Supplementary material

Visualized ratiometric fluorescence sensing system for copper ions based on gold nanoclusters / perovskite quantum dot@SiO₂ nanocomposites

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**Figure S1.** Photos of the apparatus for preparing AuNCs obtained under: (A) white light; (B) 365-nm UV light. (a) Thermostatic bath; (b) jacket Reaction beaker; (c) reaction solution; (d) 37 °C water inlet pipe; (e) 37 °C water outlet pipe.
Figure S2. Fluorescence spectra of the fluorescence intensity changes of AuNCs in different concentrations of Cu$^{2+}$. 
Figure S3. High resolution TEM image of $PVP - PQDs$. 

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Figure S4. The fluorescence quenching degree of $B\text{SA} - \text{AuNCs}/\text{PQD@SiO}_2$ by $\text{Cu}^{2+}$ at different pH.
<table>
<thead>
<tr>
<th>Water Sample (ND*)</th>
<th>Spiked concentration (μM)</th>
<th>Found in this method (μM)</th>
<th>Average Recovery (%; n=5)</th>
<th>RSD (%; n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>18.52</td>
<td></td>
<td>108.94</td>
<td>4.47</td>
</tr>
<tr>
<td>Min River</td>
<td>50</td>
<td>50.06</td>
<td>101.21</td>
<td>2.18</td>
</tr>
<tr>
<td>150</td>
<td>149.59</td>
<td></td>
<td>99.73</td>
<td>3.11</td>
</tr>
</tbody>
</table>

ND*: Negative detection