Supporting Information

A Compact and Smooth $CH_3NH_3PbI_3$ Film: Investigation of Solvent Sorts and Concentrations of CH_3NH_3I towards Highly Efficient Perovskite Solar cells

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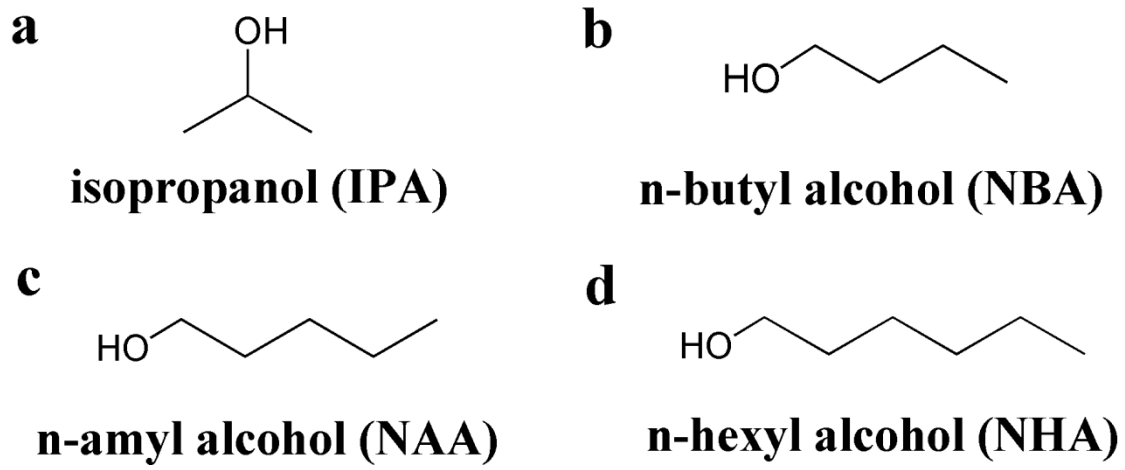

Figure S1. structural formula of the four-selected solvents molecule.

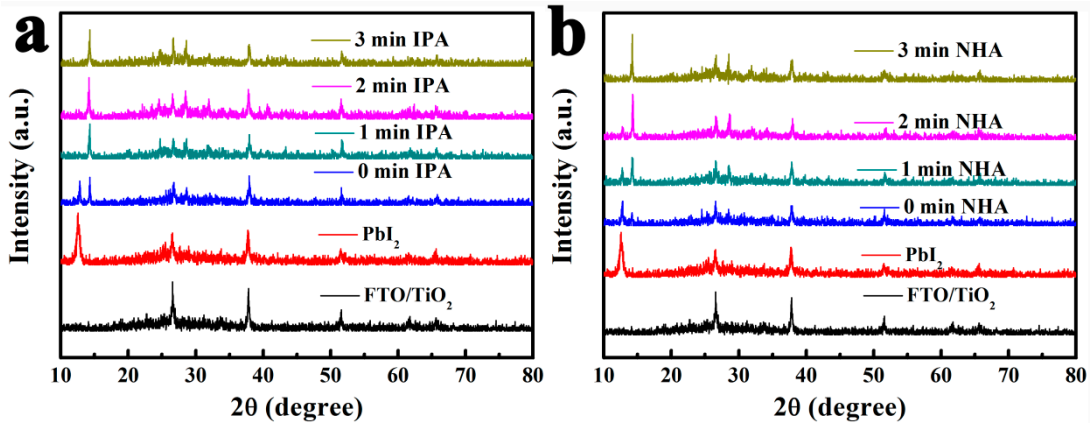

Figure S2. X-ray diffraction (XRD) patterns of Fluorine-doped tin oxide glass (FTO) substrate coated with TiO_2, PbI_2 film and the films prepared with loading time 0-3min using 6mg/mL MAI in (a) IPA and (b) NHA.

