Supplementary Information

Role of Antisolvent Temperature and Quaternary Ammonium Cation-based Ionic Liquid Engineering on the Performance of Perovskite Solar Cell Processed Under Air Ambient Conditions

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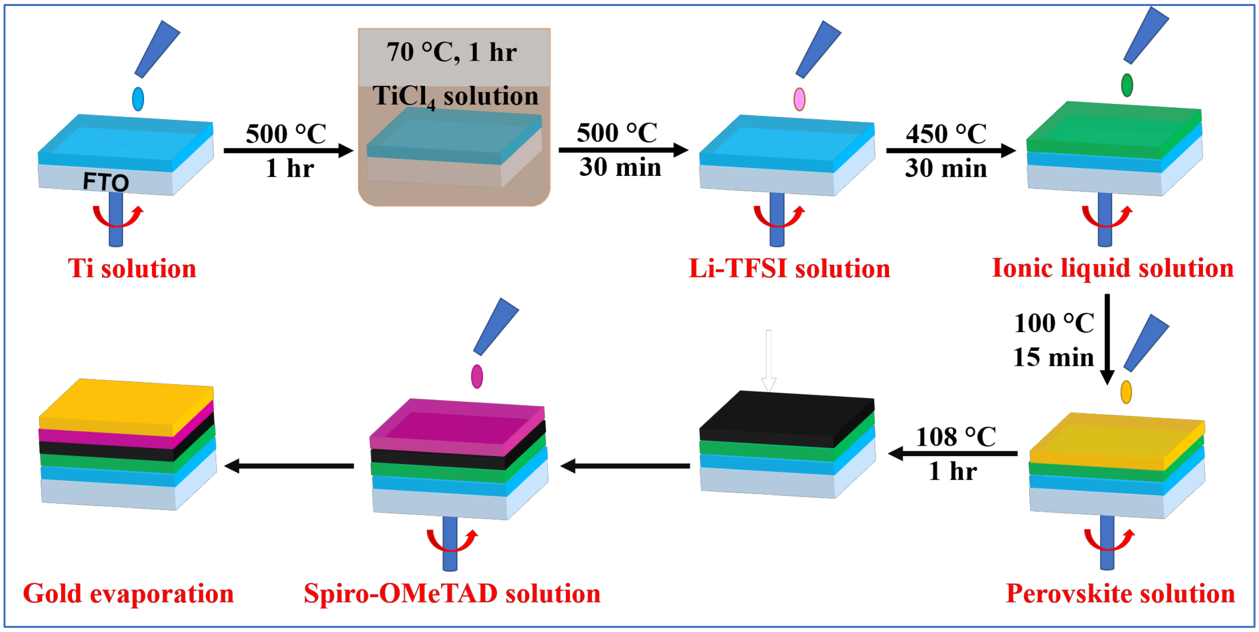

Figure S1. A schematic of device fabrication procedure.

