Supporting Information

Tailoring Carbon Nanotubes Surface with Maleic Anhydride for Highly Dispersed PtRu Nanoparticles and Their Electrocatalytic Oxidation of Methanol

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1. ICP-AES analysis of electrocatalysts

<table>
<thead>
<tr>
<th>Electrocatlysts</th>
<th>Pt (wt. %)</th>
<th>Ru (wt. %)</th>
<th>Atomic ratio of Pt:Ru</th>
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</thead>
<tbody>
<tr>
<td>PtRu/CNT-C</td>
<td>14.36</td>
<td>4.73</td>
<td>1.57</td>
</tr>
<tr>
<td>PtRu/AO-CNT</td>
<td>10.73</td>
<td>4.24</td>
<td>1.31</td>
</tr>
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</table>

The composition of the prepared catalysts was determined by ICP-AES. There are 14.36 and 4.73 wt.% of Pt and Ru in PtRu/CNT-C, respectively, whereas 10.73 and 4.24 wt.% of Pt and Ru for PtRu/AO-CNTs, respectively. Note that the loading mass of the PtRu nanoparticles supported on CNT-C is higher than that on AO-CNTs. In addition, the atomic Pt-Ru ratio of PtRu/CNT-C is 1.57, which is slightly higher than that of PtRu/AO-CNT (1.31). It confirms the CNT-C is suitable support to anchor and grow metal nanoparticles.
Figure S1. FTIR spectra of PtRu/CNT-C.

Figure S2 TEM images of PtRu/CNT-C nanohybrids.
Figure S3. Size distribution of PtRu nanoparticles of PtRu/CNT-C (a) and PtRu/AO-CNT (b) nanohybrids.

Figure S4. Cyclic voltammograms (specific activity) of PtRu/CNT-C (1) and PtRu/AO-CNT (2) nanohybrids in nitrogen-saturated 0.5 M H₂SO₄ + 1.0 M CH₃OH aqueous solution at a scan rate of 50 mVs⁻¹.
**Figure S5.** Linear sweep voltammetry of PtRu/CNT-C (1) and PtRu/AO-CNT (2) nanohybrids in nitrogen-saturated 0.5 M H$_2$SO$_4$ + 1.0 M CH$_3$OH aqueous solution at a scan rate of 50 mVs$^{-1}$.

**Figure S6** Comparison of the forward peak current at the first cycle ($i_0$) and recovery forward peak current ($i_R$) in the fresh methanol solution after long-term cyclic voltammograms scanning experiments (600 cycles) on PtRu/CNT-C and PtRu/AO-CNT nanohybrids.