Electronic Supplementary Information (ESI)

A highly specific Rhodamine-based colorimetric probe for hypochlorite and its application in tap water

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Experimental Section

Materials and Instrumentations

Compound 1 was obtained following literature procedures.[25] All reagents were of analytical reagent grade and used without further purification. Doubly distilled water was used for all experiments. CuI, NaClO, H₂O₂, Na₂SO₄, NaClO₄, NaNO₂, Na₂CO₃, NaAc·3H₂O, Na₄P₂O₇ and Sodium Ascorbate were purchased from Sinopharm Chemical Reagent Beijing Co., Ltd. UV-visible spectra were obtained using a Shimadzu UV-2550 spectrometer, and the pH values were determined by using a DELTA 320 PH dollar.

Preparation of solutions of metal ions and anions

1 mmol of each reagents (CuI, 190 mg; NaClO, 680 μL; H₂O₂, 100 μL; Na₂SO₄, 142 mg; NaClO₄, 122 mg; NaNO₂, 69 mg; Na₂CO₃, 106 mg; NaAc·3H₂O, 136 mg; Na₄P₂O₇, 266 mg; Sodium Ascorbate, 198 mg) was dissolved in distilled water (10 mL) to afford 1×10⁻¹ mol/L aqueous solution. Tris-HCl buffer solutions (pH = 7.0) were prepared using 0.01 M Tris, proper amount of HCl under adjustment by a pH meter. The stock solutions could be diluted to desired concentrations with water before usage. A 5.0×10⁻⁴ mol/L stock solution of Compound 1 was
prepared in acetonitrile, then 200 µL of this stock solution was added to a 10 mL glass tube and diluted by Tris-HCl (10 mM, pH = 7.0) buffer and acetonitrile to obtain the solutions of 1 (10 µM) in Tris-HCl buffer containing 50%(v/v) water/CH₃CN.

**UV absorption changes of 1 by Cu⁺**

A solution of 1 (10 µM) was prepared in Tris-HCl (10 mM, pH = 7.0) buffer containing 50%(v/v) water/CH₃CN, then 3.0 mL of the solution of 1 was placed in a quartz cell (10.0 mm width) and the UV absorption spectrum was recorded before and after the addition of Sodium Ascorbate and Cu⁺ to the solution of 1.

**UV absorption changes of 1 + Cu⁺ with ClO⁻**

A solution of 1 (10 µM) was prepared in Tris-HCl (10 mM, pH = 7.0) buffer containing 50%(v/v) water/CH₃CN, then 3.0 mL of the solution of 1 was placed in a quartz cell (10.0 mm width) and the UV absorption spectrum was recorded. After the solution of Sodium Ascorbate and Cu⁺ was added to 1, the solution of NaClO was introduced in portions and the UV absorption changes were recorded at room temperature each time.

**UV absorption changes of 1 + Cu⁺ with other anions**

The solutions of anions were prepared in distilled water. UV absorption changes of 1 (1.0×10⁻⁵ mol/L) + Cu⁺ (4.0×10⁻⁵ mol/L) + Sodium Ascorbate (3.0×10⁻⁶ mol/L) were recorded before and after the addition of anions to the solution of 1.

**UV absorption changes of 1 + Cu²⁺ with tap water**

The UV absorption changes of 1 (1.0×10⁻⁵ mol/L) + Cu⁺ (4.0×10⁻⁵ mol/L) + Sodium Ascorbate (3.0×10⁻⁶ mol/L) were recorded before and after the addition of different amount of tap water.

**UV absorption changes of 1 + Cu⁺ with ClO⁻ and other anions**

Then UV absorption changes of 1 (1.0×10⁻⁵ mol/L) + Cu⁺ (4.0×10⁻⁵ mol/L) + Sodium
Ascorbate (3.0×10^{-6} mol/L) were recorded before and after the addition of NaClO and the other anions (CO_{3}^{2-}, Ac^-, P_{2}O_{7}^{4-}).

UV absorption changes of 1 + P_{2}O_{7}^{4-} with Cu^{2+}

The UV absorption changes of 1 (1.0×10^{-5} mol/L) + P_{2}O_{7}^{4-} (7.0×10^{-5} mol/L) were recorded before and after the addition of different amount of Cu^{2+}.

