Facile synthesis of size-controlled Fe$_2$O$_3$ nanoparticle-decorated carbon nanotubes for highly sensitive H$_2$S detection

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1. Raman spectra of nanocomposites

![Raman spectra](image)

**Figure S1.** Raman spectra for the CPPyNT (blue) and the Fe$_2$O$_3$@CNT (red).
2. Sensing ability of nanocomposites

Figure S2. Normalized resistance changes upon sequential exposure to various concentrations of H$_2$S: (a) Fe$_2$O$_3$@CNT_0.2; (b) Fe$_2$O$_3$@CNT_1.0; (c) Fe$_2$O$_3$@CNT_3.0; (d) Fe$_2$O$_3$@CNT_5.0.
3. Comparison H₂S sensing performance of different chemical sensors

Table S1. Summary of representative sensor for H₂S detection.

<table>
<thead>
<tr>
<th>Sensing material</th>
<th>Sensing signal</th>
<th>Working temperature</th>
<th>Limit of detection</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>CuFe₂O₄ nanoparticle</td>
<td>Current</td>
<td>200°C</td>
<td>25 ppm</td>
<td>[S1]</td>
</tr>
<tr>
<td>α-Fe₂O₃ nanochain</td>
<td>Resistance</td>
<td>285°C</td>
<td>1 ppm</td>
<td>[S2]</td>
</tr>
<tr>
<td>α-Fe₂O₃ nanotube</td>
<td>Chemiluminescence</td>
<td>134°C</td>
<td>22 ppm</td>
<td>[S3]</td>
</tr>
<tr>
<td>Fe₂O₃/graphene</td>
<td>Chemiluminescence</td>
<td>190°C</td>
<td>15 ppm</td>
<td>[S4]</td>
</tr>
<tr>
<td>Ag/α-Fe₂O₃ nanoparticle</td>
<td>Resistance</td>
<td>160°C</td>
<td>50 ppm</td>
<td>[S5]</td>
</tr>
<tr>
<td>Fe₂O₃@CNT_3</td>
<td>Resistance</td>
<td>25°C</td>
<td>1 ppm</td>
<td>This work</td>
</tr>
</tbody>
</table>

4. Stability test to H\textsubscript{2}S gas

![Figure S3. Cycle stability of the Fe\textsubscript{2}O\textsubscript{3}@CNT\_3.0 to H\textsubscript{2}S gas.](image)

Figure S3. Cycle stability of the Fe\textsubscript{2}O\textsubscript{3}@CNT\_3.0 to H\textsubscript{2}S gas.