Supporting Information

Low-temperature solution-processed NiO\textsubscript{x} film for air-stable perovskite solar cells

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Figure S1. The absorption spectra of the perovskite film and the NiO\textsubscript{x} film on the perovskite film.

Figure S2. UPS spectrum of the NiO\textsubscript{x} film. According to the spectrum, the work function and the valence band maximum (VBM) of the NiO\textsubscript{x} can be determined as -4.75 eV and -5.33 eV, respectively. The position of the conduction band minimum can be determined according to the previously measured bandgap of NiO\textsubscript{x}. \cite{1, 2}
Figure S3. NiO$_x$ film with different weight concentration of NiO$_x$ NP suspension

Figure S4. J-V curves and performance parameters of the PSCs with NiO$_x$ and spiro-MeOTAD as HTL.
Figure S5. The external quantum efficiency (EQE) spectra of PSCs with different HTLs.

Figure S6. Air-stability of the whole device with different HTLs without encapsulation: (a) normalized $V_{oc}$, (b) normalized $J_{sc}$ and (c) normalized FF.
Table S1. The conductivity of different HTLs

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<thead>
<tr>
<th>HTL</th>
<th>Conductivity (S/cm)</th>
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<tr>
<td>NiO$_x$ Only</td>
<td>7.31*10$^{-8}$</td>
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<tr>
<td>NiO$_x$/CuSCN</td>
<td>1.26*10$^{-5}$</td>
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<tr>
<td>NiO$_x$/Spiro-MeOTAD</td>
<td>2.93*10$^{-4}$</td>
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Figure S7. SEM image of the cross-section of FTO/TiO$_2$/Perovskite/NiO$_x$/CuSCN structure.

References