Cationic Ni-MOF-Assembled CdS/PFC-8 Catalyst for Photocatalytic Hydrogen Production with Selective Benzyl Alcohol Oxidation under Visible Light

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Results

**Fig. S1**  The morphology of the CdS/PFC-8 composites EDX elemental mapping.

**Fig. S2**  The Tauc plots of CdS (a) with direct band gap and PFC-8 (b) with indirect band gap.

**Fig. S3**  Mott-Schottky plots for (a) CdS and (b) PFC-8 at frequencies of 800 Hz.
Fig. S4  Photos of the photocatalysts: (a) before and (b) after photocatalysis.

Fig. S5  TEM of CdS/PFC-8 composites after catalysis.

Fig. S6  CdS/PFC-8 composite before and after catalysis: (a) XPS spectra of Ni 2p and (b) detailed diagram of Ni 2p.

Table S1  Photocatalytic results of different ratio of CdS and PFC-8 in CdS/PFC-8.

<table>
<thead>
<tr>
<th>Catalyst</th>
<th>Mass ratio of CdS and PFC-8</th>
<th>PFC-8 contents (wt%)</th>
<th>$\text{H}_2$ ($\mu$mol g$^{-1}$·h$^{-1}$)</th>
<th>Benzoaldehyde (µmol g$^{-1}$·h$^{-1}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CdS/PFC-8</td>
<td>1:2</td>
<td>6.51</td>
<td>445</td>
<td>531</td>
</tr>
<tr>
<td>CdS/PFC-8</td>
<td>1:1</td>
<td>5.74</td>
<td>3376</td>
<td>4120</td>
</tr>
<tr>
<td>CdS/PFC-8</td>
<td>2:1</td>
<td>3.79</td>
<td>602</td>
<td>919</td>
</tr>
<tr>
<td>CdS/PFC-8</td>
<td>5:1</td>
<td>1.96</td>
<td>174</td>
<td>305</td>
</tr>
</tbody>
</table>
The conversion of benzyl alcohol and the selectivity of benzaldehyde were defined as follows:

Conversion (%) = \([\frac{(C_0 - C_{\text{benzyl alcohol}})}{C_0}] \times 100\%\),

Selectivity (%) = \([\frac{C_{\text{benzaldehyde}}}{(C_0 - C_{\text{benzyl alcohol}})}] \times 100\%\),

where \(C_0\) is the initial concentration of benzyl alcohol, \(C_{\text{benzyl alcohol}}\) and \(C_{\text{benzaldehyde}}\) are the concentrations of the substrate benzyl alcohol and benzaldehyde.