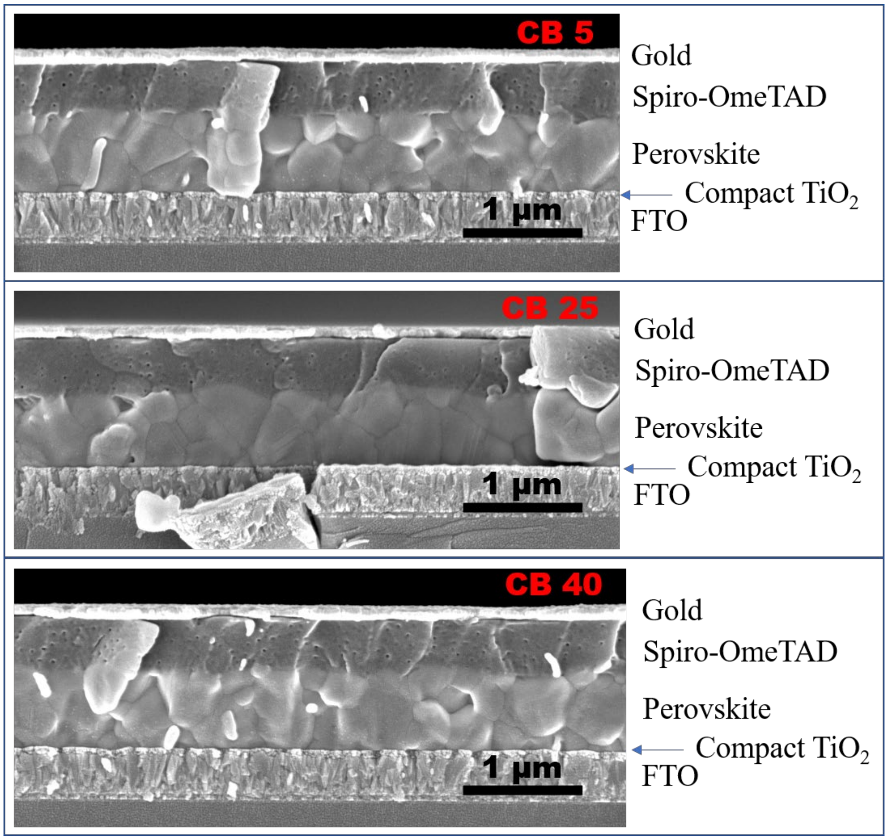

Figure S2. Cross-section SEM images of the complete devices with perovskite films fabricated using antisolvent of different temperatures.

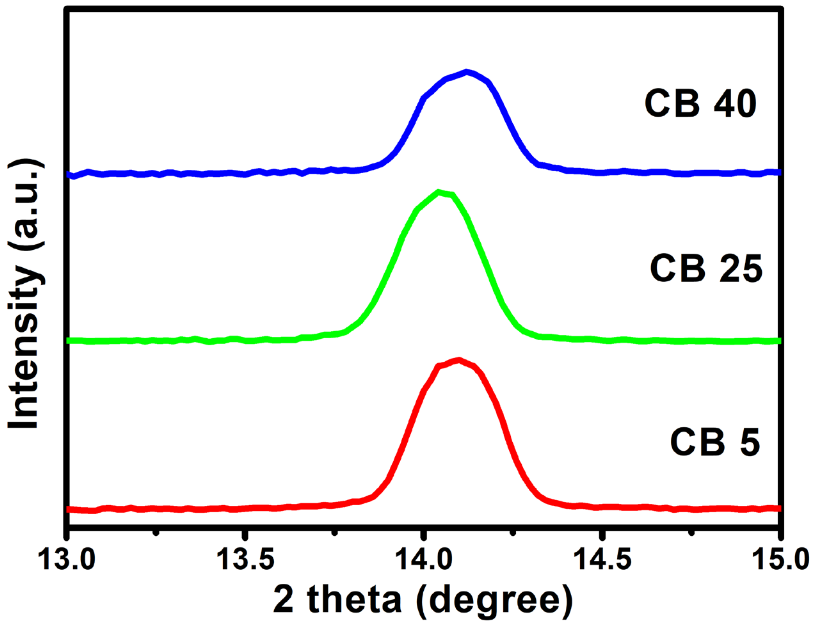

Figure S3. Zoomed in plot of (100) plane. The FWHM of the (100) plane is 0.272°, 0.265° and 0.266° for CB5, CB 25 and CB 40 samples, respectively.

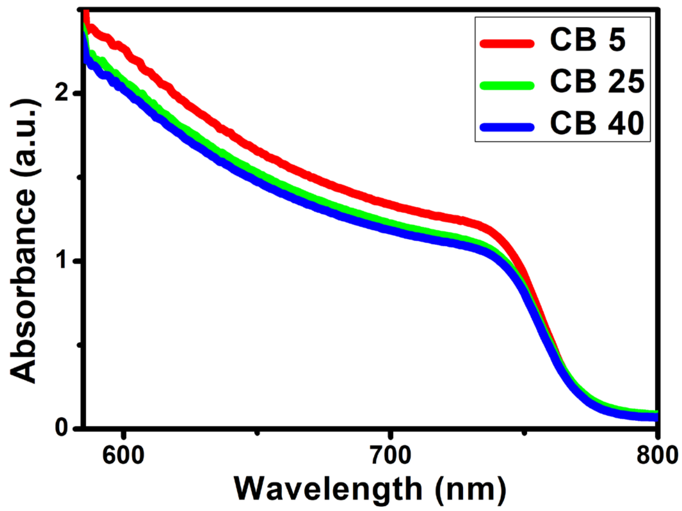

Figure S4. UV-Vis absorption spectroscopy of perovskite films fabricated using chlorobenzene of different temperature.

