A novel Fe₃O₄-graphene-Au multifunctional nanocomposite: Green synthesis and catalytic application

Supplementary Information

Tao Zeng, a Xiao-le Zhang, a,b Yu-rong Ma, a Hong-yun Niu a and Ya-qi Cai*a

a The State Key Laboratory of Environmental Chemistry and Ecotoxicology of Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing 100085, China; E-mail: caiyaqi@rcees.ac.cn
b College of Life Science, Hebei United University, Tangshan, 063000, Hebei, China.
**Fig. S1** GO aqueous solution before (a) and after reducing by Fe$_3$O$_4$@PDA (b).
Fig. S2 Particle size distribution of Au NPs.

D = 7.3 ± 2.9 nm
**Fig. S3** EDX spectrum of Fe$_3$O$_4$@PDA@RGO@Au.
**Fig. S4** Reaction mixture before (a) and after (b) catalytic reduction by the synthesized nanocatalyst.
Fig. S5 The required time of each cycle to completely reduce o-nitroaniline in the presence of Fe$_3$O$_4$@PDA@RGO@Au catalyst.
Table S1  Au loss (mg/L) in each filtrate and Au content (wt %) on the catalyst after each cycle.

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Initial&lt;sup&gt;a)&lt;/sup&gt;</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Au loss</td>
<td>-</td>
<td>0.16</td>
<td>0.14</td>
<td>0.14</td>
<td>0.10</td>
<td>0.09</td>
<td>0.04</td>
<td>0.08</td>
<td>0.05</td>
<td>0.07</td>
<td>0.19</td>
</tr>
<tr>
<td>Au content&lt;sup&gt;b)&lt;/sup&gt;</td>
<td>13.6</td>
<td>13.0</td>
<td>12.5</td>
<td>12.0</td>
<td>11.6</td>
<td>11.3</td>
<td>11.1</td>
<td>10.8</td>
<td>10.6</td>
<td>10.4</td>
<td>9.7</td>
</tr>
</tbody>
</table>

<sup>a)</sup> The catalyst was digested and analysed by ICP-MS to determine the initial Au content.  
<sup>b)</sup> Au content on the catalyst of each cycle was obtained from the Au concentration in each filtrate.