Supplementary Information (SI) for Journal of Materials Chemistry C.

Supporting Information

Enhancing Buried Interfacial Toughness and Performance in n-i-p Perovskite Solar Cells via Dipolar Molecule Interlayer

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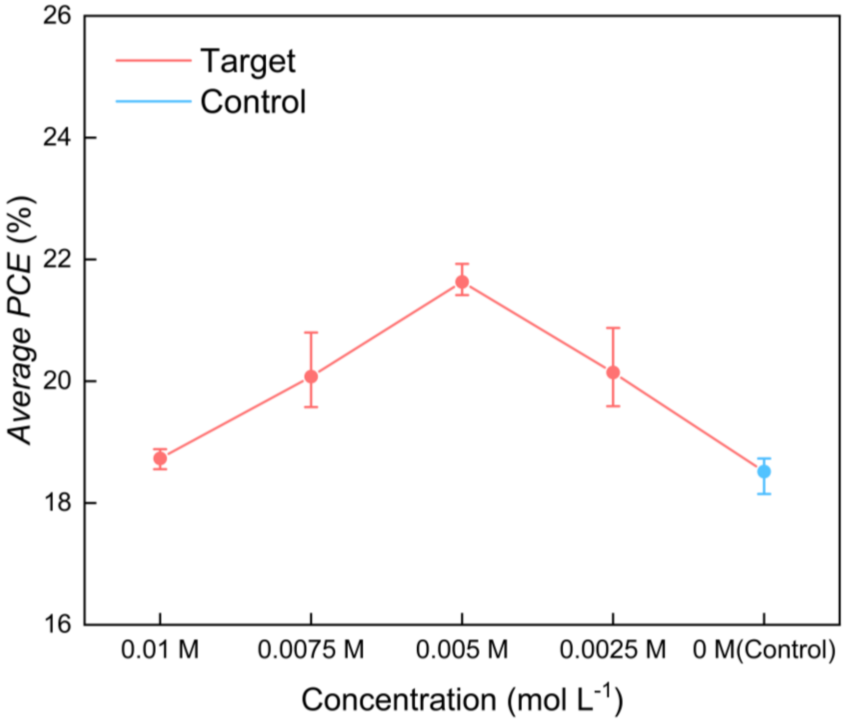

Figure S1. PCEs as a function of CF3-mDA concentrations.

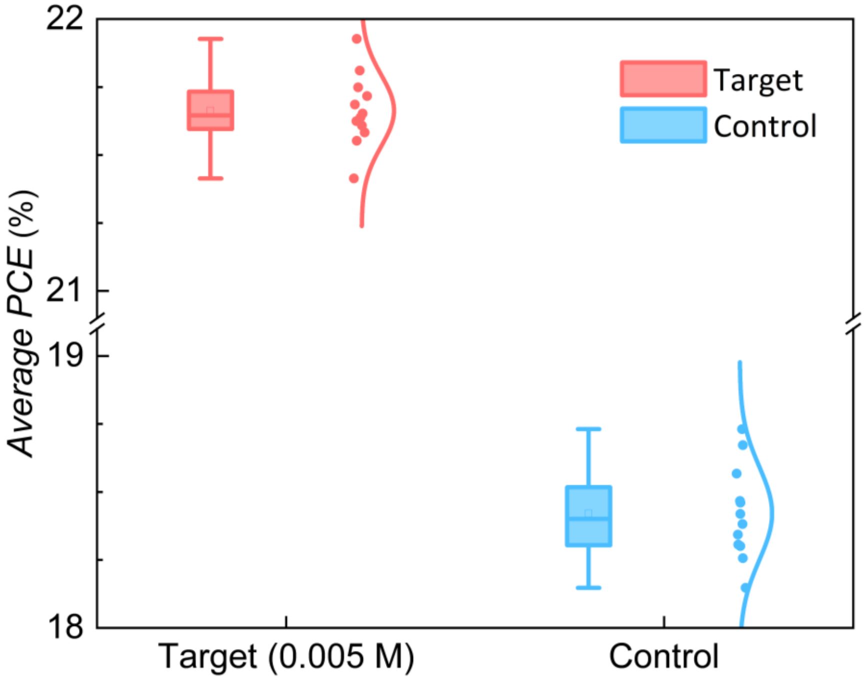

Figure S2. Average PCE statistical diagram of devices with or without CF3-mDA modification.