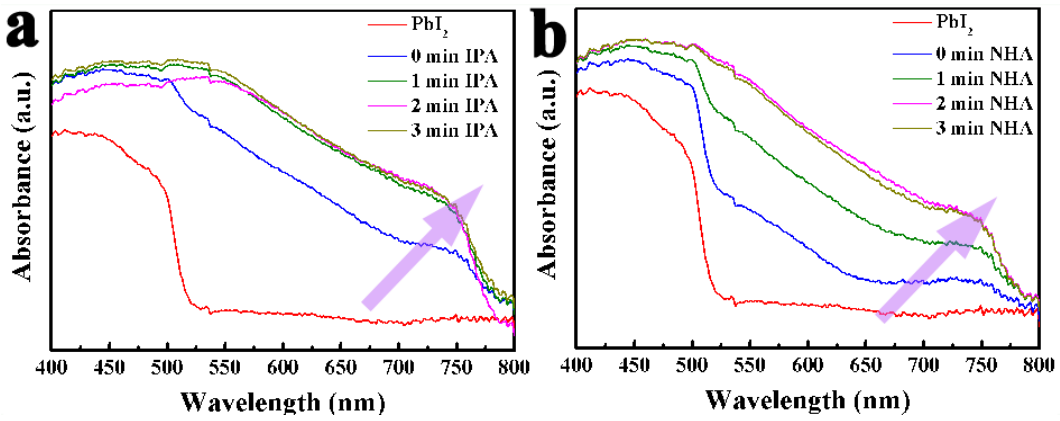

Figure S3. Ultraviolet–visible (UV-vis) absorption spectra of PbI_2 film and the films prepared with loading time 0-3min using 6mg/mL MAI in (a) IPA and (b) NHA.

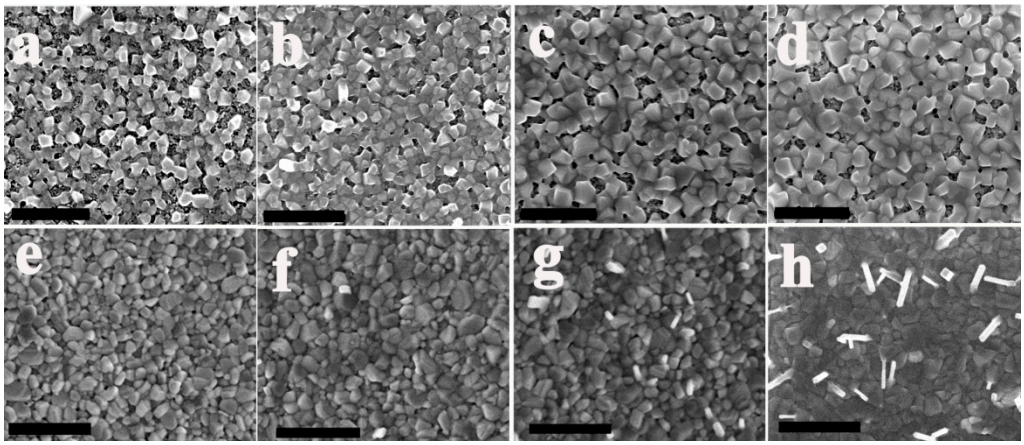

Figure S4. Field emission scanning electron microscope (FE-SEM) images of perovskite films prepared with loading time 0-3min using 6mg/mL MAI in (a)-(d) IPA and (e)-(h) NHA. The scale bars of a-h are 1μm.

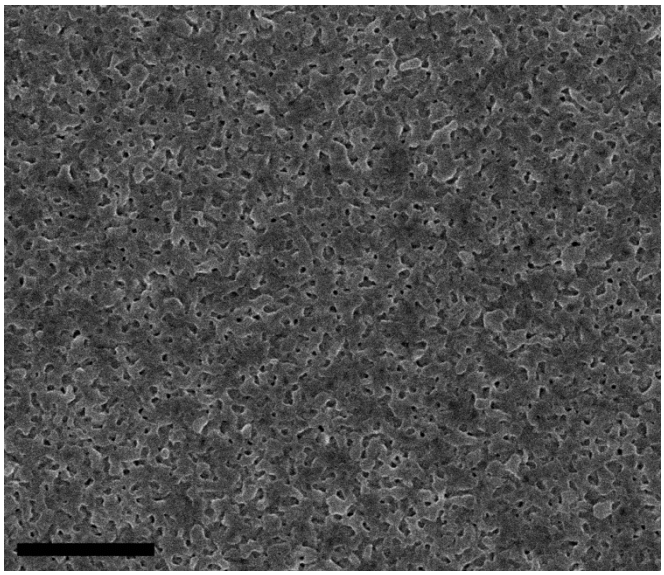

Figure S5. FE-SEM images of PbI_2 films. The scale bar is 1μm.

