Engineering the NiO/CeO$_2$ interface to enhance the catalytic performance for CO oxidation

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Figure S1. TEM and HRTEM images of CeO$_2$ (a, b) nanorod; (c, d) nanoctahedron; (e, f) nanocube.
Figure S2. Electron diffraction patterns of (a) CeO$_2$ octahedron, (b) Ni/CeO$_2$ octahedron; (c) the corresponding dark field image of white spot in the red circle; (d) the corresponding bright field image; (e) the HRTEM image of Ni/CeO$_2$ octahedron.
Figure S3. Electron diffraction patterns of (a) CeO$_2$ cube, (b) Ni/CeO$_2$ cube; (c) the corresponding dark field image of white spot in the red circle; (d) the corresponding bright field image; (e) the HRTEM image of Ni/CeO$_2$ cube.
Figure S4. CO conversion over CeO$_2$ catalysts with different shapes.
Figure S5. XRD patterns of Ni/CeO$_2$ and CeO$_2$ samples with different shapes.
Figure S6. N₂ adsorption–desorption isotherms of Ni/CeO₂ and CeO₂ samples with different shapes.
Figure S7. XPS spectra of O 1s over Ni/CeO$_2$ catalysts with different shapes.
Figure S8. H$_2$-TPR profiles of Ni/CeO$_2$ and CeO$_2$ with different shapes.
Figure S9. In-situ CO-adsorption DRIFTS of Ni/CeO$_2$ catalysts with different shapes.
Table S1. Surface area, crystallite size, lattice parameter, \( I_{605+1172}/I_{460} \) in Raman spectra and turnover frequency (TOF\(_{\text{CO}}\)) at 120 °C of Ni/CeO\(_2\) and CeO\(_2\) samples, respectively.

<table>
<thead>
<tr>
<th>Samples</th>
<th>( S_{\text{BET}} ) (m(^2)/g)</th>
<th>Grain size (nm)</th>
<th>Lattice parameter (Å)</th>
<th>( I_{605+1172}/I_{460} )</th>
<th>TOF(_{\text{CO}}^a) (h(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni/CeO(_2)-r</td>
<td>64</td>
<td>12.8</td>
<td>5.4052</td>
<td>0.32</td>
<td>35.2</td>
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<tr>
<td>Ni/CeO(_2)-o</td>
<td>84</td>
<td>16.6</td>
<td>5.4050</td>
<td>0.21</td>
<td>10.1</td>
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<tr>
<td>Ni/CeO(_2)-c</td>
<td>30</td>
<td>24.8</td>
<td>5.4011</td>
<td>0.12</td>
<td>0.5</td>
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<tr>
<td>CeO(_2)-r</td>
<td>66</td>
<td>11.5</td>
<td>5.4133</td>
<td>0.054</td>
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</tr>
<tr>
<td>CeO(_2)-o</td>
<td>85</td>
<td>12.9</td>
<td>5.4064</td>
<td>0.051</td>
<td></td>
</tr>
<tr>
<td>CeO(_2)-c</td>
<td>32</td>
<td>24.6</td>
<td>5.4022</td>
<td>0.046</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) TOF\(_{\text{CO}} = P \cdot S_v \cdot C_{\text{CO}} \cdot X_{\text{CO}} / R \cdot T \cdot C_{\text{Ni}}\), in which P was the atmospheric pressure, \( C_{\text{CO}} \) was the molar CO concentration at the inlet, \( S_v \) was the space velocity, X was the CO conversion and \( C_{\text{Ni}} \) was the molar concentration of surface Ni atoms determined by XPS.