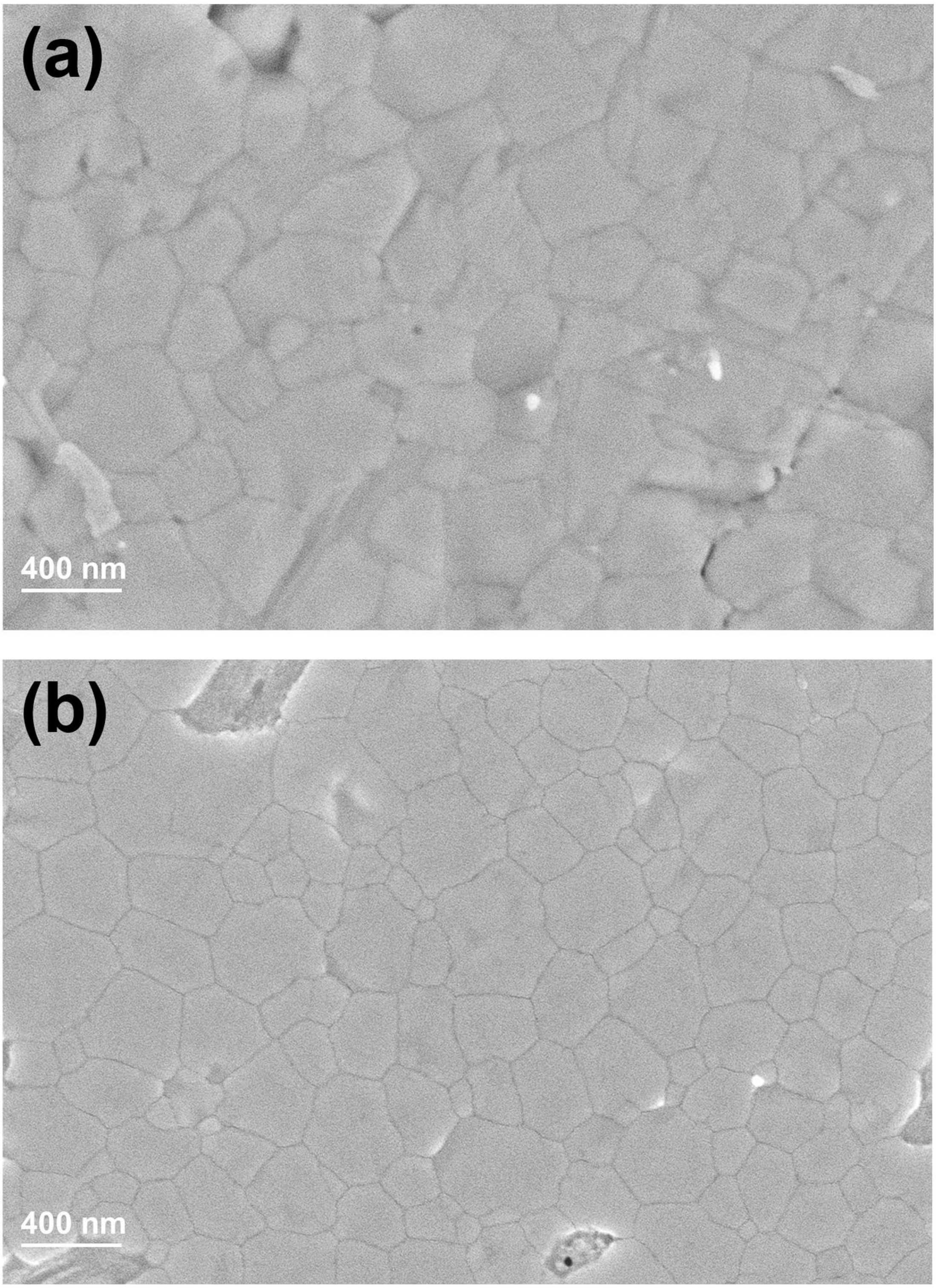

Figure S3. High-resolution SEM images of the buried interface (a) with and (b) without CF3-mDA modification.