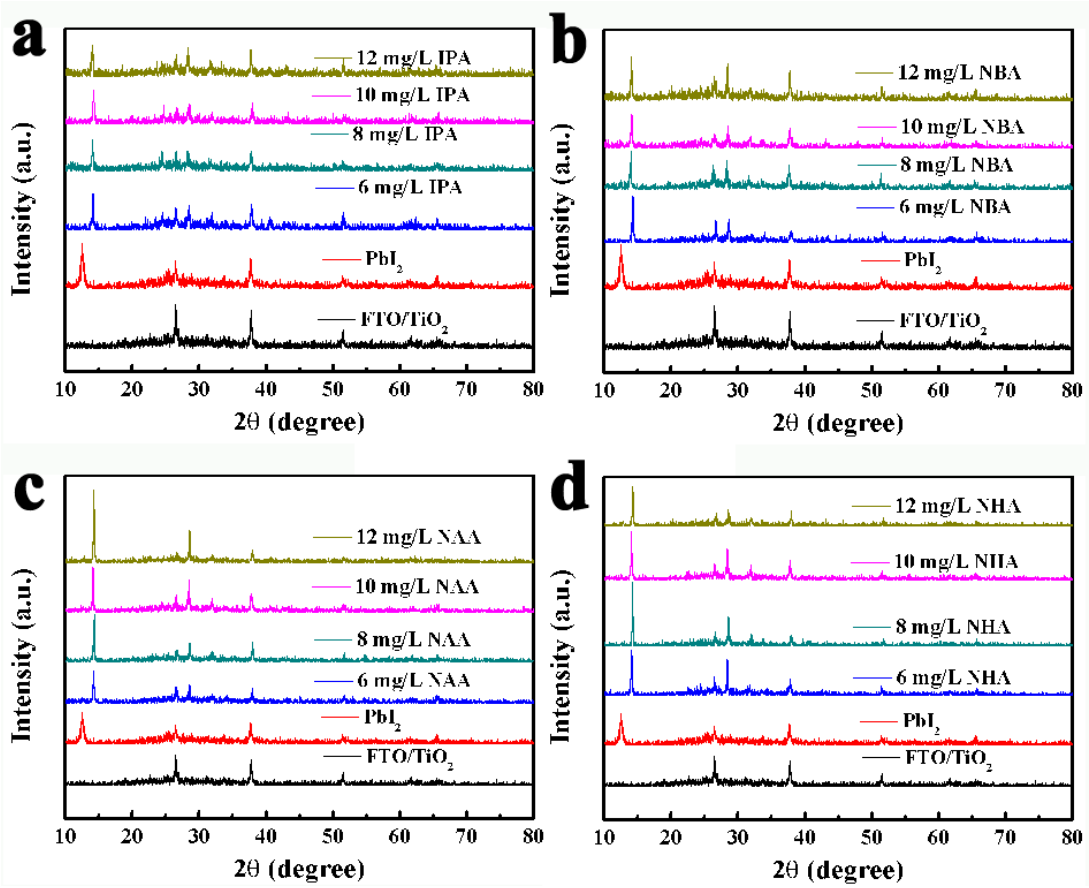

Figure S6. XRD patterns of FTO substrate coated withTiO_2, PbI_2 film and $MAPbI_3$ films obtained from 6-12 mg/mL MAI in (a) IPA, (b) NBA, (c) NAA and (d) NHA