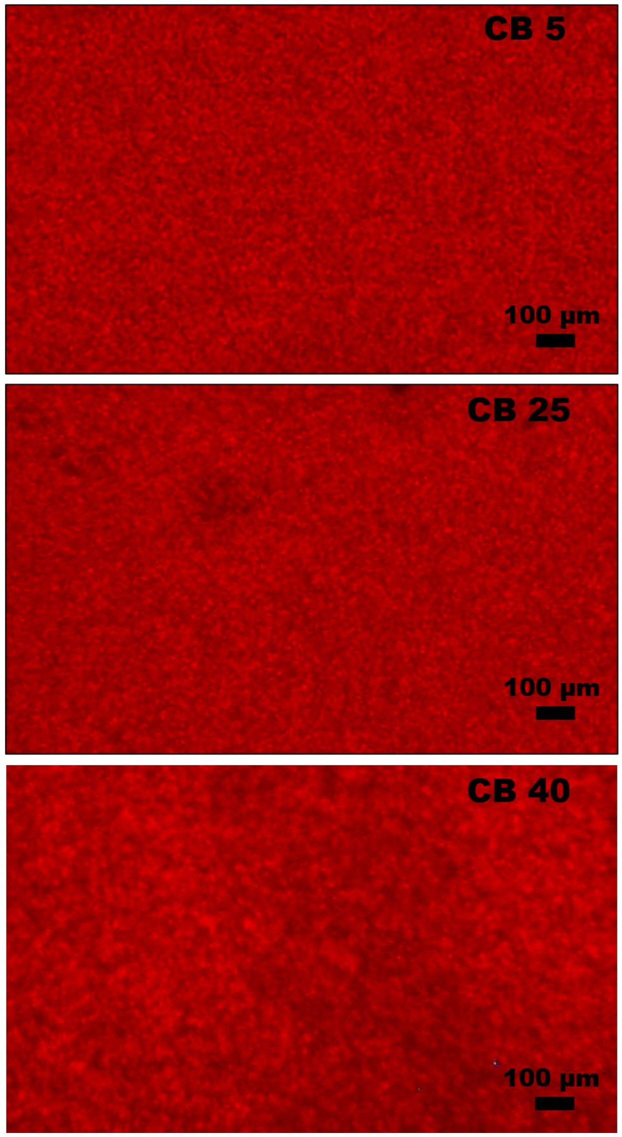

Figure S5. Optical microscopic images of the perovskite films taken immediately after dripping antisolvent of various temperatures and without any heat treatment.

