Electronic Supplementary Information

Dual role of g-C$_3$N$_4$/carbon intra Schottky junction in charge carrier generation and separation for efficient solar H$_2$ production.

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**Section S1. Solar to hydrogen (STH) efficiency calculation**

The solar to hydrogen efficiency can be calculated by following mathematical expression

\[
STH(\%) = \frac{\text{Energy of generated } H_2}{\text{Solar energy irradiating the solution}} \times 100 = \frac{E_{H_2}}{E_{\text{Solar}}} \times 100
\]

\[
E_{H_2} = (\text{H}_2\text{ in mol/sec} \times 232\text{kJ/mol})
\]

\[
E_{\text{Solar}} = P \times S \times t
\]

Where, P= Irradiated solar energy in W/m$^2$
- S= Area of irradiation in m$^2$
- t= Irradiated time in sec

Figure S1. FE-SEM images of C100.
Figure S2. SEM and EDAX of (a) and (b) g-C$_3$N$_4$, (b) and (c) C$_3$N$_4$-5C, (e) and (f) C100.
Figure S3. FTIR spectrum of C100.

Figure S4. Wide Scan XPS of g-C$_3$N$_4$ and C$_3$N$_4$-5C.
Figure S5. Nitrogen sorption isotherms of g-C3N4 and C3N4-5C

Table S1. Different bonding percentage of deconvoluted N1s XPS spectra of g-C3N4 and C3N4-5C

<table>
<thead>
<tr>
<th>Sample Name</th>
<th>C=N-C</th>
<th>N-(C)3</th>
<th>C=N-H</th>
</tr>
</thead>
<tbody>
<tr>
<td>g-C3N4</td>
<td>0.52</td>
<td>0.33</td>
<td>0.15</td>
</tr>
<tr>
<td>C3N4-5C</td>
<td>0.48</td>
<td>0.41</td>
<td>0.11</td>
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Table S2. Life time decay data.

<table>
<thead>
<tr>
<th>Sample</th>
<th>A1 (%)</th>
<th>η1 (ns)</th>
<th>A2 (%)</th>
<th>η2 (ns)</th>
<th>A3 (%)</th>
<th>η3 (ns)</th>
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</thead>
<tbody>
<tr>
<td>C3N4</td>
<td>16.6</td>
<td>2.24</td>
<td>83</td>
<td>11.2</td>
<td>0.4</td>
<td>0.047</td>
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<tr>
<td>C3N4-5C</td>
<td>16.6</td>
<td>1.34</td>
<td>0.4</td>
<td>0.031</td>
<td>83</td>
<td>6.63</td>
</tr>
</tbody>
</table>

Table S3. STH (%) of prepared photocatalysts.

<table>
<thead>
<tr>
<th>Catalyst Name</th>
<th>STH (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3N4</td>
<td>0.015614</td>
</tr>
<tr>
<td>C3N4-2.5C</td>
<td>0.036531</td>
</tr>
<tr>
<td>Sample name</td>
<td>Surface Area (m$^2$/g)</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>g-C$_3$N$_4$</td>
<td>26.313</td>
</tr>
<tr>
<td>C$_3$N$_4$-5C</td>
<td>19.545</td>
</tr>
</tbody>
</table>

Table S4. BET Specific surface area of g-C$_3$N$_4$ and C$_3$N$_4$-5C