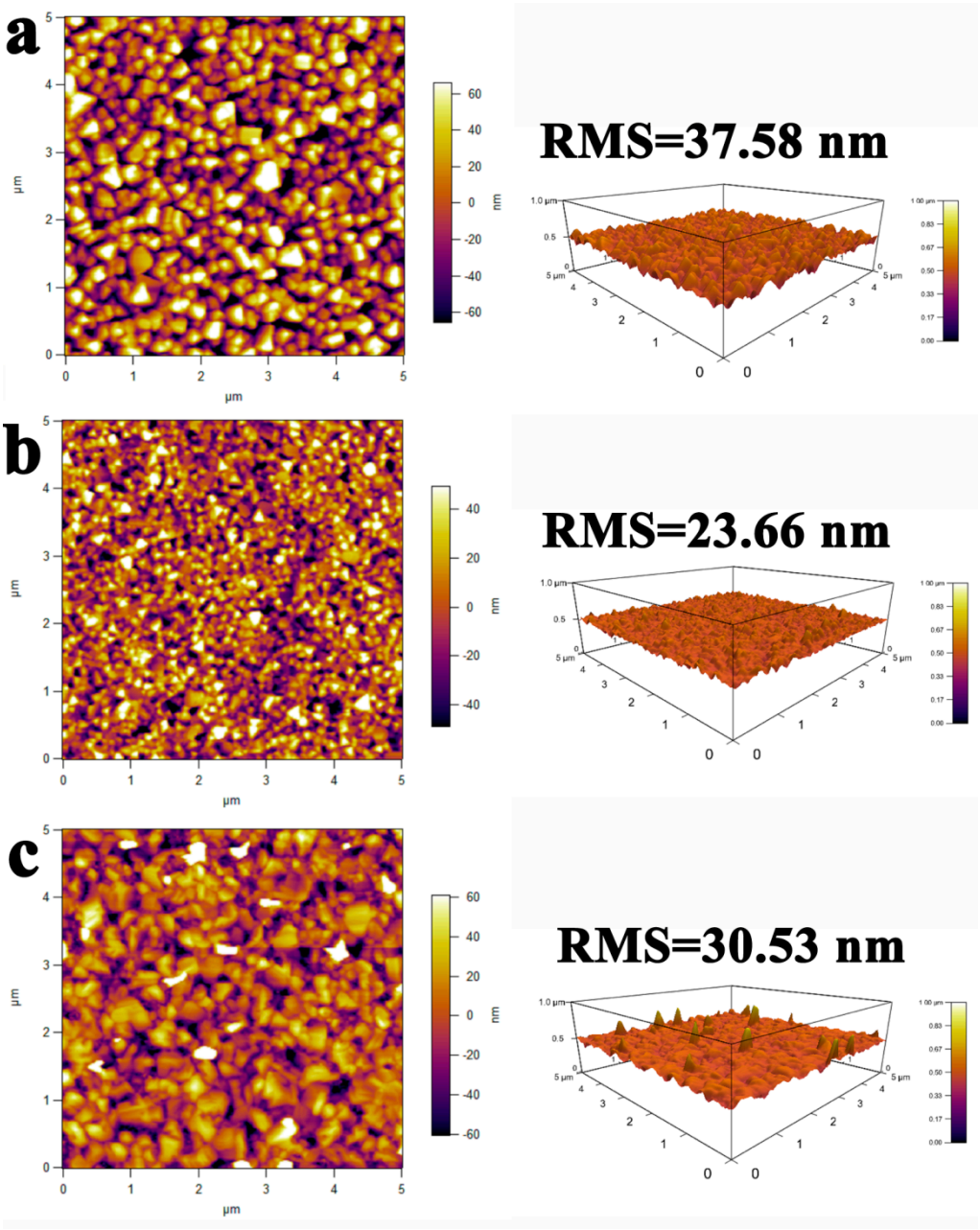

Figure S7. Atomic force microscope (AFM) images of three $MAPbI_3$ films basic types (a) incomplete-covered perovskite film, (b) compact perovskite film and (c) compact perovskite film with nanorods/nanoplates. a, b and c were obtained from 6, 8 and 10 mg/mL MAI in NBA, respectively.