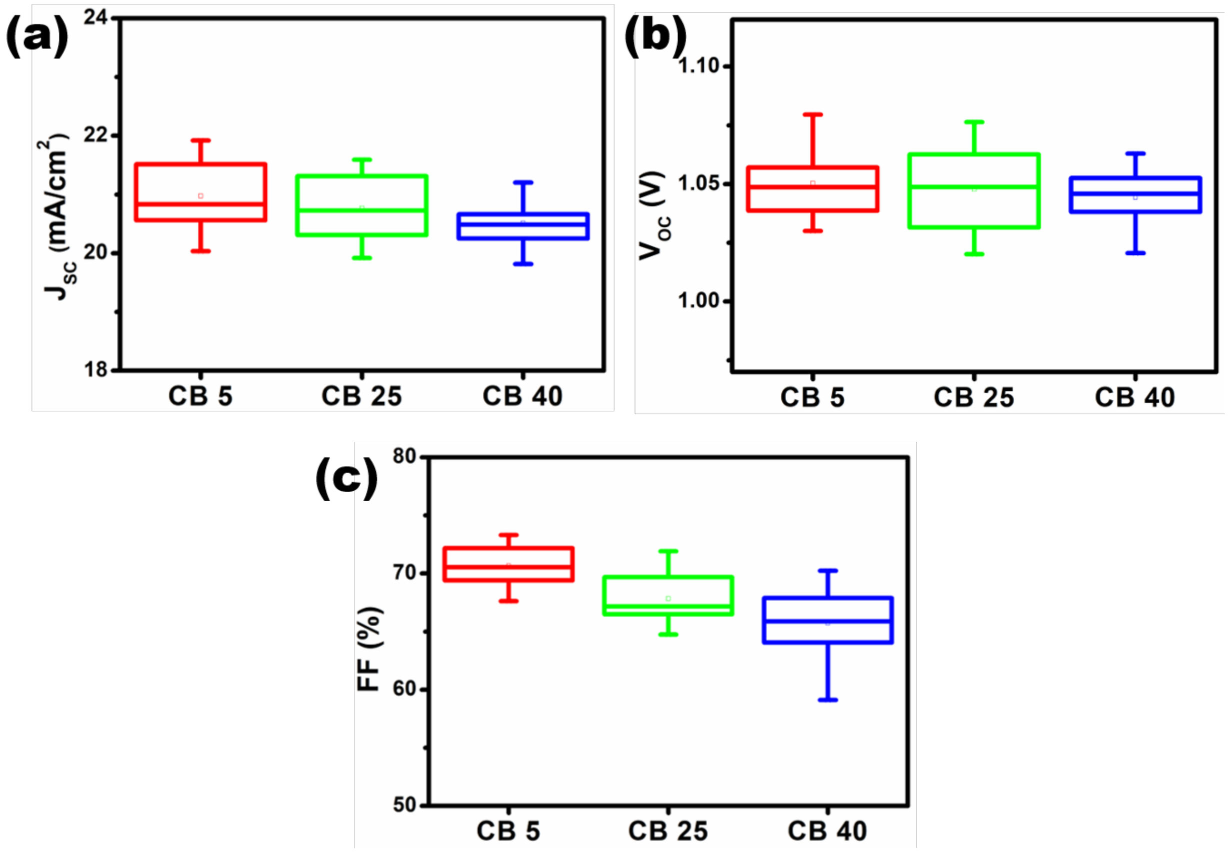

Figure S6. Box chart of (a) J_{SC}, (b) V_{OC}, and (c) FF of the devices fabricated using different temperature of chlorobenzene antisolvent.

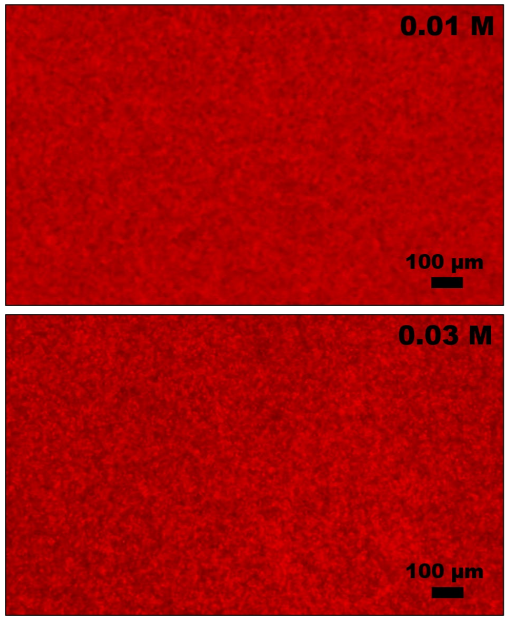

Figure S7. Optical microscopic images of the perovskite films (deposited on ionic liquid treated TiO_2 surface) immediately after the antisolvent (5 °C) dripping without annealing.

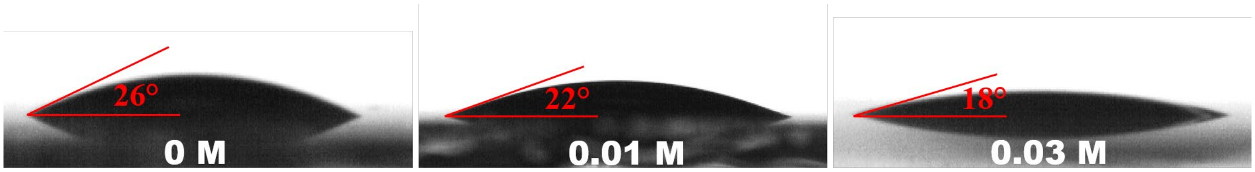

Figure S8. Water contact angle of the TiO_2 surface with [TMPA][TFSI] modification.

