Supporting Information

The enhancement of CdS ultrathin nanosheets photocatalytic activity for water splitting via activate (001) polar facet by hydrogenation and its charge separation mechanism

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Fig. S1. XRD pattern of CdS samples after 5 cycles test.
**Measurement of Mott–Schottky curve.** The Mott–Schottky plots were measured in the conventional three-electrode glass cell mode on the CHI 760E electrochemical station. The concentration of Na$_2$SO$_4$ electrolyte solution is 0.5 M.

![Mott-Schottky plots](image)

**Fig. S2.** Mott-Schottky plot of CdS, CdS-H150 and CdS-H170 nanosheet film.
Fig. S3. Schematic diagram of photocurrent measurement device.

Counter Electrode (CE) : Ag/AgCl
Reference Electrode (RE) : Calomel Electrode
Working Electrode (WE) : CdS/ITO
Electrolyte Solutions: 0.1 M Na$_2$SO$_4$
**Table S1** The average electron emission lifetime for the CdS, CdS-H150 and CdS-H170 nanosheets.

<table>
<thead>
<tr>
<th>Sample</th>
<th>$\tau_1$</th>
<th>$\tau_2$</th>
<th>$\tau_{av}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>CdS</td>
<td>0.61</td>
<td>5.78</td>
<td>6.84</td>
</tr>
<tr>
<td>CdS-H150</td>
<td>0.79</td>
<td>6.17</td>
<td>7.05</td>
</tr>
<tr>
<td>CdS-H170</td>
<td>0.99</td>
<td>9.66</td>
<td>12.58</td>
</tr>
</tbody>
</table>