Supporting Information

for

Visual Trace Copper(II) Detection Based on Its Catalytic Action to the Disassociation of Thiosulfate

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Fig. S1. The relationship of the absorbance at the position of maximum absorption peak and corresponding ΔA of TAg-NPs with the different concentrations of heating temperature. TAg-NPs-Vc-Cu²⁺-Na₂S₂O₃ not be heated (Curve a), TAg-NPs-Vc-Cu²⁺-Na₂S₂O₃ be heated (Curve b), ΔA (Curve c). Different heating temperature (90, 80, 70, 60, 50, 40, 25 °C ), cCu²⁺ (0.75 μM), cNa₂S₂O₃ (5.0 μM), pH 6.8.

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**Fig. S2.** The relationship of the $\Delta A$ at the position of maximum absorption peak of TAg-NPs and different heating time of mixture of Na$_2$S$_2$O$_3$ and Cu$^{2+}$, $c_{\text{Cu}^{2+}}$ (0.75 µM), $c_{\text{Na}_2\text{S}_2\text{O}_3}$ (5.0 µM), pH 6.8, heating at 80 °C, reacted 40 min at room temperature.

**Fig. S3.** The relationship of the absorbance at the position of maximum absorption peak of TAg-NPs and corresponding $\Delta A$ with the different concentrations of Na$_2$S$_2$O$_3$. TAg-NPs/Na$_2$S$_2$O$_3$ (Curve a), TAg-NPs/Cu$^{2+}$/Na$_2$S$_2$O$_3$ (Curve b), $\Delta A$ (Curve c). Different concentrations of Na$_2$S$_2$O$_3$ (10.0, 9.0, 8.0, 7.0, 6.0, 5.0, 4.0, 3.0, 2.0, 1.0 µM), $c_{\text{Cu}^{2+}}$ (0.75 µM), pH 6.8, heating temperature 80 °C, heating 30 min and then reacted with TAg-NPs for 40 min at room temperature.
**Fig. S4.** The relationship of the absorbance at the position of maximum absorption peak of TAg-NPs, and corresponding $\Delta A$ with the different pH. TAg-NPs-$\text{Na}_2\text{S}_2\text{O}_3$ (Curve a), TAg-NPs-$\text{Cu}^{2+}$-$\text{Na}_2\text{S}_2\text{O}_3$ (Curve b), $\Delta A$ (Curve c). Britton–Robinson buffer solutions with pH were individually 1.81, 2.87, 3.78, 4.35, 5.72, 6.8, 7.96, 8.69, 9.62, 10.88, and 11.82, $c_{\text{Cu}^{2+}}$ (0.75 µM), $c_{\text{Na}_2\text{S}_2\text{O}_3}$ (5.0 µM), heating temperature 80 °C, heating time 30 min and then reacted with TAg-NPs for 40 min at room temperature.

**Fig. S5.** The relationship of the $\Delta A$ at the position of maximum absorption peak of TAg-NPs and different reaction time, $c_{\text{Cu}^{2+}}$ (0.1 µM), $c_{\text{Na}_2\text{S}_2\text{O}_3}$ (5.0 µM), pH 6.8, heating temperature 80 °C, heating time 25 min, then reacted with TAg-NPs for different time at room temperature.
Table S1 Comparison of the sensitivity for copper ion detection in recent spectral methods.

<table>
<thead>
<tr>
<th>Method</th>
<th>probe</th>
<th>Linear range(μM)</th>
<th>Detection limit(μM)</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluorescence</td>
<td>Copper/Silver Nanoclusters</td>
<td>0.005-0.2</td>
<td>0.0027</td>
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<td>Absorption/colorimetry</td>
<td>Gold nanorods</td>
<td>0.05-1000</td>
<td>0.05</td>
<td>[2]</td>
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<tr>
<td>Absorption/colorimetry</td>
<td>Gold nanorods</td>
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<td>[3]</td>
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<td>Absorption</td>
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<td>0.0015</td>
<td>[4]</td>
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<tr>
<td>Absorption/colorimetry</td>
<td>TAg-NPs</td>
<td>0.0025-0.75/0.025-0.75</td>
<td>0.001</td>
<td>This work</td>
</tr>
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Reference: