**ZIF-67 - Derived Flower-like ZnIn$_2$S$_4$@CoS$_2$ Heterostructure for Photocatalytic Hydrogen Production**

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# Equal contribution
Figure S1. Enlarged XRD patterns of ZC-x at 2θ= (a) 31-35°, (b) 35-38°, and (c) 53-58°.
Figure S2. (a) SEM image and (b-f) element mappings of ZC-5.
Figure S3. Brunauer-Emmet-Teller (BET) surface area of synthesized sample.

Table S1. BET surface area, mean pore size and pore volume of synthesized sample.

<table>
<thead>
<tr>
<th></th>
<th>( S_{\text{BET}} ) (m(^2)/g)</th>
<th>Mean pore size (nm)</th>
<th>Pore volume (cm(^3)/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZnIn(_2)S(_4)</td>
<td>75.7972</td>
<td>13.8633</td>
<td>0.2627</td>
</tr>
<tr>
<td>ZC-1</td>
<td>64.3987</td>
<td>16.5097</td>
<td>0.2658</td>
</tr>
<tr>
<td>ZC-3</td>
<td>57.8564</td>
<td>16.5461</td>
<td>0.2489</td>
</tr>
<tr>
<td>ZC-5</td>
<td>54.4725</td>
<td>16.2504</td>
<td>0.2213</td>
</tr>
<tr>
<td>ZC-7</td>
<td>51.5461</td>
<td>15.3542</td>
<td>0.2579</td>
</tr>
<tr>
<td>ZC-10</td>
<td>47.5694</td>
<td>16.1215</td>
<td>0.2148</td>
</tr>
</tbody>
</table>
Figure S4. (a) Photocurrent response of ZnIn$_2$S$_4$ (grey), CoS$_2$ (brown), and ZC-5 (green) under the irradiation of simulated sunlight; (b) EIS curves of ZnIn$_2$S$_4$ (grey) and ZC-5 (green).
<table>
<thead>
<tr>
<th>Testing ion</th>
<th>Concentration of the testing ion in an aqueous solution (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co^{2+}</td>
<td>0.03524</td>
</tr>
<tr>
<td>Zn^{2+}</td>
<td>0.08142</td>
</tr>
</tbody>
</table>
Table S3 Summary of reported ZnIn$_2$S$_4$-based catalysts for photocatalytic hydrogen evolution.

<table>
<thead>
<tr>
<th>Catalyst</th>
<th>Light source (W/nm)</th>
<th>Sacrificial reagent</th>
<th>Cocatalyst</th>
<th>$\text{H}_2$ evolution rate ($\mu$mol/h/g)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZnIn$_2$S$_4$@CoS$_2$</td>
<td>300 Xe $\geq$ 350</td>
<td>TEOA</td>
<td>-</td>
<td>879</td>
<td>This work</td>
</tr>
<tr>
<td>ZnS- ZnIn$_2$S$_4$</td>
<td>400 metal halide $&gt;$ 420</td>
<td>Glucose</td>
<td>Pt</td>
<td>103</td>
<td>Int. J. Hydrogen Energ., 2010, 35, 7116.</td>
</tr>
<tr>
<td>RGO/ ZnIn$_2$S$_4$</td>
<td>300 Xe $&gt;$ 420</td>
<td>lactic acid</td>
<td>-</td>
<td>817</td>
<td>ACS Appl. Mater. Interfaces 2014, 6, 3483.</td>
</tr>
<tr>
<td>ZnIn$_2$S$_4$-MoS$_2$</td>
<td>150 Xe</td>
<td>Na$_2$SO$_3$/Na$_2$S</td>
<td>-</td>
<td>111.6</td>
<td>Catal. Sci. Technol., 2020, 10, 2838.</td>
</tr>
</tbody>
</table>