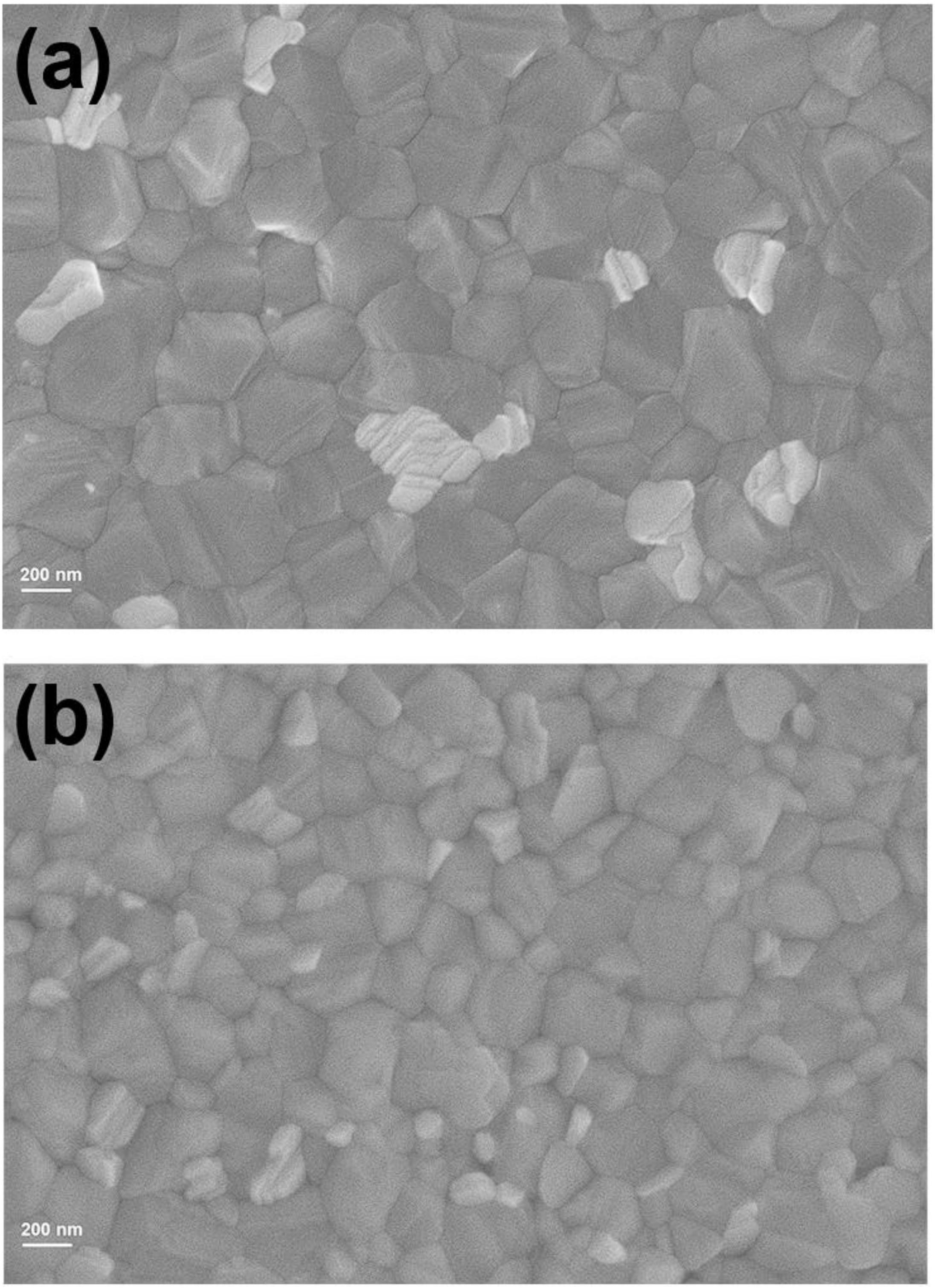

Figure S4. SEM of perovskite surface (a) with and (b) without CF3-mDA modification.

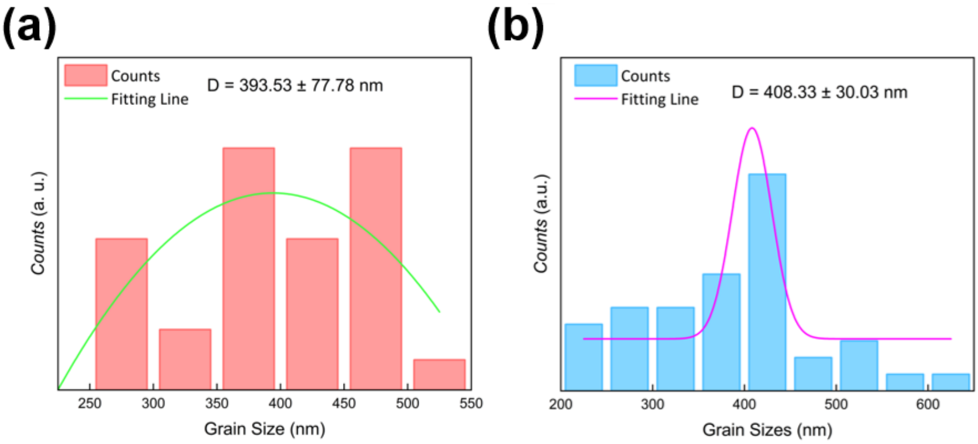

Figure S5. Statistical histogram of surface grain size from SEM of (a) target sample and (b) control sample.

