Electronic Supplementary Information

Identification and Characterization of New Intermediate to Obtain High Quality Perovskite Films with Hydrogen Halides as Additives

Bin Duan\textsuperscript{ab}, Yingke Ren\textsuperscript{c}, Yafeng Xu\textsuperscript{ab}, Wenyong Chen\textsuperscript{ab}, Qing Ye\textsuperscript{ab}, Jun Zhu\textsuperscript{a}, and Songyuan Dai\textsuperscript{ac}

\textsuperscript{a}Key Laboratory of Novel Thin-Film Solar Cells, Institute of Applied Technology, Hefei Institutes of Physical Science, Chinese Academy of Sciences, Hefei, Anhui, 230088, P. R. China.

\textsuperscript{b}University of Science and Technology of China, Hefei 230026, P. R. China

\textsuperscript{c}Beijing Key Laboratory of Novel Thin-Film Solar Cells, North China Electric Power University, Beijing, 102206, P. R. China.

Corresponding author (*)

Jun Zhu & Song-Yuan Dai

Fax: +86-0551-65591377

E-mail: zhuj Zhu@gmail.com, sydai@ipp.ac.cn

\textbf{Figure S1} Cross-sectional SEM images of perovskite films fabricated with different
additives deposited on the FTO glass. (a) blank, (b) HCl, (c) HBr, (d) HI.

**Figure S2** The EDX of perovskite films fabricated from different precursor solution (a) MAI+PbI₂+DMF+HCl; (b) MAI+PbI₂+DMF+HBr.
Figure S3 SEM images of perovskite films from different precursor solution with adding different amount additives.