Supplementary information: Ru-Ti Oxide Based Catalysts for HCl Oxidation: the Favorable Oxygen Species and Influence of Ce Additive

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Supplementary Information Caption:

Figure S1. XRD patterns of the self-made RuO2 and the corresponding intensity line in red from PDF 65-2824.

Figure S2. H2-TPR profiles of the pure TiO2 in rutile and anatase.

Figure S3. XPS profiles of Ti 2p for RuO2/TiO2-r with 0.3, 0.5, and 1.0 wt% Ru.

Figure S4. XPS spectra of Ce 3d for Ru-Ce/Ti oxide catalysts.

Figure S5. XPS spectra of O 1s for the supported RuO2 and Ru-Ce/Ti oxide catalysts.

Table S1. Chemisorbed oxygen (Oα) in the supported RuO2 and Ru-Ce/Ti oxide catalysts.

Figure S6. Raman spectra of the supported RuO2 and Ru-Ce/Ti oxide catalysts.
Figure S1. XRD patterns of the self-made RuO₂ and the corresponding intensity line in red from PDF 65-2824.

Figure S2. H₂-TPR profiles of the pure TiO₂ in rutile and anatase.
Figure S3. XPS profiles of Ti 2p for RuO$_2$/TiO$_2$-r with 0.3, 0.5, and 1.0 wt% Ru.

Figure S4. XPS spectra of Ce 3d for Ru-Ce/Ti oxide catalysts.
Table S1. Chemisorbed oxygen (O$_\alpha$) in the supported RuO$_2$ and Ru-Ce/Ti oxide catalysts.

<table>
<thead>
<tr>
<th>Sample</th>
<th>E$<em>\theta$ of O$</em>\alpha$ (eV)</th>
<th>O$<em>\alpha$/O$</em>\tau$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RuO$_2$/TiO$_2$-r</td>
<td>532.27</td>
<td>20.12</td>
</tr>
<tr>
<td>Ru-2Ce-R/ TiO$_2$-r</td>
<td>531.83</td>
<td>12.57</td>
</tr>
<tr>
<td>Ru-2Ce/ TiO$_2$-r</td>
<td>531.84</td>
<td>11.13</td>
</tr>
<tr>
<td>Ru-2Ce-C/TiO$_2$-r</td>
<td>532.14</td>
<td>4.95</td>
</tr>
</tbody>
</table>
Figure S6. Raman spectra of the supported RuO₂ and Ru-Ce/Ti oxide catalysts.