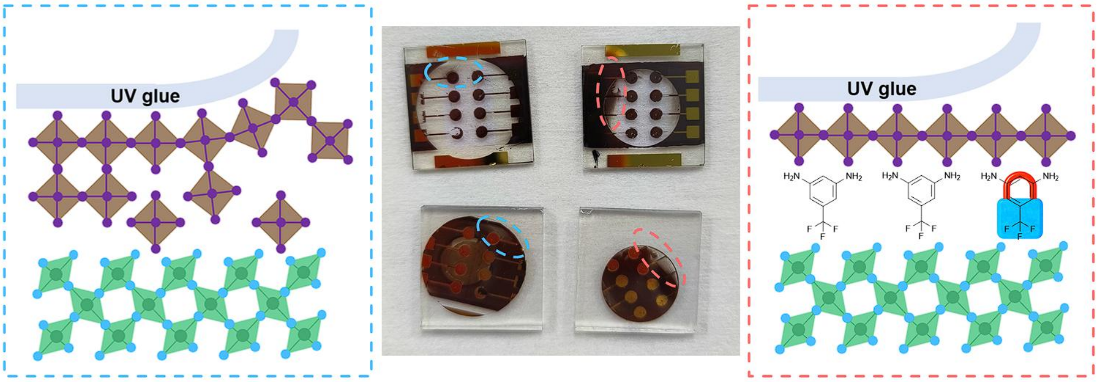

Figure S6. Schematic of peeling off the perovskite film from the fabricated devices

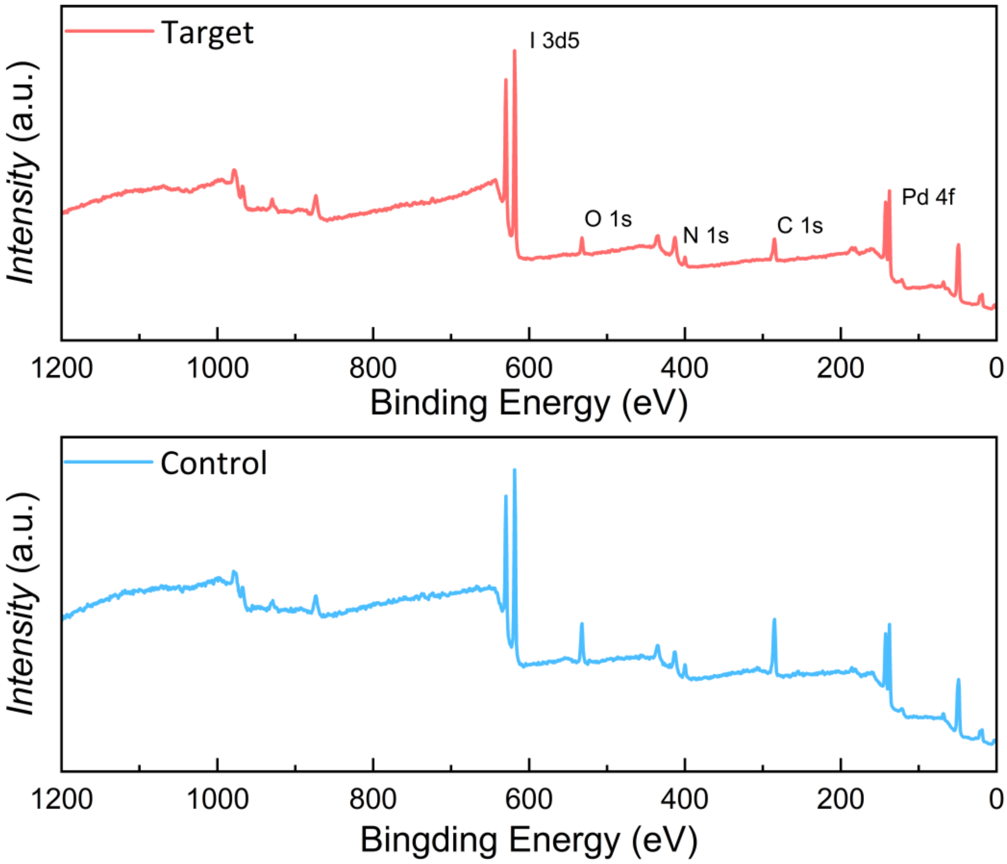

Figure S7. Full XPS spectra of the perovskite buried interface.

