Electronic Supplementary Information

Hierarchically Ordered Arrays with Platinum Coated PANI Nanowires for Highly Efficient Fuel Cell Electrode

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Experimental section

We could obtain the growth density of PANI nanowires by the following method. In detail, we chose five regions in the SEM figures with low magnification. The area of five regions was $1 \times 1 \mu m^2$. Then, the growth density could be obtained through figuring the amount of PANI nanowires in five regions and averaging.

Fig. S1 SEM and TEM images of the disordered clusters structure of Pt-GDL electrode. (a, b) SEM images of side view of Pt-GDL electrode. (c, d) TEM images of Pt clusters on carbon powder.
Fig. S2 SEM images of PANI-GDL electrodes (a, b, c) and Pt-PANI-GDL electrodes (d, e, f).

PANI nanowires was polymerized at 270 K (a, d), 277 K (b, e) and 297 K (c, f).
Fig.S3 SEM images of Pt-PANI-GDL electrodes with different sputtering time. (a) 1 min, (b) 5 min, (c) 10 min.
Fig. S4 XRD patterns of Pt-GDL electrode and Pt-PANI-GDL electrodes with different PANI nanowires under the same sputtering time.
Table 1 Electrochemical properties of different electrodes.

<table>
<thead>
<tr>
<th>Electrochemical properties</th>
<th>ECSA (m²/gPt)</th>
<th>MA (mA/mgPt)</th>
<th>SA (mA/cm²Pt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt-PANI-GDL-3</td>
<td>13.853</td>
<td>14.695</td>
<td>0.108</td>
</tr>
<tr>
<td>Pt-GDL</td>
<td>11.818</td>
<td>11.133</td>
<td>0.0942</td>
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<tr>
<td>Pt-C (JM)</td>
<td>45.225</td>
<td>15.340</td>
<td>0.0339</td>
</tr>
</tbody>
</table>

Fig. S5 CO stripping curves of Pt-GDL electrode and Pt-PANI-GDL electrodes. CO stripping measure was conducted in CO saturated HClO₄ electrolyte (0.1 M) at 0.1 V vs. RHE kept 20 min, and then in N₂ saturated HClO₄ electrolyte (0.1 M) with the same potential kept 60 min, and thus cyclic voltammetry (CV) at a scan rate of 20 mV s⁻¹ was performed.
Fig. S6 EIS curves of PEMFC single cells with Pt-PANI-GDL-3 and Pt-GDL electrode at different current density.
Fig S7 Performances of PEMFC single cells for Pt-PANI-GDL electrodes with different orderliness.