Supporting Information

In situ one-step synthesis of metal-organic frameworks encapsulated naked Pt nanoparticles without additional reductants

Hongli Liu, Lina Chang, Liyu Chen, and Yingwei Li *

School of Chemistry and Chemical Engineering, South China University of Technology, Guangzhou 510640, China.

* Corresponding author. Email: liyw@scut.edu.cn
Figure S1. Powder XRD patterns of DUT-5 (a), Pt@DUT-5 with Pt loading of 0.5 wt% (b), 0.8 wt% (c), 1.5 wt% (d), and 0.5 wt% Pt@DUT-5 after catalytic reaction (e).

Figure S2. The corresponding particle size distribution histograms of Pt@DUT-5 with Pt loading of 0.5 wt% (a), 0.8 wt% (b), and 1.5 wt% (c), respectively.
Figure S3. Nitrogen adsorption isotherms (a) and pore-size distribution curves (b) of DUT-5 (●), Pt@DUT-5 with Pt loading of 0.5 wt% (○), 0.8 wt% (◆), 1.5 wt% (▲), and 0.5 wt% Pt@DUT-5 after catalytic reaction (∆).

Figure S4. TEM image of 0.5 wt% Pt@DUT-5 after catalytic reaction (a), and the corresponding size distribution of Pt nanoparticles (b).
Figure S5. Powder XRD patterns of UiO-66 and 0.5 wt% Pt@UiO-66.

Figure S6. Powder XRD patterns of MOF-253 and 0.5 wt% Pt@MOF-253.
Table S1 Results of the oxidation of cinnamyl alcohol.\(^a\)

<table>
<thead>
<tr>
<th>Entry</th>
<th>Catalyst</th>
<th>Conversion (%)</th>
<th>Selectivity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.5% Pt@DUT-5</td>
<td>&gt;99</td>
<td>&gt;99</td>
</tr>
<tr>
<td>2(^b)</td>
<td>0.5% Pt@MOF-253</td>
<td>&gt;99</td>
<td>&gt;99</td>
</tr>
<tr>
<td>3(^c)</td>
<td>0.5% Pt@UiO-66</td>
<td>&gt;99</td>
<td>&gt;99</td>
</tr>
<tr>
<td>4</td>
<td>0.5% Pt/DUT-5</td>
<td>38</td>
<td>&gt;99</td>
</tr>
<tr>
<td>5</td>
<td>treated 0.5% Pt/DUT-5</td>
<td>45</td>
<td>&gt;99</td>
</tr>
</tbody>
</table>

\(^a\) Reaction conditions: cinnamyl alcohol (1 mmol), catalyst (Pt 1 mol%), toluene (10 mL), 80 °C, 15 h, 1 atm O\(_2\). \(^b\) 10 h. \(^c\) 18 h.

To investigate the effect of surfactants on the reactivity of Pt NPs, the Pt/DUT-5 material prepared by colloidal deposition with PVP as protecting agent was treated at 220 °C for 2 h under N\(_2\) atmosphere. The results (Table S1, entries 4-5) showed that the catalytic activity was enhanced over the Pt/DUT-5 treated at 220 °C as compared to the untreated Pt/DUT-5, which is likely due to the movement or partial decomposition of PVP molecules from the Pt surface at a high temperature, making it easier for reactant to adsorb on the Pt surface (PVP glass transition temperature, 175 °C; decomposition temperature, 435 °C).\(^1\)\(^-\)\(^3\)

References