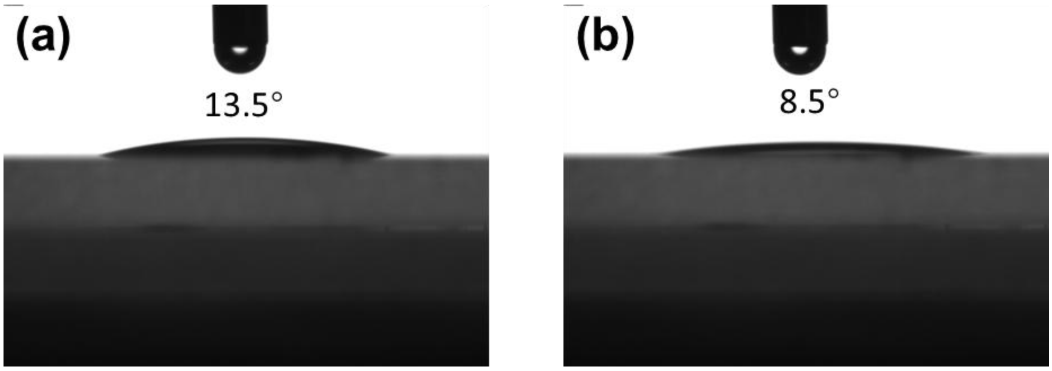

Figure S8. Contact angle of SnO_2 on ITO (a) with and (b) without CF3-mDA.

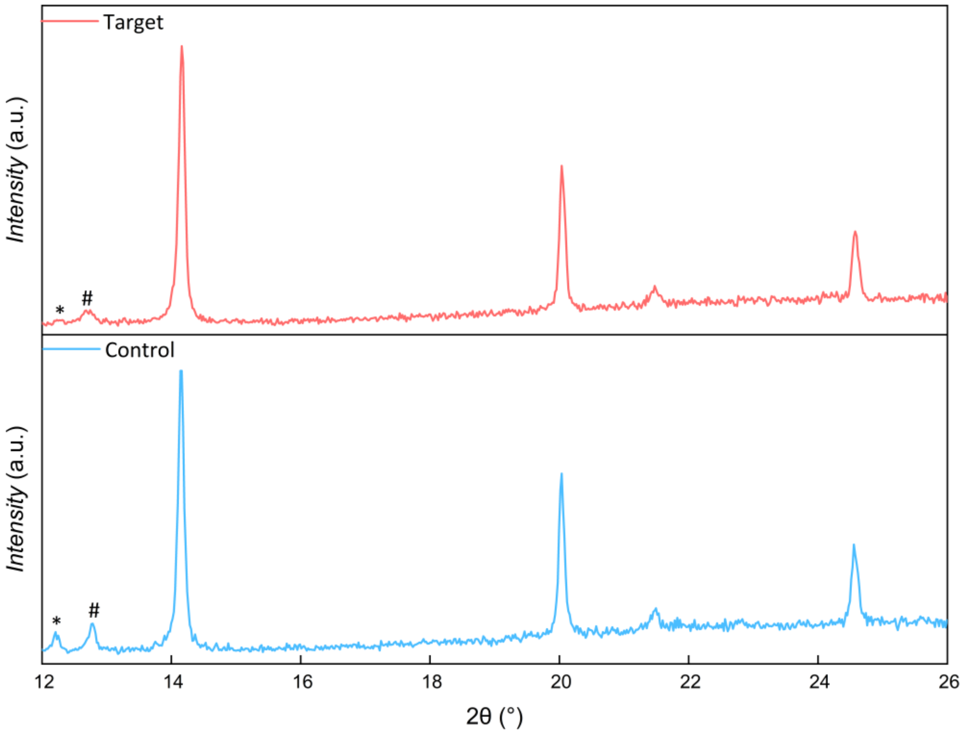

Figure S9. XRD Pattern of perovskite film adding CF3-mDA (Target) or not (Control). The peak marked with “#” is the <001> crystal plane diffraction peak of PbI_2, and the peak marked with “*” is suspected to correspond to a certain compound containing $PbBr_2$.

