Supporting information

Synthesis of Monodisperse CeO$_2$ Octahedra Assembled by Nano-sheets with exposed \{001\} facets and Catalytic property

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Experimental Section:

**Synthesis of Monodisperse CeO$_2$ Octahedra Assembled by Nano-sheets:**

In a typical synthesis, Ce(NO$_3$)$_3$•6H$_2$O (0.434 g, 1 mmol) and PVP (K-30, M=58000, 0.335 g, 0.006 mmol, m$_{\text{Ce(NO}_3)_3\cdot6\text{H}_2\text{O}}$/m$_{\text{PVP}}$ = 1.300) were in order added to the mixed solvent of ethanol and distilled water (6 mL, v/v of 1:1). The mixed solvent placed in a beaker was put into ultrasonic cleaning machine (Frequency: 40 KH, Power: 50 W) for about 5 minutes. The purpose of treatment is fully mixed of the reactants. The resulting solution was transferred into a Teflon-lined stainless-steel autoclave and was kept at 200 °C for 12 h. The products were collected by centrifugation at 10000 rpm, and washed several times with deionized water and ethanol.

The composition and phase of the as-prepared products were acquired by the powder X-ray diffraction (XRD) pattern using a Panalytical X-pert diffractometer with CuKα radiation. The morphology and crystal structure of as-prepared products were observed by scanning electron microscopy (SEM, S4800), and high-resolution transmission electron microscopy (HRTEM, FEI Tecnai-F30) with an acceleration voltage of 300 kV. All TEM samples were prepared from depositing a drop of diluted suspensions in ethanol on a carbon film coated copper grid.

**Measurement of catalytic CO oxidation.** The catalytic activity of CeO$_2$ catalysts towards CO oxidation was carried out in a continuous flow reactor. The reaction gas, 10 mL/min 5% CO in nitrogen and 40 mL/min air, was fed to catalyst particles.
Steady-state catalytic activity was measured at each temperature with the reaction temperature rising from room temperature to 380 °C in step of 20 °C. The effluent gas was analyzed on-line by an on-stream gas chromatograph (FuLi 9790II) equipped with a TDX-01 column.

Table S1: The percentage of CO conversion to CO₂ at different reaction temperature

<table>
<thead>
<tr>
<th>Reaction temperature (°C)</th>
<th>140</th>
<th>160</th>
<th>180</th>
<th>200</th>
<th>220</th>
<th>240</th>
<th>260</th>
<th>280</th>
<th>300</th>
<th>320</th>
<th>340</th>
<th>360</th>
<th>380</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conversion to CO₂ (%) (CeO₂ assemble by nanosheets)</td>
<td>2.3</td>
<td>4.5</td>
<td>13.1</td>
<td>32.8</td>
<td>61.7</td>
<td>87.3</td>
<td>98.1</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Conversion to CO₂ (%) (CeO₂ assemble by nanoparticles)</td>
<td>0.0</td>
<td>0.0</td>
<td>1.3</td>
<td>3.5</td>
<td>9.4</td>
<td>17.5</td>
<td>39.4</td>
<td>59.9</td>
<td>75.6</td>
<td>89.5</td>
<td>97.2</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>