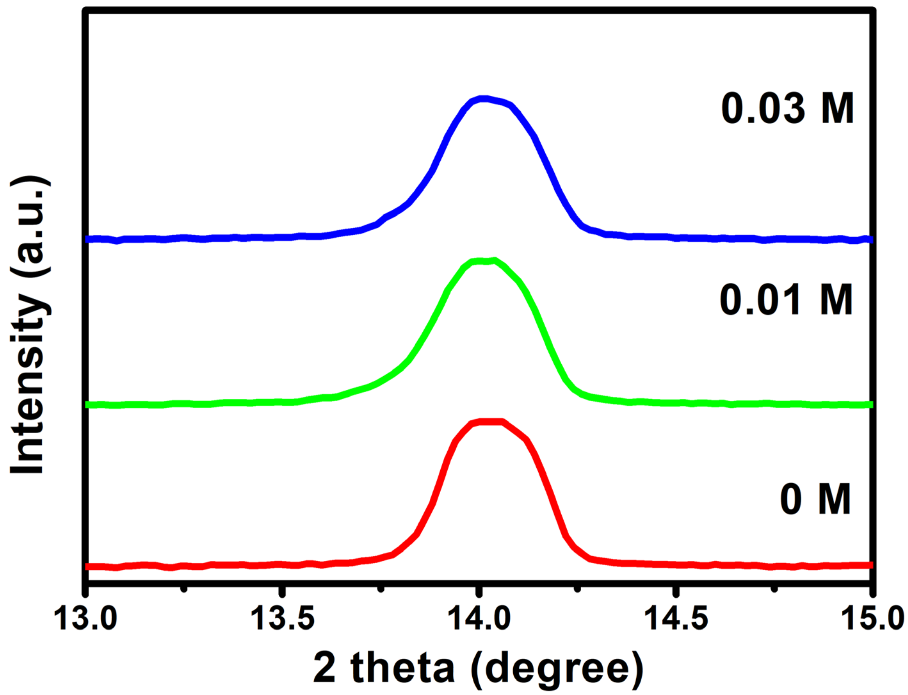

Figure S9. Zoomed in plot of (001) plane of XRD pattern for ionic liquid modified perovskite films. The FWHM of the (001) plane is 0.290°, 0.304° and 0.303° for 0 M, 0.01 M and 0.03 M samples, respectively.

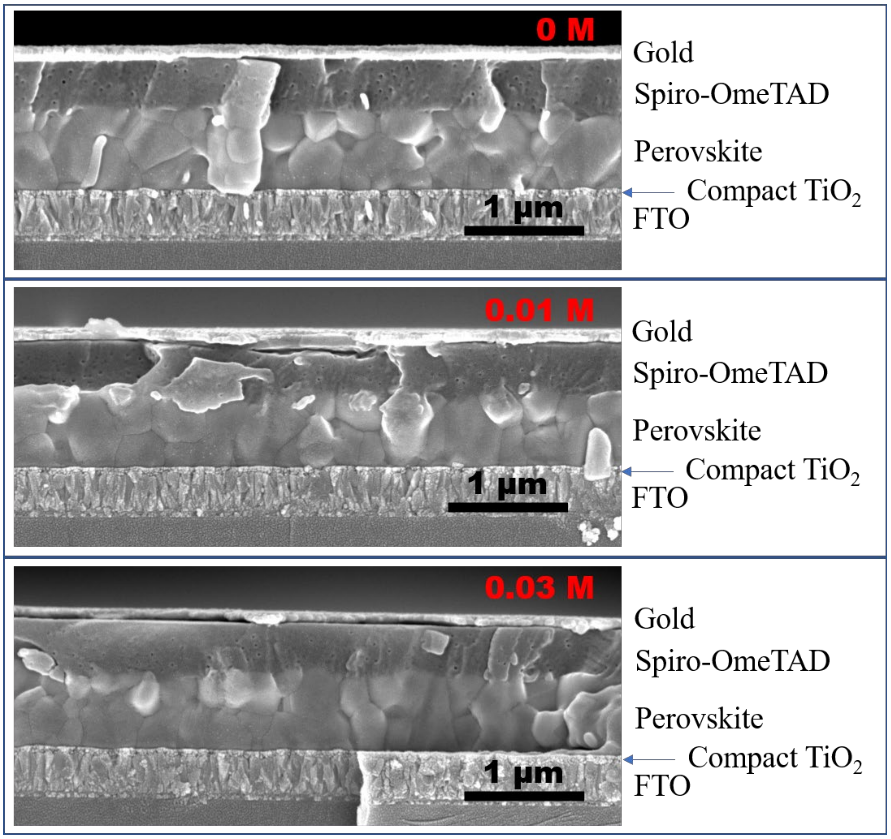

Figure S10. Cross-section SEM images of the complete devices with perovskite films fabricated on ionic liquid modified TiO_2 surface.