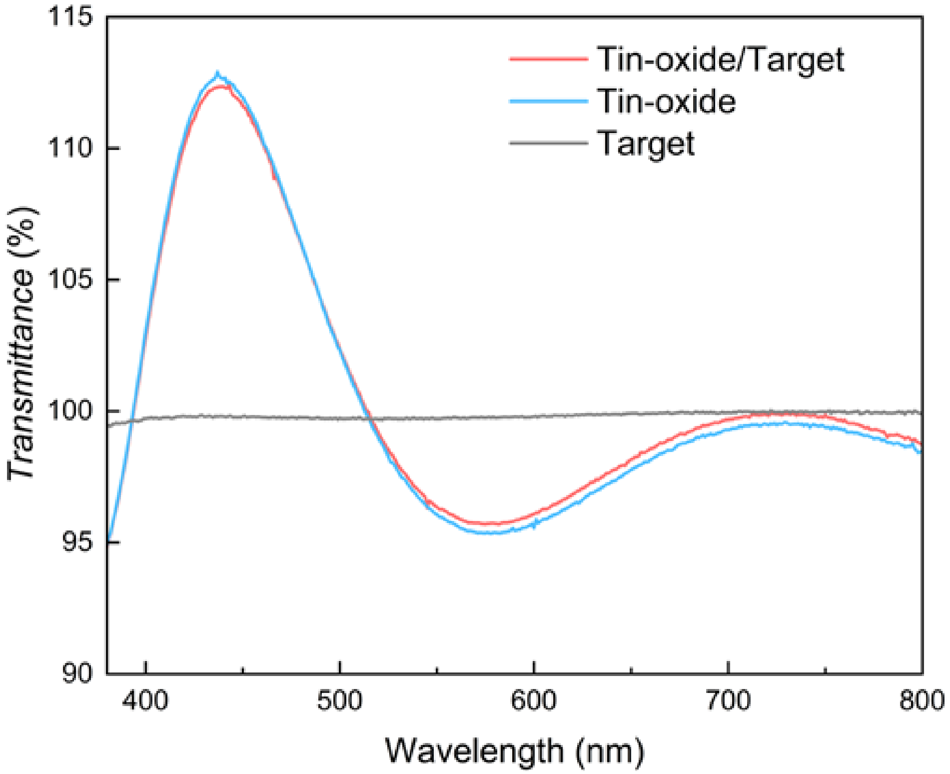

Figure S10. Transmittance of ITO coating with different layers.

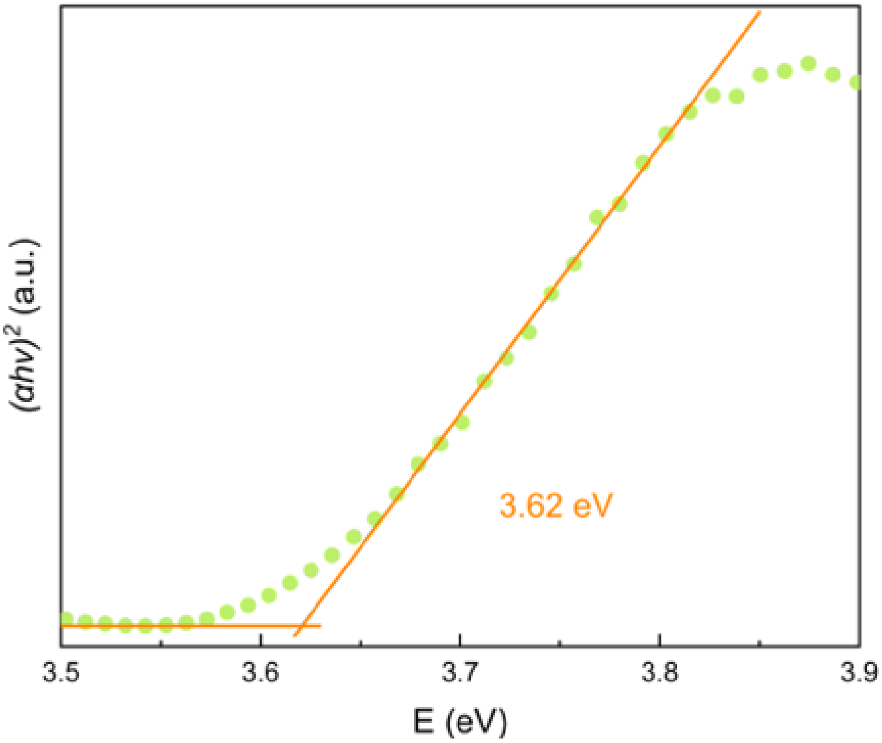

Figure S11. Tauc plot of SnO_2 film. (The bandgap is plotted in orange.)

