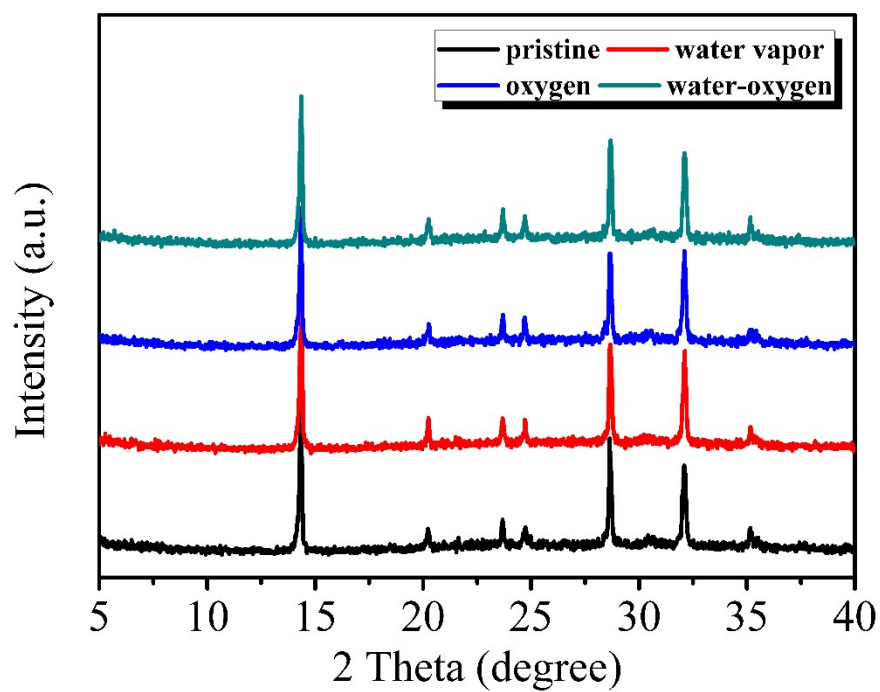


Figure S3. The XRD result for perovskite treated with variation condition.

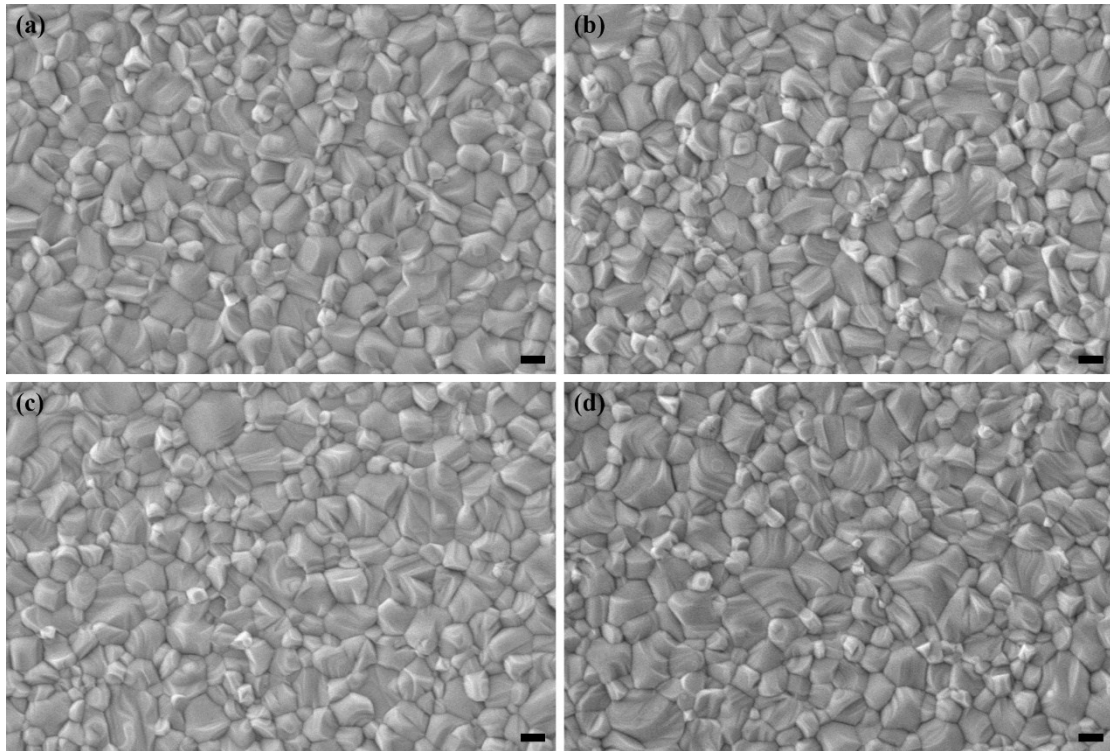


Figure S4. Top-view of scanning electron microscopy images of (a) pristine, (b) water vapor, (c) oxygen and (d) water-oxygen exposed perovskite films. The scale bar is 200 nm.

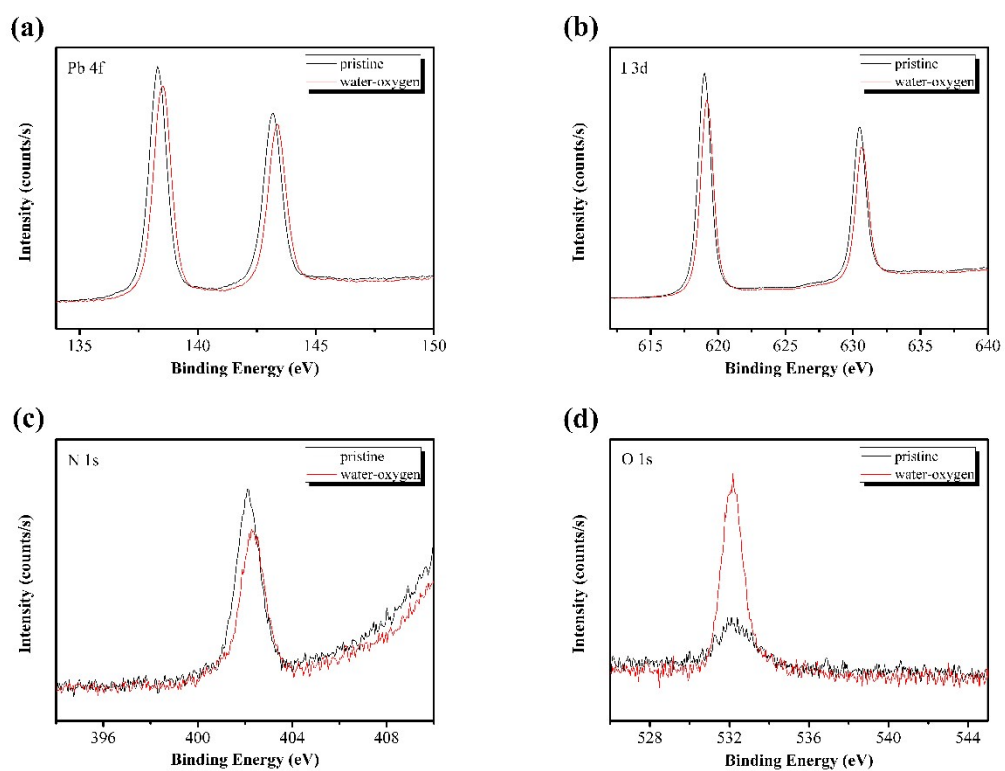


Figure S5. (a) Pb 4f, (b) I 3d, (c) N 1s and (d) O 1s core level spectra of the perovskite films before and after water-oxygen exposure.