Diethanolamine Modified Perovskite-Substrate Interface for Realizing Efficient ESL-Free PSCs

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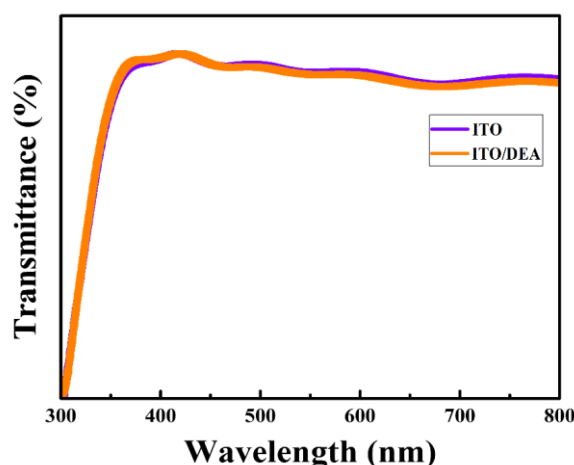
Supporting Information

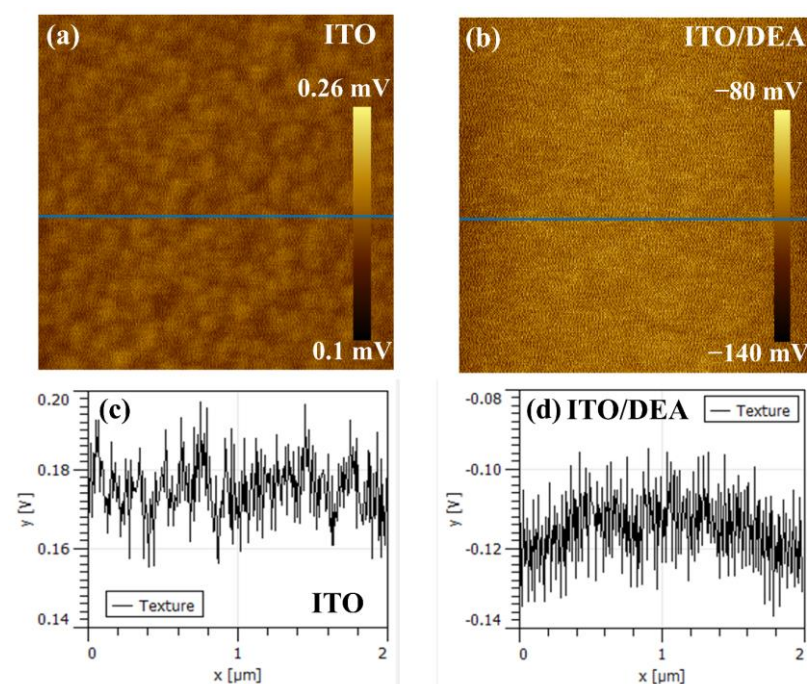**Figure S1.** Transmittance spectra of bare ITO and DEA-treated ITO substrates.

Figure S2. KPFM images (**a**,**b**) and corresponding potential difference curves (**c**,**d**) of the bare ITO and DEA-modified ITO substrates.
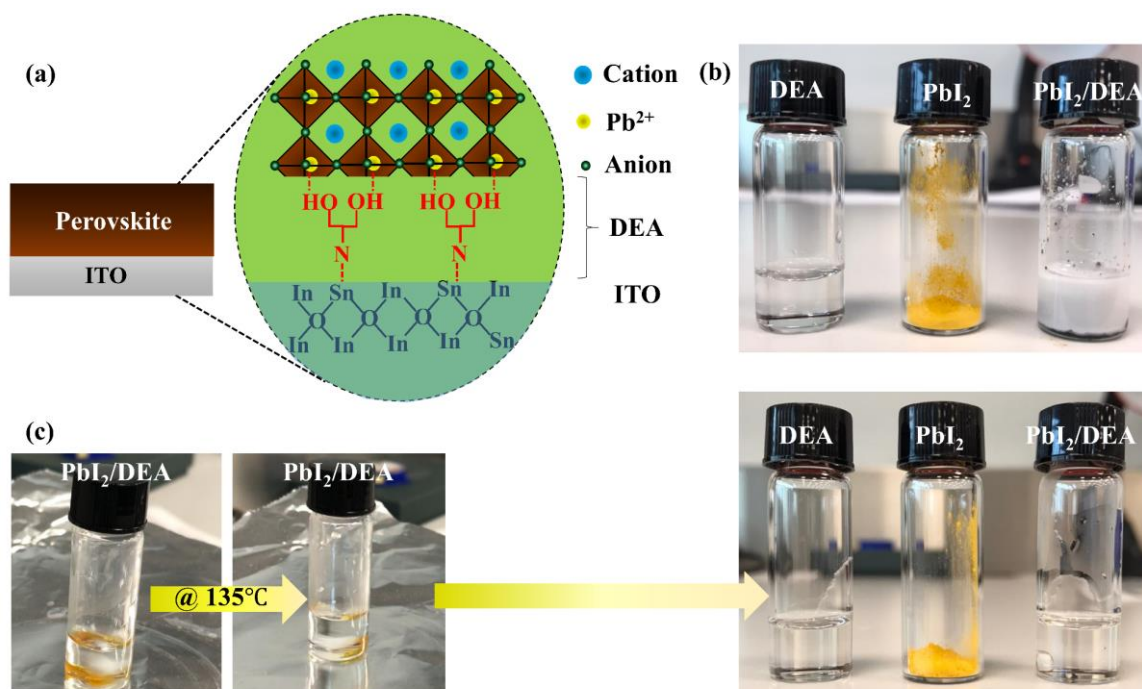

Figure S3. An strengthened link at the ITO/perovskite interface is highlighted by a coupling between the –OH group and Pb in the perovskite in this schematic example of surface modification of ITO-substrate with DEA (**a**), Photos of DEA liquid, PbI_2 powder and PbI_2/DEA mixture (**b**), Photos of DEA liquid, PbI_2 powder and PbI_2/DEA mixture under 135 °C (**c**).
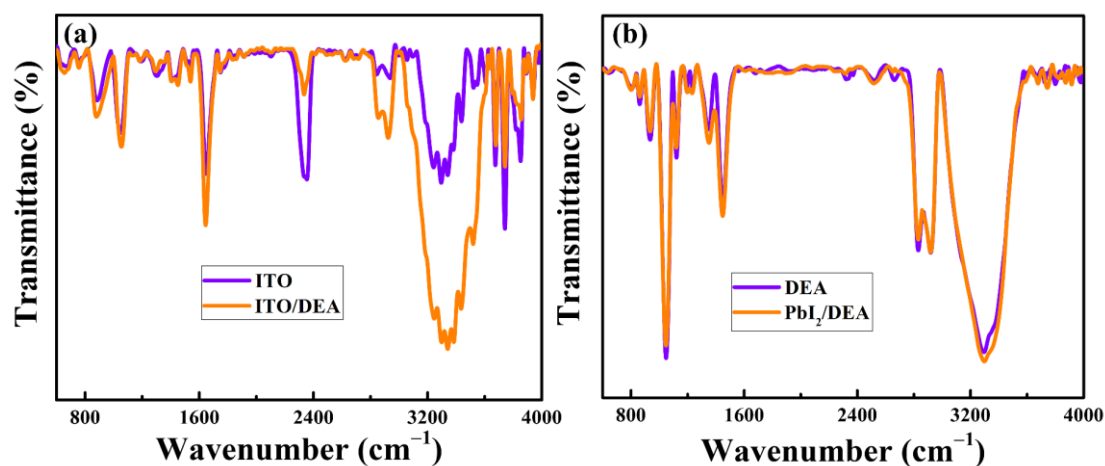
Figure S4. FT-IR spectroscopy of the ITO and ITO/DEA substrates (**a**), and DEA liquid and PbI₂/DEA mixture (**b**).
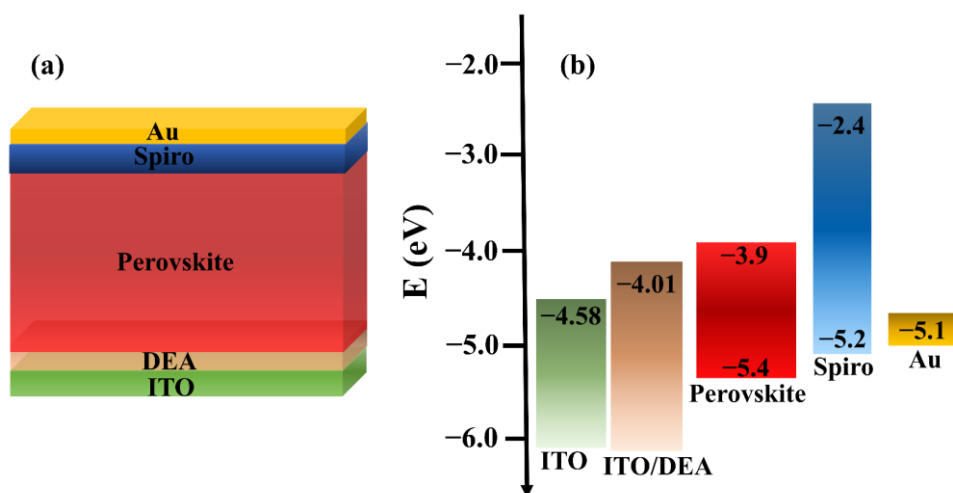

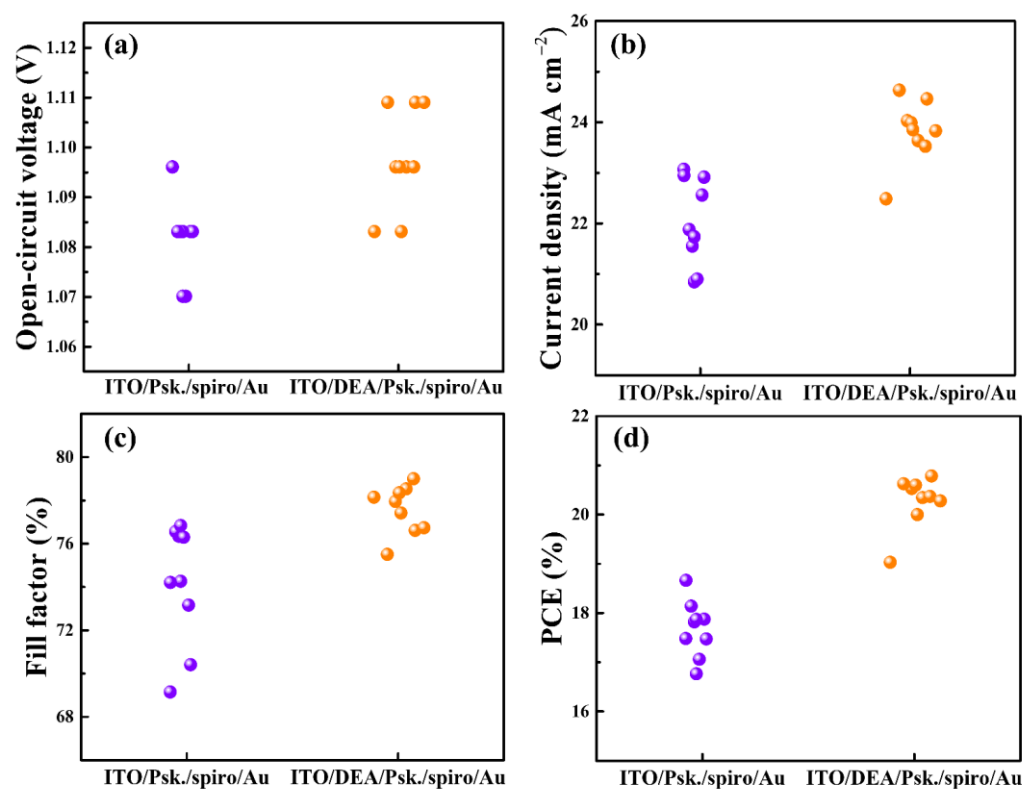**Figure S5.** Schematic illustration of as-prepared PSC (**a**) and energy band diagrams of the corresponding layers (**b**).

Figure S6. Statistical analyses of the ESLs-free PSCs prepared with bare ITO and DEA-modified ITO substrates, V_{oc} (**a**), J_{sc} (**b**), FF (**c**), and PCE (**d**).

Table S1. TRPL data for the perovskite layers prepared on bare ITO and DEA-modified substrates.

Perovskite on	τ_1 (ns)	τ_2 (ns)
ITO	10.95783 ± 0.195	111.30219 ± 1.58806
ITO/DEA	6.82892 ± 0.11677	48.19467 ± 0.39644