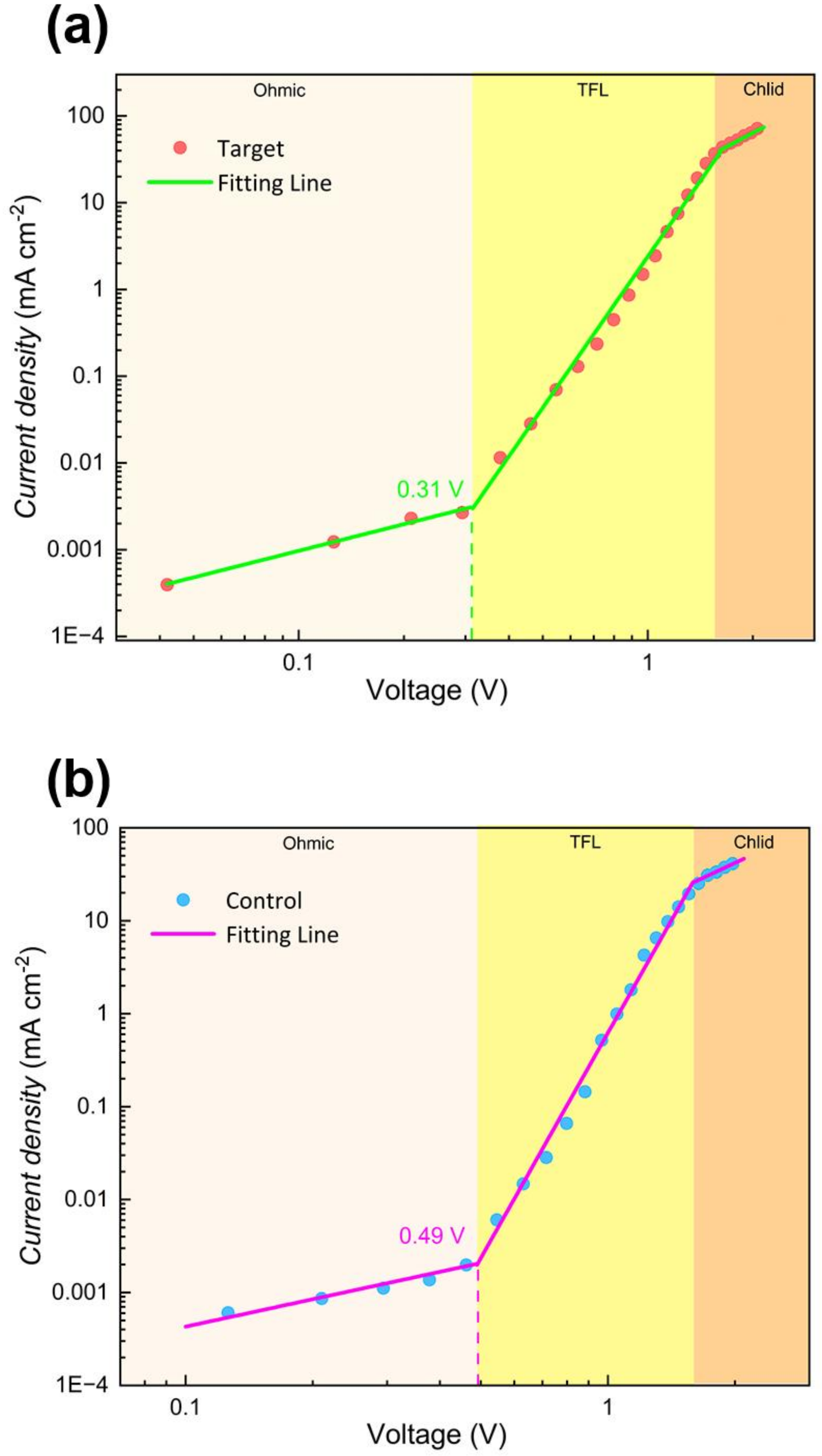

Figure S12. Dark-state I−V curves of electron-only devices (a) with and (b) without CF3-mDA.

