Sol-gel synthesis of DyCrO$_3$ and 10% Fe-doped DyCrO$_3$ nanoparticles with enhanced photocatalytic hydrogen production abilities†

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**Electronic supplementary information**

**EDS spectra**

![EDS spectra images](image-url)

Fig. S1: EDS spectra of (a) DCO(700), (b) DCO(800), (c) DFCO(700), and (d) DFCO(800) nanoparticles

**Calculation of CBM and VBM**

Calculation of $E_{cb}$ requires using the empirical formula:\(^1\)

$$E_{cb} = \chi - E_e - 0.5E_g$$  (1)

Here, $\chi$ is the absolute electronegativity, $E_e$ is the free electron energy on hydrogen scale (approximately 4.5 eV) and $E_g$ is the band gap. For compound semiconductors, $\chi$ can be calculated from the geometric mean of the absolute electronegativity of the constituent...
atoms. Calculating $E_{cb}$ with appropriate values of $\chi^2$ from equation (1), we can determine $E_{vb} = E_{cb} + E_g$. Table S1 lists these calculated values for DCO(700), DCO(800), DFCO(700), and DFCO(800) nanoparticles.

Table S1: Table of $\chi$, $E_g$, $E_{cb}$ and $E_{vb}$ of DCO(700), DCO(800), DFCO(700), and DFCO(800) nanoparticles

<table>
<thead>
<tr>
<th>Material</th>
<th>$\chi$(eV)</th>
<th>$E_g$ (eV)</th>
<th>$E_{cb}$ (eV)</th>
<th>$E_{vb}$ (eV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCO(700)</td>
<td>5.4963</td>
<td>2.82</td>
<td>-0.4287</td>
<td>2.33213</td>
</tr>
<tr>
<td>DCO(800)</td>
<td>5.4963</td>
<td>2.72</td>
<td>-0.3787</td>
<td>2.38213</td>
</tr>
<tr>
<td>DFCO(700)</td>
<td>5.5048</td>
<td>2.45</td>
<td>-0.2452</td>
<td>2.2548</td>
</tr>
<tr>
<td>DFCO(800)</td>
<td>5.5048</td>
<td>2.33</td>
<td>-0.1631</td>
<td>2.1669</td>
</tr>
</tbody>
</table>

Fig. S2: Tauc plots obtained using modified Kubelka-Munk function from diffuse reflectance spectra for (a) DCO(700) and DCO(800), (b) DFCO(700) and DFCO(800)
Fig. S3: Normalized photocatalytic hydrogen generation plotted against irradiation time for DFCO(700) and P25 nanoparticles

References
1 Y. Cui, S. M. Goldup and S. Dunn, RSC Advances, 2015, 5, 30372-30379.