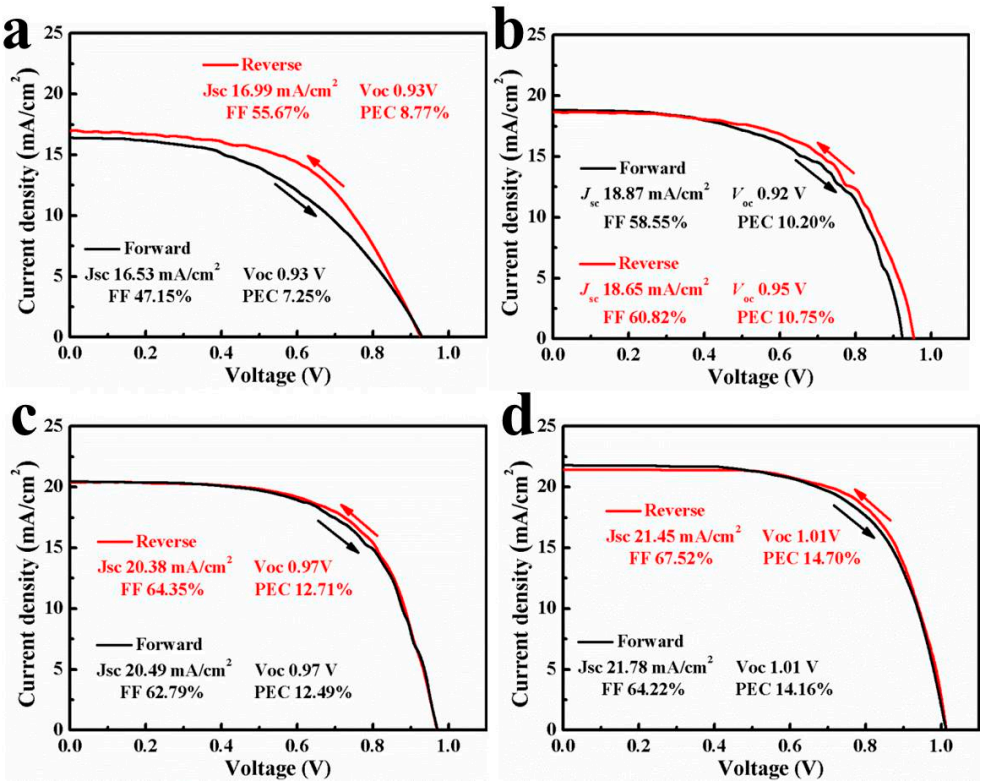

Figure S8. Detail parameters and I-V cures of the cells prepared by using (a) 6 mg/mL, (b) 8 mg/mL, (c) 10 mg/mL (d) 12 mg/mL MAI in IPA.

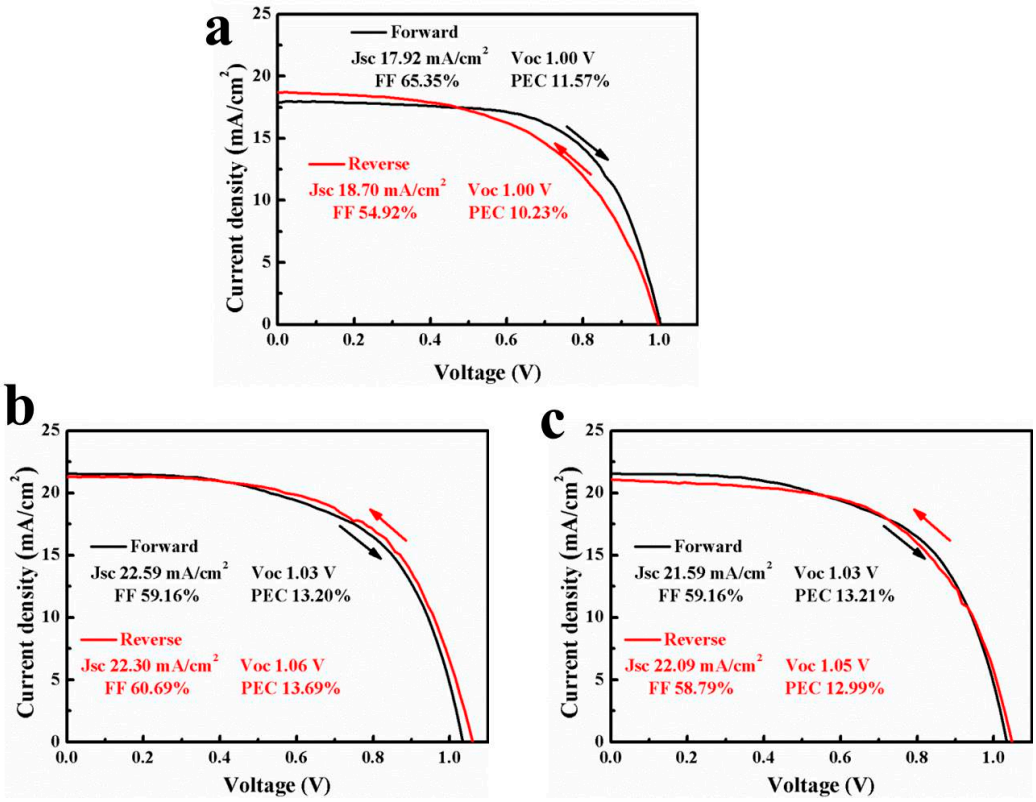

Figure S9. Detail parameters and I-V cures of the cells prepared by using (a) 6 mg/mL, (b) 10 mg/mL (c) 12 mg/mL MAI in NBA.

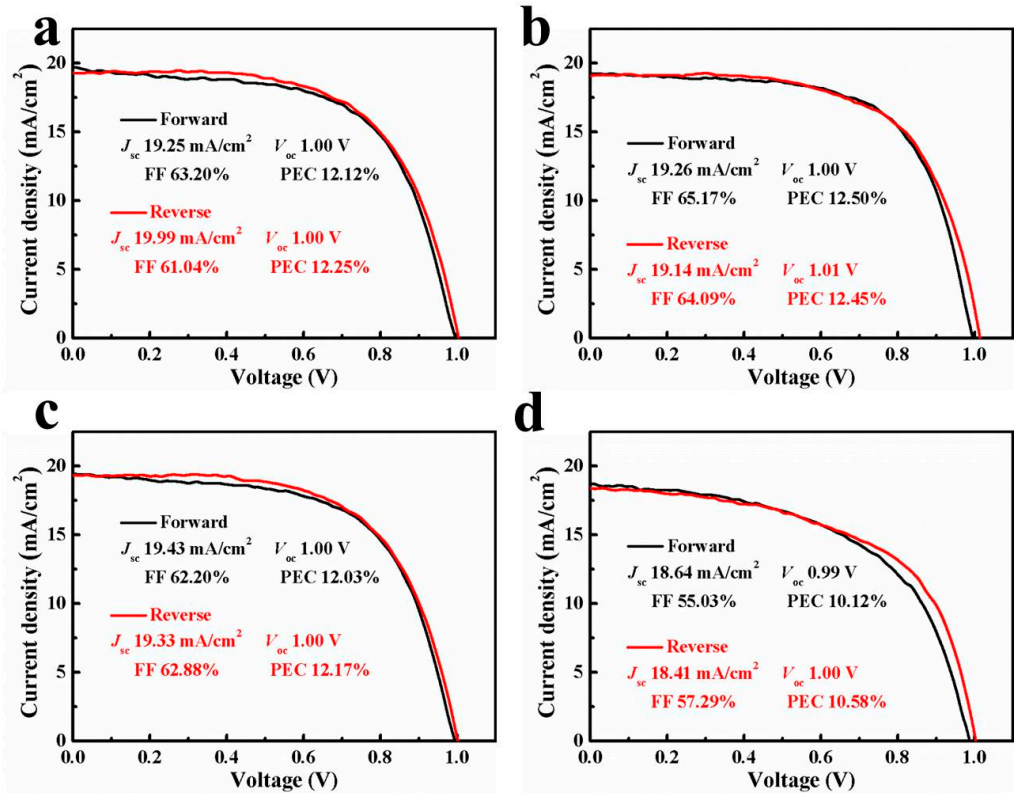

Figure S10. Detail parameters and I-V cures of the cells prepared by using (a) 6 mg/mL, (b) 8 mg/mL, (c) 10 mg/mL (d) 12 mg/mL MAI in NAA.

