Supplementary Information

Single-crystal Pt nanorods with tunable length fabricated by a simple glycol-assisted vacuum impregnation method

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1. Synthesis

The mesoporous silica SBA-15 was synthesized according to the procedures reported earlier.1 Briefly, a solution of P123 : HCl : TEOS : H2O = 2 : 15 : 3.6 : 60 (mass ratio) was prepared, stirred for 24 h at 40 °C, and then heated at 100 °C for 2 days. The products were washed, dried and calcined at 550 °C for 6 h to remove the template. This was the starting material.

In a typical preparation of Pt nanorods incorporation of the SBA-15, 0.5 g of the template-free SBA-15 was dehydrated at 383 K for about 4 h in a homemade vacuum apparatus. After cooling down to room temperature, it was immersed into 2.5ml mixture of glycol, water, and H2PtCl6.6H2O (1.25 ml glycol, 1.25 ml water, 53 mg H2PtCl6.6H2O). The resulting sample (SBA-15 / H2PtCl6 / water / glycol) was quickly transferred into the oven at 413 K and hold for 30 min, then washed and dried at 373 K to get the SBA-15 hosted Pt nanorods (4 wt%). When the concentration of the H2PtCl6.6H2O in the mixture solution was changed, we can get Pt nanorods/SBA-15 with different weight loadings, for instance: 2% (26.5 mg), 8% (106 mg), 16% (212 mg ). Pt nanoparticles/SBA-15 (4 wt%) was prepared with the similar method, except adding 0.5g glucose in the mixture of glycol, water, and H2PtCl6.6H2O (1.25 ml glycol, 1.25 ml water, 53mg H2PtCl6.6H2O). To extract nanorods from
SBA-15, aqueous HF (46 wt %) was diluted to 5.0 wt % with ethanol, and to this solution was added the powder sample. After a few minutes without stirring, the solution turned pale gray, and black Pt nanorods were precipitated. The unsupported Pt nanorods were separated on a filter paper, washed with ethanol, and dried in air.

2. Characterization

The N₂ adsorption–desorption isotherms were recorded on an ASAP 2000 instrument. TEM images were obtained on a Tecnai G² Spirit FEI Transmission Electron Microscope operating at 120 kv. The HRTEM images were obtained with Tecnai G² F30 S-Twin Transmission Electron Microscope, operating at 300 kv. XRD patterns were collected on a Rigaku D/MAX 2400 diffractometer equipped with a CuKa X-ray source.
Figure S1 TEM images of parent SBA-15 with the diameter of around 7 nm.

<table>
<thead>
<tr>
<th>Sample</th>
<th>$S_{\text{BET}}$/m$^2$/g$^{-1}$</th>
<th>$V_t$/cm$^3$/g$^{-1}$</th>
<th>$D_{\text{BJH}}$/nm</th>
<th>Length of rods/nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBA-15</td>
<td>711</td>
<td>0.92</td>
<td>5.62</td>
<td></td>
</tr>
<tr>
<td>Pt/SBA-15 (4 wt%)</td>
<td>582</td>
<td>0.78</td>
<td>5.57</td>
<td>25-45</td>
</tr>
</tbody>
</table>

$S_{\text{BET}}$, BET specific surface area; $V_t$, total pore volume; $D_{\text{BJH}}$, pore diameter calculated using BJH method; the length of rods determined by TEM.
**Figure S2.** Magnification of the TEM images of the SBA-15 hosted pt nanorods with different lengths: A 15-25 nm (2 wt%), B 50-80 nm (8 wt% ) and inserts are unsupported Pt nanorods extracted from SBA-15 matrix.
**Figure S3.** HRTEM image of the Pt nanorods bundles extracted from SBA-15 matrix and the interconnected bridge of two pt nanorods marked in the panel.

**Figure S4.** TEM images of the Pt nanoparticles incorporation into the SBA-15 (A) (4 wt%) and unsupported Pt nanoparticles after removing the SBA-15 matrix (B). Insert is the magnification.

**Reference**