Supporting Information

Improved interface of $ZnO/CH_3NH_3PbI_3$ by a dynamic spin-coating process for efficient perovskite solar cells

Feng Yang[a], *Dong-Won Kang*[b,*] *and Yong-Sang Kim*[a,*]

[a.] School of Electronic and Electrical Engineering, Sungkyunkwan University, Suwon, Gyeonggi, 440-746, Republic of Korea

[b.] Department of Solar & Energy Engineering, Cheongju University, Cheongju, Chungbuk, 363-764, Republic of Korea

[*]Co-corresponding authors: E-mail: yongsang@skku.edu (Yong-Sang Kim), kang@cju.ac.kr (Dong-Won Kang)

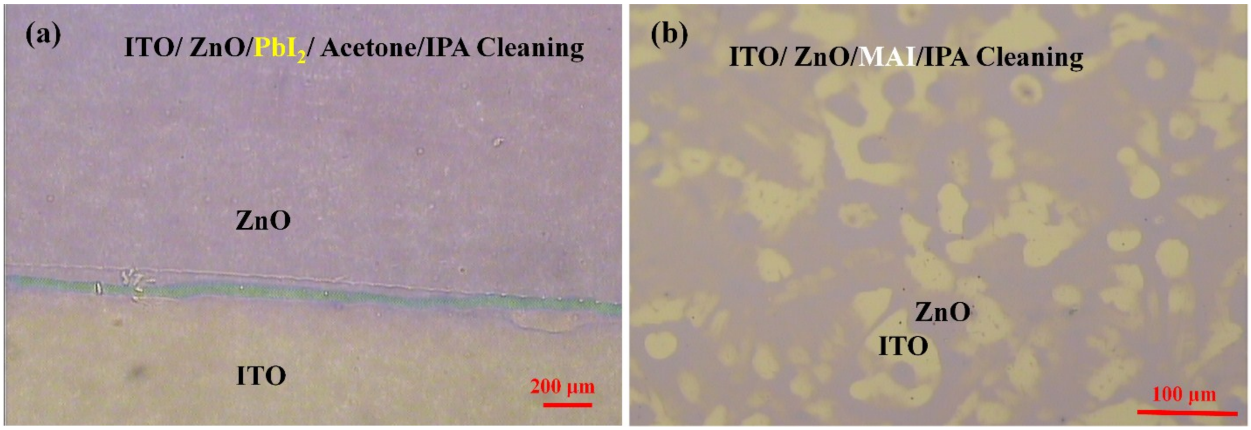

Fig. S1. Optical microscopy images of the effect of (a) PbI_2, or (b) MAI, on the ZnO films. All processes were in ambient air. The surfaces of ZnO film were rinsed with isopropyl alcohol (IPA) after the coating process.

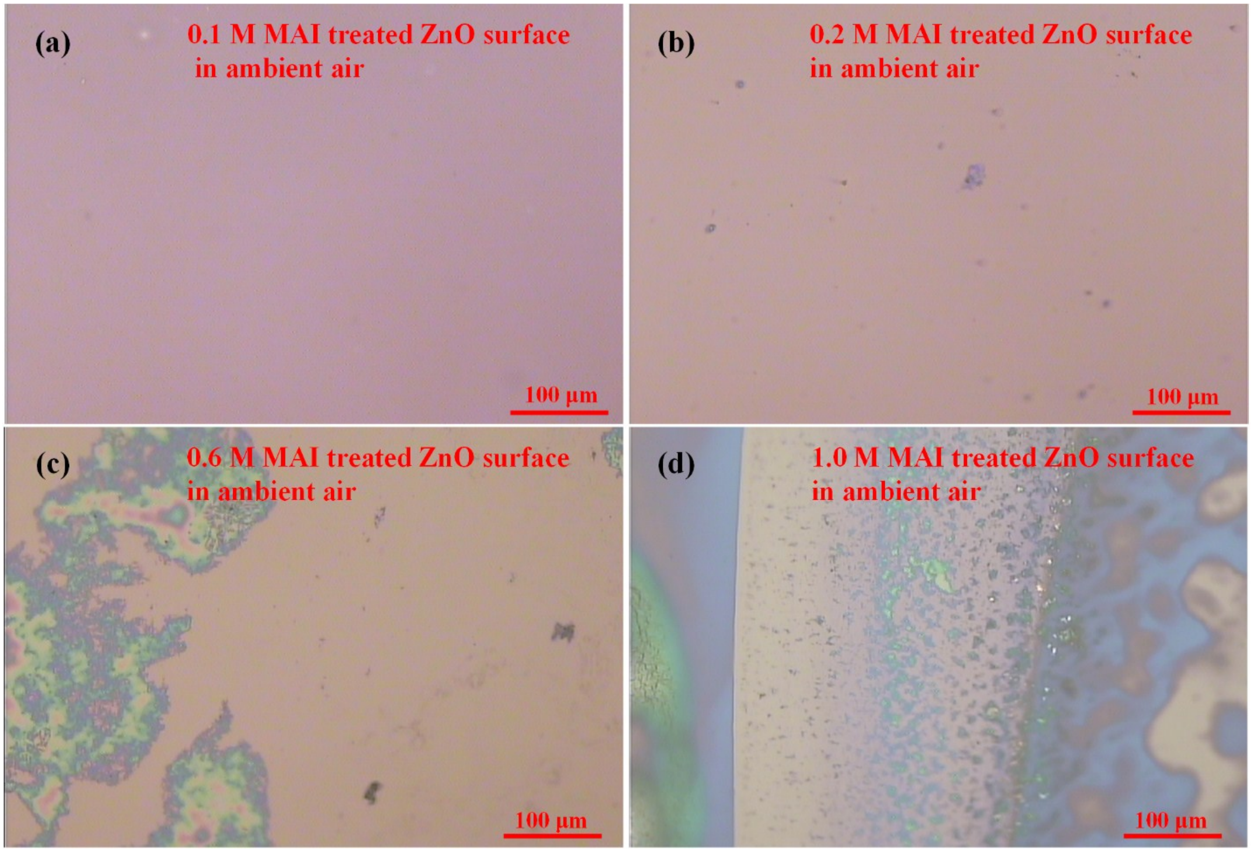

Fig. S2. Optical microscopy images of ZnO surfaces treated with various concentrations of MAI solution of (a) 0.1, (b) 0.2, (c) 0.6, and (d) 1.0 M. All processes were in ambient air. The surfaces of ZnO film were rinsed with IPA after the coating process.

