Simultaneously Enhanced Durability and Performance by Employing Dopamine Copolymerized PEDOT with High Work Function and Water-proofness for Inverted Perovskite Solar Cells

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Partial characterization results

**Figure S1.** IR spectra of samples: a) PDA:PEDOT:LS; b)DA; c)EDOT.

**Figure S2.** The UV-vis absorption spectra for PEDODT:PSS and PDA:PEDOT:LS;
Table S1. The conductivity of PEDOT:PSS, PDA:PEDOT:LS and PDA:PEDOT:LS-h.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Conductivity (s/cm)</th>
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<tbody>
<tr>
<td>PEDOT:PSS</td>
<td>0.02</td>
</tr>
<tr>
<td>PDA:PEDOT:LS</td>
<td>0.004</td>
</tr>
<tr>
<td>PDA:PEDOT:LS-h</td>
<td>0.08</td>
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</table>
Figure S3. The UV–vis absorption spectra for the PDA:PEDOT:LS-h dispersions.
Figure S4. Cyclic voltammogram of PDA:PEDOT:LS-h film in CH$_2$Cl$_2$ (a); 30 scans (b) (0.1M Bu$_4$NPF$_6$, Scan rate: 100 mV/s).
**Figure S5.** The statistic device performances with PEDOT: PSS and PDA:PEDOT:LS-h as the HELs, respectively.
Figure S6. J-V curves of the PSCs with PEDOT:PSS and PDA:PEDOT:LS-h as the HELs
Figure S7. (a-b) $J-V$ curves of devices with (a) PEDOT: PSS and (b) PDA:PEDOT:LS-h HEL measured along the forward (from -0.2 V to 1.1 V) and reverse (from 1.1 V to -0.2 V) scans. The voltage step is 0.01V, and the delay time is 100 ms; Steady output characteristics of devices with (c) PEDOT:PSS and (d) PDA:PEDOT:LS-h as the HELs.
Figure S8. Stability characteristics of the PSCs using PEDOT:PSS and PDA:PEDOT:LS-h as the HELs. (a) PCE; (b) $J_{sc}$; (c) $V_{oc}$; (d) FF.