Self-Doped SrTiO$_{3.4}$ with Enhanced Activity for Artificial Photosynthesis under Visible Light – Supporting Information

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Table S1* ICP Mass spectroscopy result of nitrogen residual in sample

<table>
<thead>
<tr>
<th>Element content</th>
<th>Sr</th>
<th>Ti</th>
<th>O</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element content</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>&lt;0.01%</td>
</tr>
</tbody>
</table>

Fig. S1* (a) TEM of 1400 °C sample, blue lines indicate the CS along <101> direction (b) Ruddlesden-Popper defect model with CS projected along <100> direction

Fig. S2* XPS and EPR (120K) of samples treated in Ar at 1200 °C
Fig.S3* XPS and EPR (120K) of samples treated in Ar at 1250 °C

Fig.S4* XPS and EPR (120K) of samples treated in Ar at 1300 °C
Fig. S5* XPS and EPR (120K) of samples treated in Ar at 1350 °C

Fig. S6* XPS and EPR (120K) of samples treated in Ar at 1400 °C
Table S2* Surface area of samples treated in Ar at different temperatures

<table>
<thead>
<tr>
<th>Sample</th>
<th>1200 °C</th>
<th>1250 °C</th>
<th>1300 °C</th>
<th>1350 °C</th>
<th>1400 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface area (m²/g)</td>
<td>2.4</td>
<td>1.8</td>
<td>1.2</td>
<td>1.1</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Fig. S7* CO₂ pulse adsorption and TPD of 1250 °C sample with 1 m² surface area

Fig. S8* CO₂ pulse adsorption and TPD of 1300 °C sample with 1 m² surface area

Fig. S9* CO₂ pulse adsorption and TPD of 1350 °C sample with 1 m² surface area
Program of Pulsed Adsorption and Temperature Programmed Desorption of CO\textsubscript{2}

1.01 Experiment, chemisorption LDH-CO\textsubscript{2}, prep Ar 50 ml/min
1.02 Temperature ramp, Temp: 300 °C, Ramp: 10 °C/min, Level: 30 min
1.03 Temperature ramp, Temp: 30 °C, Ramp: 10 °C/min, Level: 30 min
1.04 Change gas flow, Prep (None) Carrier/Ref(He) Loop (Carbon dioxide) Valves: Bypass Analyze Fill Bypass
1.05 Wait, wait for 5 min
1.06 Wait, wait until baseline is stable
1.07 Start recording, One measurement every 1.0 second
1.08 Start repeat, repeat until peaks are equal or 10 times
1.09 Dose, inject loop gas, wait for change from baseline or 3.0 min, then return to baseline
1.10 Stop repeat
1.11 Stop recording
2.01 Experiment, TPD LDH-CO\textsubscript{2} Prep (None) Carrier/Ref (He) Loop (None) Valves: Bypass Analyze Fill Bypass
2.02 Wait, wait until baseline is stable
2.03 Start recording, one measurement every 1.0 minute
2.04 Temperature ramp, Temp: 800 °C, Ramp: 10 °C/min, Time: 0
2.05 Stop recording
Termination