Supplementary Information

High-performance NiO/g-C$_3$N$_4$ composites for visible-light-driven photocatalytic overall water splitting

Yijun Fu$^a$, Chang’an Liu$^a$, Cheng Zhu$^a$, Huibo Wang$^a$, Yujiang Dou$^b$*, Weilong Shi$^a$, Mingwang Shao$^a$, Hui Huang$^{**}$, Yang Liu$^{*}$ and Zhenhui Kang$^{**}$

$^a$ Jiangsu Key Laboratory for Carbon-Based Functional Materials & Devices, Institute of Functional Nano & Soft Materials (FUNSOM), Soochow University, 199 Ren’ai Road, Suzhou, 215123, Jiangsu, P.R. China.

$^b$ School of Electronic and Information Engineering, Soochow University, 199 Ren’ai Road, Suzhou, 215123, Jiangsu, P.R. China.

E-mail: hhuang0618@suda.edu.cn, yangl@suda.edu.cn, douyj@suda.edu.cn, zhkang@suda.edu.cn

Additional Tables

Table S1. The Brunauer-Emmett-Teller (BET) specific surface area and average pore width of NiO/C$_3$N$_4$ with different NiO contents obtained at different temperatures.

<table>
<thead>
<tr>
<th>Sample name</th>
<th>BET specific surface area (m$^2$/g)</th>
<th>Average pore width (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>g-C$_3$N$_4$</td>
<td>5.76</td>
<td>30.32</td>
</tr>
<tr>
<td>NiO/g-C$_3$N$_4$/1/300</td>
<td>9.56</td>
<td>27.87</td>
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<tr>
<td>NiO/g-C$_3$N$_4$/3/300</td>
<td>21.66</td>
<td>16.51</td>
</tr>
<tr>
<td>NiO/g-C$_3$N$_4$/5/300</td>
<td>11.76</td>
<td>20.04</td>
</tr>
<tr>
<td>NiO/g-C$_3$N$_4$/3/200</td>
<td>11.52</td>
<td>14.45</td>
</tr>
<tr>
<td>NiO/g-C$_3$N$_4$/3/400</td>
<td>16.10</td>
<td>17.53</td>
</tr>
</tbody>
</table>

Additional Figures

**Fig. S1** (a and b) TEM images of g-C$_3$N$_4$ with different scale bars. (c) HAADF-STEM image and (d and e) corresponding elemental mapping images of g-C$_3$N$_4$. 
Fig. S2 Full XPS spectrum of NiO/g-C$_3$N$_4$/3/300.

Fig. S3 High-resolution XPS spectra of NiO for (a) Ni 2p and (b) O 1s.

Fig. S4 XRD patterns of g-C$_3$N$_4$ (black line) and NiO/g-C$_3$N$_4$/300 with different NiO contents.
Fig. S5 (a) FT-IR spectra of g-C₃N₄ and NiO/g-C₃N₄/300 with different NiO contents. (b) FT-IR spectra of g-C₃N₄ and NiO/g-C₃N₄/3 obtained at different temperatures.

Fig. S6 UV-vis absorption spectra of g-C₃N₄ and NiO/g-C₃N₄/300 with different NiO contents.

Fig. S7 (a) Full XPS spectra of g-C₃N₄ and NiO/g-C₃N₄/300 with different NiO contents. (b) Full XPS spectra of g-C₃N₄ and NiO/g-C₃N₄/3 obtained at different temperatures.
Fig. S8 (a) High-resolution XPS spectra of NiO/g-C$_3$N$_4$/3/400 for Ni 2p. (b) High-resolution XPS spectra of NiO/g-C$_3$N$_4$/3/400 for O 1s.

Fig. S9 High-resolution XPS spectra of g-C$_3$N$_4$ and NiO/g-C$_3$N$_4$/3 obtained at different temperatures for (a) C 1s and (b) N 1s.
Fig. S10 High-resolution XPS spectra of g-C$_3$N$_4$ and NiO/g-C$_3$N$_4$/300 with different NiO contents for (a) C 1s, (b) N 1s, (c) O 1s and (d) Ni 2p.

Fig. S11 PL spectra of NiO (black line), g-C$_3$N$_4$ (red line) and NiO/g-C$_3$N$_4$/300 with different NiO contents with excitation wavelength of 360 nm.
Fig. S12 (a, c, e, g, i and k) N$_2$ adsorption-desorption isotherms of g-C$_3$N$_4$, NiO/g-C$_3$N$_4$/1/300, NiO/g-C$_3$N$_4$/3/300, NiO/g-C$_3$N$_4$/5/300, NiO/g-C$_3$N$_4$/3/200 and NiO/g-C$_3$N$_4$/3/400, respectively. (b, d, f, h, j and l) Pore size distribution curves of g-C$_3$N$_4$, NiO/g-C$_3$N$_4$/1/300, NiO/g-C$_3$N$_4$/3/300, NiO/g-C$_3$N$_4$/5/300, NiO/g-C$_3$N$_4$/3/200 and NiO/g-C$_3$N$_4$/3/400, respectively.
Fig. S13 (a) XRD patterns, (b) FTIR spectra, (c) Full XPS spectra of NiO/g-C₃N₄/3/300 before (black line) and after (red line) photocatalytic reaction.

Fig. S14 High-resolution XPS spectra of NiO/g-C₃N₄/3/300 for (a) C 1s, (b) N 1s, (c) O 1s, (d) Ni 2p before (black line) and after (red line) photocatalytic reaction.