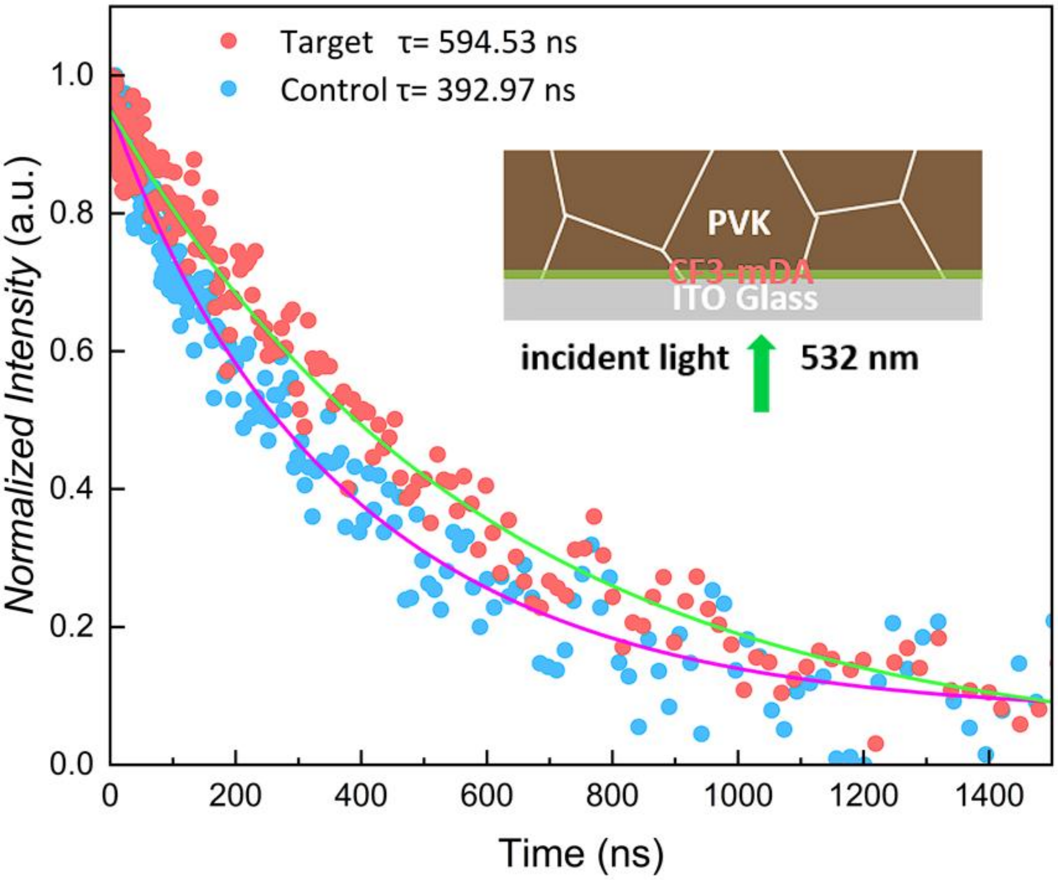

Figure S13. TRPL of perovskite with (Target) and without the buried interface modified (Control).

Table S1. Summary of the photovoltaic performances of the devices with or without CF3-mDA modification under RS and FS

Device	J_{SC} (mA cm^{-2})	V_{OC} (V)	FF (%)	PCE (%)
Target FS	23.355	1.227	75.85	21.74
Target RS	23.653	1.237	75.62	22.12
Control FS	22.407	1.175	67.61	17.81
Control RS	22.475	1.200	72.89	19.66

Table S2. Summary of the average photovoltaic performances of the devices with or without CF3-mDA modification

Device	J_{SC} (mA cm^{-2})	V_{OC} (V)	FF (%)	PCE (%)
Target	23.504	1.232	75.74	21.93
Control	22.441	1.188	70.25	18.74

Table S3. Summary of parameters extracted from SCLC measurements

Device	N_t (×10^{-15} cm^{-3})	μ_e (×10^{-5} cm^2 V^{-1} s^{-1})
Target	1.48	7.15
Control	2.34	4.13

Table S4. The biexponential fitted parameters of the TRPL spectra of perovskite films deposited on bare SnO_2 or SnO_2/CF3-mDA films and their corresponding proportions.

Sample	A_1 (%)	A_2 (%)	τ_1 (ns)	τ_2 (ns)	τ (ns)
Target	0.050	0.831	97.941	397.347	392.97
Control	0.464	0.470	594.480	594.535	594.53

Table S5. Fitting parameters of EIS

Device	R_S (Ω)	R_{rec} (Ω)
Target	8.709	26479
Control	60.673	14663

Table S6. Fitting parameters of M-S measurement

Device	Slope (×10^{16} F^{-2})	V_{bi} (V)
Target	5.847	0.983
Control	5.220	0.968