Silver doped reduced graphene oxide as promising plasmonic photocatalyst for oxidative coupling of benzylamines under visible light irradiation

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Calculation: -

The identification of product was done by gas chromatography-mass spectrometry (GC-MS). (Fig. S1) The conversion of benzylamine, yield and selectivity of imine were analysed based on the following equations:

Conversion (%) = \[\frac{(C_0 - C_{\text{benzylamine}})}{C_0}\] × 100

Yield (%) = \[\frac{C_{\text{imine}}}{C_0}\] × 100

Selectivity (%) = \[\frac{C_{\text{imine}}}{(C_0 - C_{\text{benzylamine}})}\] × 100

Where \(C_0\) is the whole quantity of benzylamine in the reaction mixture before irradiation; \(C_{\text{benzylamine}}\) is the amount of benzylamine in the solution after irradiation for 12 h; \(C_{\text{imine}}\) is the amount of imine in the solution after irradiation for 12 h.
Fig. S13: GC-MS of the product obtained from oxidative coupling of benzylamine using Ag@rGO photocatalyst after 12 h irradiation time.

Table S1: A comparison of the Ag@rGO with literature known photocatalyst for the oxidation of benzylamine

<table>
<thead>
<tr>
<th>Entry</th>
<th>Photocatalyst</th>
<th>T [°C]</th>
<th>Oxidant</th>
<th>Product Yield [%]a or [μmol g⁻¹ h⁻¹]b</th>
<th>Ref. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ag@rGO</td>
<td>RT</td>
<td>O₂</td>
<td>97a</td>
<td>This work</td>
</tr>
<tr>
<td>2</td>
<td>Cu₂O/CQD</td>
<td>RT</td>
<td>O₂</td>
<td>95a</td>
<td>[1]</td>
</tr>
<tr>
<td>3</td>
<td>Au/TiO₂</td>
<td>RT</td>
<td>Air</td>
<td>883b</td>
<td>[2]</td>
</tr>
<tr>
<td>4</td>
<td>Au-Pd/ZrO₂</td>
<td>45 °C</td>
<td>O₂</td>
<td>198b</td>
<td>[3]</td>
</tr>
<tr>
<td>5</td>
<td>Fe(bpy)₃/npg-C₃N₄</td>
<td>RT</td>
<td>O₂</td>
<td>94a</td>
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<tr>
<td>6</td>
<td>BiVO₄/g-C₃N₄</td>
<td>RT</td>
<td>O₂</td>
<td>1089b</td>
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<tr>
<td>7</td>
<td>WS₂</td>
<td>50 °C</td>
<td>O₂</td>
<td>94a</td>
<td>[6]</td>
</tr>
<tr>
<td>8</td>
<td>WO₃</td>
<td>RT</td>
<td>O₂</td>
<td>950b</td>
<td>[7]</td>
</tr>
</tbody>
</table>
Fig. S2: EDX Pattern of Ag@rGO showing elemental composition

Fig. S3: Tauc plot for band gap determination of a) rGO, b) Ag@rGO.
Fig. S4: PL spectra of a) rGO, b) Ag@rGO photocatalyst.

Fig. S5: TGA diagram of Ag@rGO.
Fig. S6: N$_2$ adsorption-desorption isotherms; b) BJH pore size distribution curves of Ag@rGO.
Fig. S7: $^1$H NMR of N-benzylidenebenzylamine.

Fig. S8: $^1$H NMR of N-(4-methoxybenzylidene)-p-methoxybenzylamine.

Fig. S9: $^1$H NMR of N-(4-methylbenzylidene)-p-methylbenzylamine.
Fig. S10: $^1$H NMR of N-(2-methylbenzylidene)-o-methylbenzylamine.

Fig. S11: $^1$H NMR of N-(4-chlorobenzylidene)-p-chlorobenzylamine.

Fig. S12: $^1$H NMR of N-(4-bromobenzylidene)-p-fluorobenzylamine.
Fig. S13: $^1$H NMR of N-(4-cyanobenzylidene)-p-fluorobenzylamine.
References:


