Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

A facile strategy to adjust SnO_2/Perovskite interfacial properties for high efficiency perovskite solar cells

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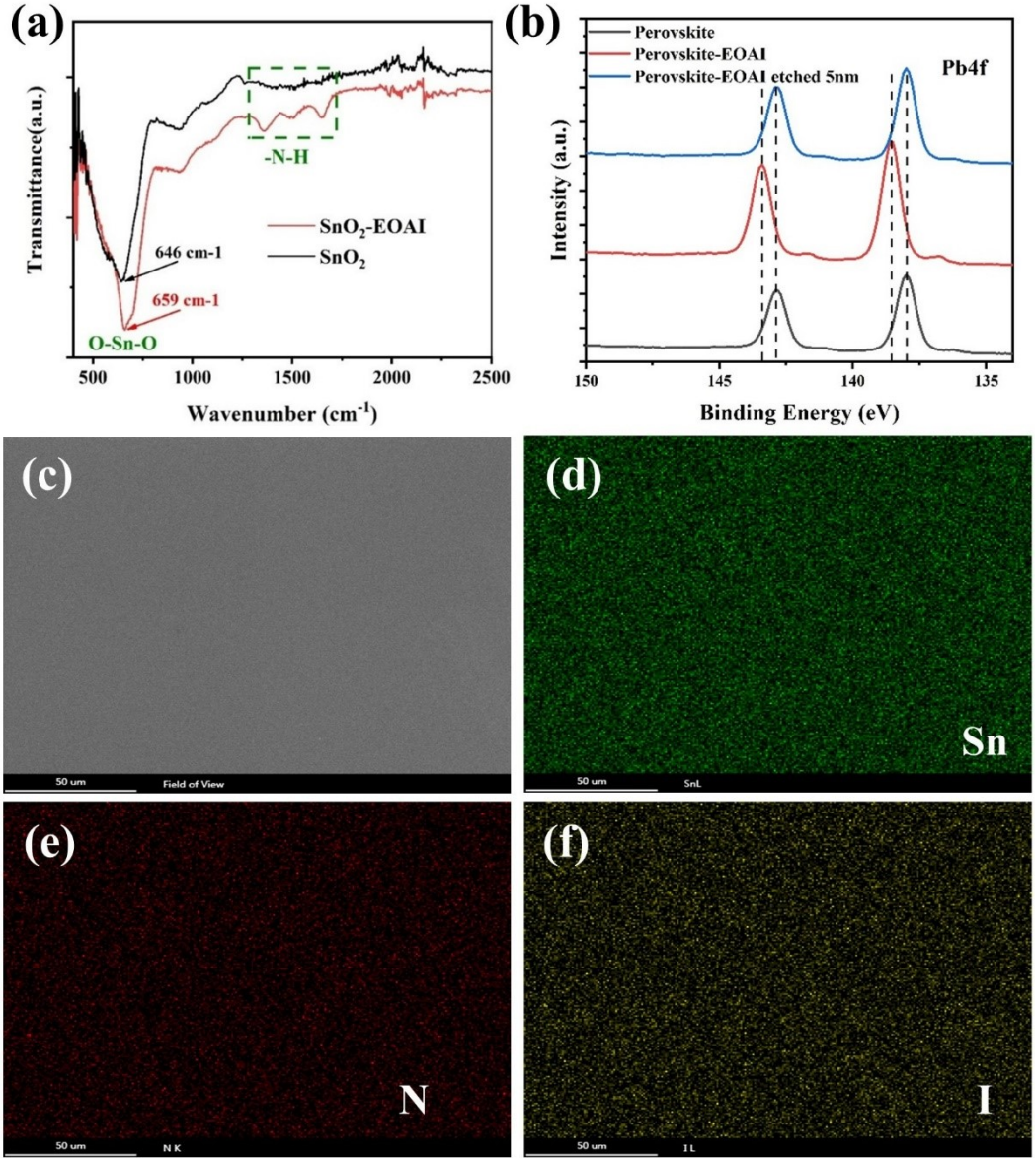

Figure S1. (a) The FTIR of the SnO_2 film without and with EOAI. (b) XPS spectra of Pb 4f core level for perovskite films with and without EOAI treatment. (c) SEM image and element map of (d) Sn, (e) N, and (f) I of SnO_2 film with EOAI after IPA washing using energy dispersive spectroscopy (EDS) on SEM.

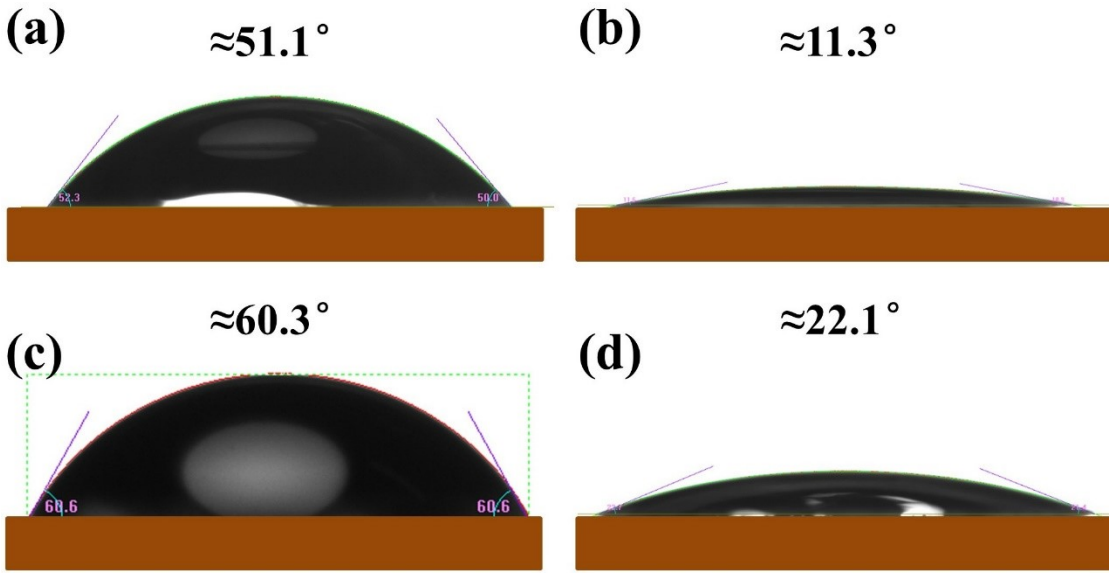

Figure S2. The water and perovskite precursor (c-d) contact angles (a-b) of ITO/SnO_2, ITO/SnO_2-EOAI.

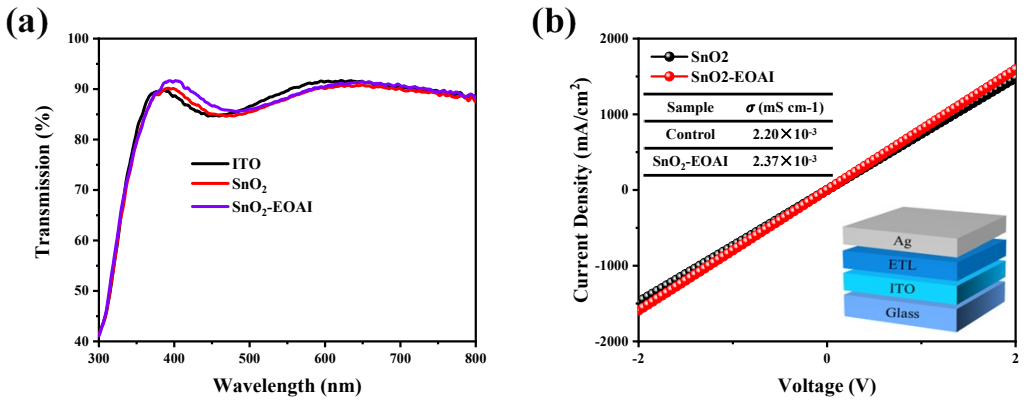

Figure S3. a) Optical transmission spectra of ITO, ITO/SnO_2, ITO/SnO_2-EOAI films on glass substrates; b) The J−V characteristics under dark with the device structure of ITO/ETL/Ag.

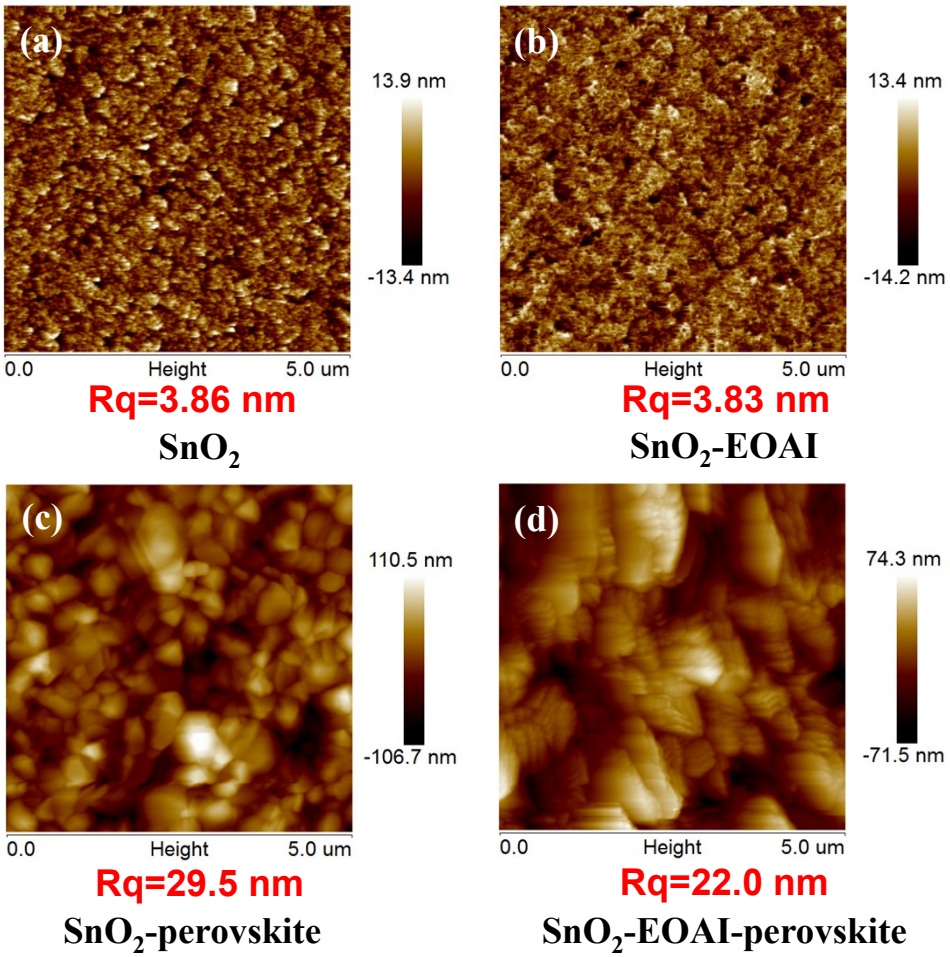

Figure S4. The AFM images of the a) SnO_2 film, b) SnO_2-EOAI film, c, d) perovskite film based on different substrates.

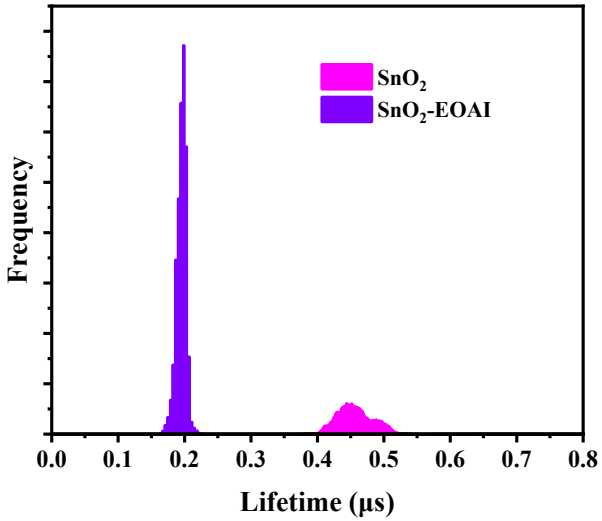

Figure S5. The histogram of lifetime distribution of the perovskite films based on different substrates.

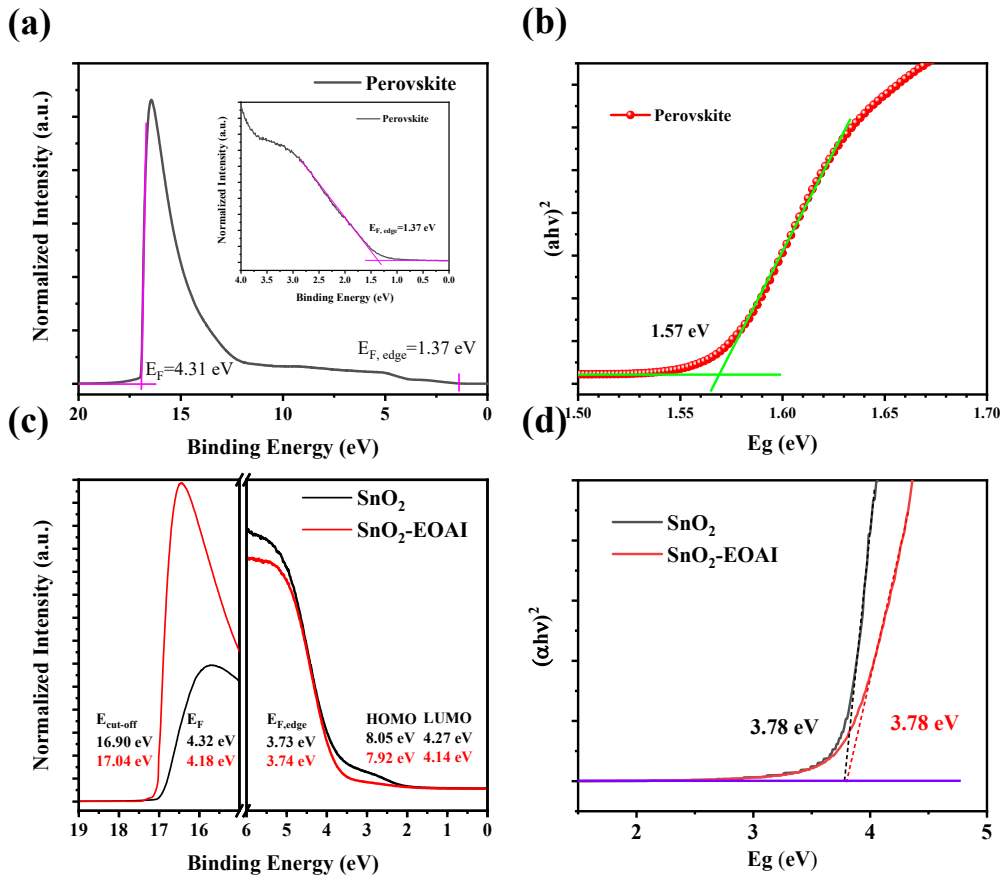

Figure S6. UPS spectra and Tauc plot of absorption spectra of a, b) perovskite, c, d) SnO_2 and SnO_2-EOAI films.

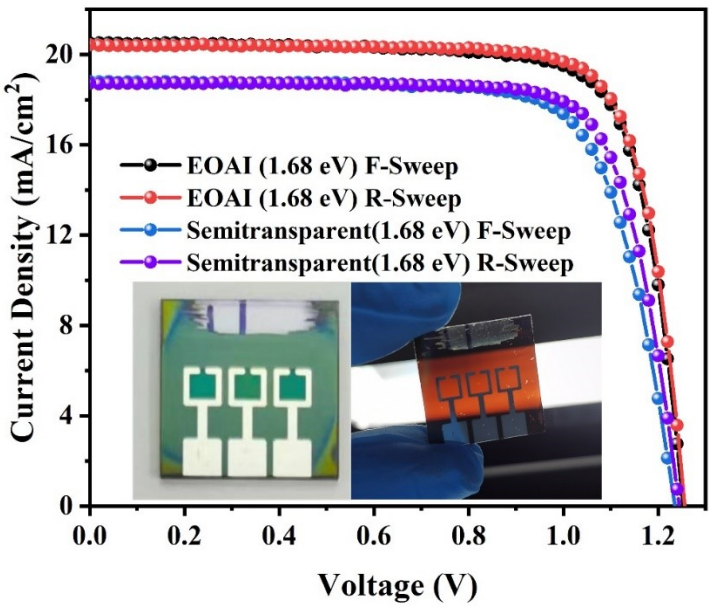

Figure S7. Current density-voltage (J-V) curves of the 1.68eV wide-band gap perovskite solar cell under forward and reverse scanning modes.

Table S1. Fitted results of TRPL curves of perovskite films based on different substrates.

Sample	A_1	T_1	A_2	T_2	T_{ave}
SnO2-P	70.7%	22.3	29.3%	478.7	432.6
SnO2—EOAI-P	80.4%	9.4	19.6%	311.4	278.1

Table S2. Calculated valence band (E_{VB}) and conduction band (E_{CB}) from $E_{cut\text{-}off}$, E_F, $E_{F,\ edge}$ and E_g for the SnO_2, the SnO_2-EOAI, and the $(FAPbI_3)_{0.95}(MAPbBr_3)_{0.05}$ perovskite films.

Films	$E_{cut\text{-}off}$ (eV)	E_F (eV)	$E_{F,\ edge}$ (eV)	E_{VB} (eV)	E_g (eV)	E_{CB} (eV)
SnO_2	16.90	4.32	3.73	4.27	3.78	8.05
SnO_2-EOAI	17.04	4.18	3.74	4.14	3.78	7.92
Perovskite	16.91	4.31	1.37	4.11	1.57	5.68

Table S3. Summary of device performances obtained from the champion devices of 1.68 eV wide-band gap perovskite solar cell.

Sample		J_{SC} (mA/cm^2)	V_{OC} (V)	FF	PCE (%)
EOAI (1.68 eV)	F-sweep	20.50	1.252	77.52	19.90
	R-sweep	20.43	1.256	78.71	20.20
Semitransparent (1.68 eV)	F-sweep	18.79	1.235	74.83	17.36
	R-sweep	18.71	1.244	77.56	18.05