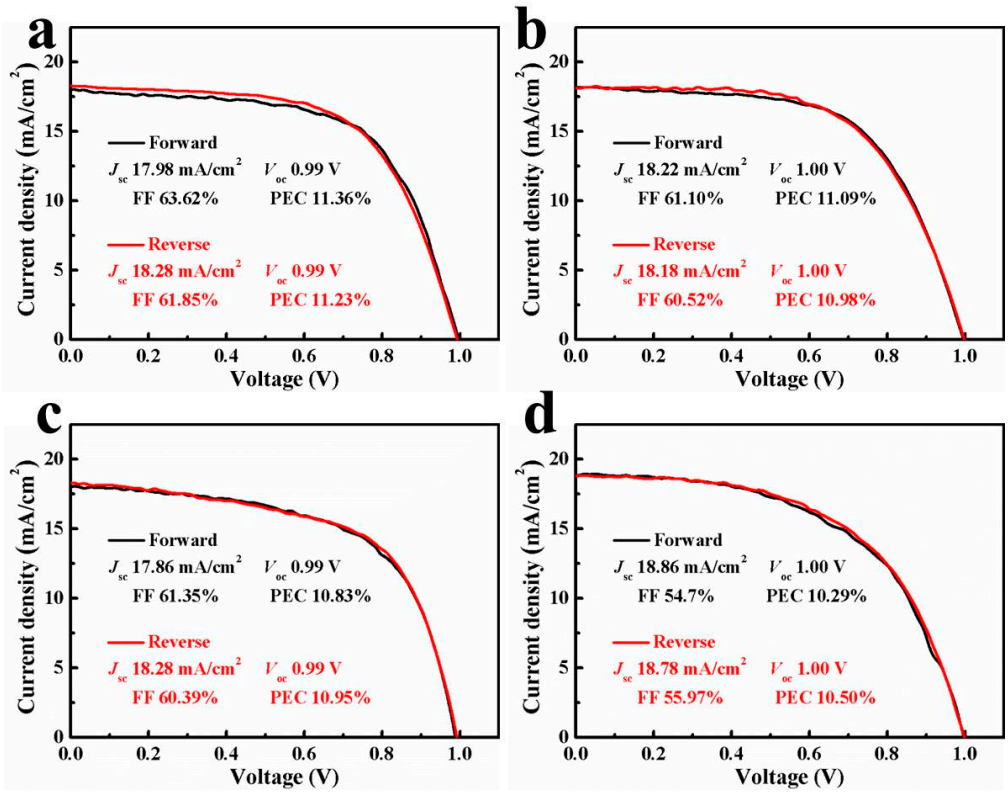

Figure S11. Detail parameters and I-V cures of the cells prepared by using (a) 6 mg/mL, (b) 8 mg/mL, (c) 10 mg/mL (d) 12 mg/mL MAI in NHA.

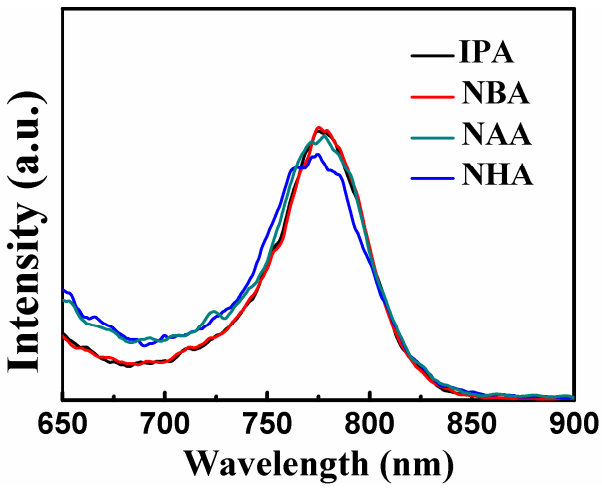

Figure S12. photoluminescence spectrum of $CH_3NH_3PbI_3$ perovskites films on FTO that were prepared by using 8 mg/mL MAI in IPA, NBA, NAA, and NHA.