When 0.6 or 1.0 M MAI was applied on the ZnO surface, the spreading of MAI solution was slowed down. In a way, the path of moisture from air to the interface was increased, since the thickness of 0.6 or 1.0 M MAI solution on the ZnO surface was increased by the slow spreading process before the spin-coating. Because of the longer path of the moisture, some ZnO film or particles were left on the surface.

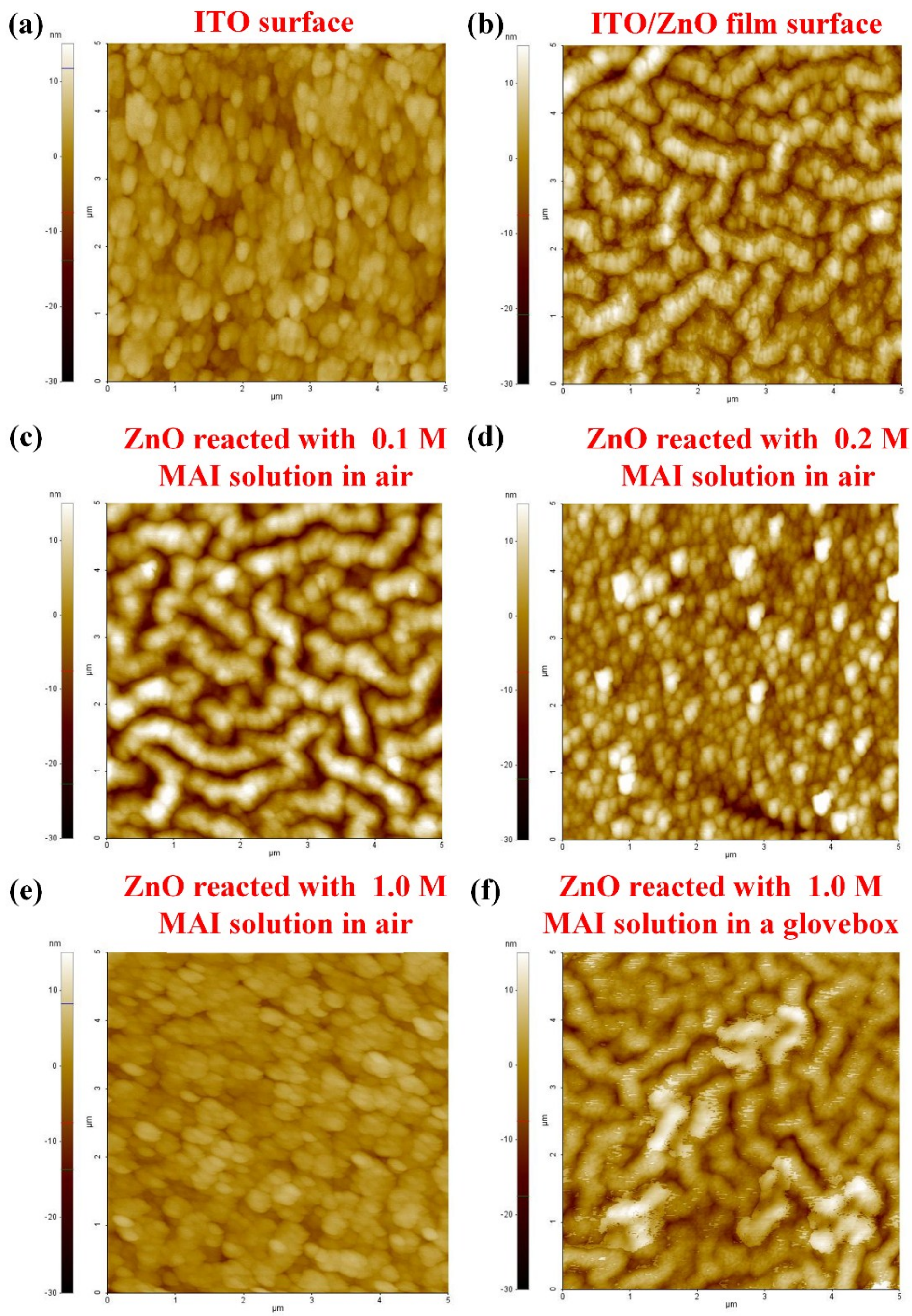

Fig. S3. AFM topography images of (a) the bare ITO surface, RMS = 3.2 nm; (b) the ITO/ZnO film surface prior to MAI treatment, RMS = 5.5 nm; (c) the ITO/ZnO film surface reacted with 0.1 M MAI solution in air, RMS = 7.3 nm; (d) the ITO/ZnO film surface reacted with 0.2 M MAI solution in air, RMS = 5.8 nm; (e) the ITO/ZnO film surface reacted with 1.0 M MAI solution in air, RMS = 2.4 nm; (f) the ITO/ZnO film surface reacted with MAI solution in a glovebox, RMS = 5.0 nm. The size of the AFM images is 5 × 5 μm^2.