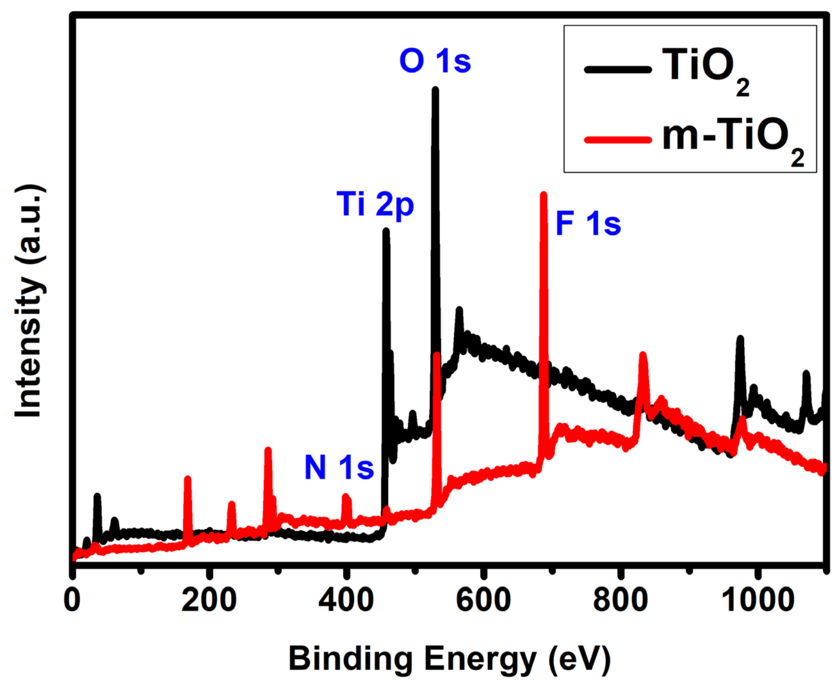

Figure S11. XPS spectra of the unmodified and [TMPA][TFSI] coated TiO_2 surface.

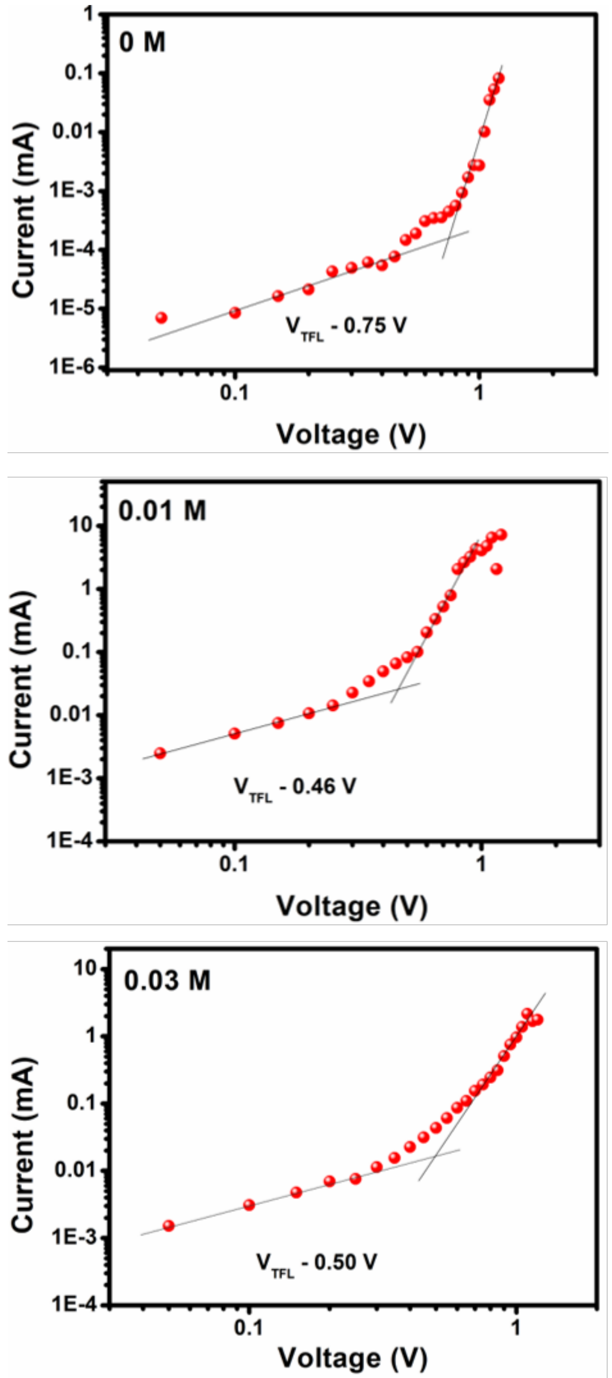

Figure S12. Dark I–V curves of the electron-only devices (FTO/TiO_2/[TMPA][TFSI]/perovskite/LiF/Al) revealing V_{TFL} kink point.