UV absorption changes of 1 + P_{2}O_{7}^{4-} + Cu^{2+} + Cu^{+} with ClO^{-}

The UV absorption changes of 1 (1.0×10^{-5} mol/L) + P_{2}O_{7}^{4-} (7.0×10^{-5} mol/L) + Cu^{2+} (5.0×10^{-5}, 4.0×10^{-5}, 3.0×10^{-5}, 2.0×10^{-5} mol/L) + Cu^{+} (4.0×10^{-5} mol/L) + Sodium Ascorbate (3.0×10^{-6} mol/L) were recorded before and after the addition of different amount of ClO^{-}.

![Absorption spectra of 1 (1.0×10^{-5} mol/L), CuI (3.0×10^{-5} mol/L) and Sodium Ascorbate (1.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH_{3}CN.](https://example.com/spectra.png)

**Fig. S1** Absorption spectra of 1 (1.0×10^{-5} mol/L), CuI (3.0×10^{-5} mol/L) and Sodium Ascorbate (1.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH_{3}CN.
Fig. S2 Absorption spectra of $1$ (1.0×10$^{-5}$ mol/L), CuI (6.0×10$^{-5}$ mol/L) and Sodium Ascorbate (1.0×10$^{-6}$ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN.

Fig. S3 Absorption spectra of $1$ (1.0×10$^{-5}$ mol/L), CuI (6.0×10$^{-5}$ mol/L) and Sodium Ascorbate (3.0×10$^{-6}$ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN.
**Fig. S4** Absorption spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN.

**Fig. S5** Absorption spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of NaClO after 30min.
Fig. S6 Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of NaClO after 27min.

Fig. S7 Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of NaClO after 24min.
Fig. S8 Absorption spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of NaClO after 21min.

Fig. S9 Absorption spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of NaClO after 18min.
**Fig. S10** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of NaClO after 15min.

**Fig. S11** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of NaClO after 12min.
Fig. S12 Absorption spectra of 1 (1.0×10^{-5} \text{ mol/L}), CuI (4.0×10^{-5} \text{ mol/L}) and Sodium Ascorbate (3.0×10^{-6} \text{ mol/L}) in Tris-HCl (10 \text{ mM, pH = 7.0}) buffer containing 50\% (v/v) water/CH_{3}CN in the presence of different amounts of NaClO after 9\text{ min}.

Fig. S13 Absorption spectra of 1 (1.0×10^{-5} \text{ mol/L}), CuI (4.0×10^{-5} \text{ mol/L}) and Sodium Ascorbate (3.0×10^{-6} \text{ mol/L}) in Tris-HCl (10 \text{ mM, pH = 7.0}) buffer containing 50\% (v/v) water/CH_{3}CN in the presence of NaClO (3.0×10^{-6} \text{ mol/L}) at different time.
**Fig. S14** Absorption spectra of $1\ (1.0\times10^{-5}\ \text{mol/L})$, CuI (4.0×10^{-5}\ \text{mol/L}) and Sodium Ascorbate (3.0×10^{-6}\ \text{mol/L}) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of NaClO (6.0×10^{-6}\ \text{mol/L}) at different time.

**Fig. S15** Absorption spectra of $1\ (1.0\times10^{-5}\ \text{mol/L})$, CuI (4.0×10^{-5}\ \text{mol/L}) and Sodium Ascorbate (3.0×10^{-6}\ \text{mol/L}) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of NaClO (9.0×10^{-6}\ \text{mol/L}) at different time.
**Fig. S16** Absorption spectra of $\text{1} \ (1.0 \times 10^{-5} \text{ mol/L}), \ 
\text{CuI} \ (4.0 \times 10^{-5} \text{ mol/L})$ and Sodium Ascorbate $\ (3.0 \times 10^{-6} \text{ mol/L})$ in Tris-HCl $\ (10 \text{ mM, pH = 7.0})$ buffer containing 50% (v/v) water/CH$_3$CN in the presence of NaClO $\ (1.3 \times 10^{-5} \text{ mol/L})$ at different time.

**Fig. S17** Absorption spectra of $\text{1} \ (1.0 \times 10^{-5} \text{ mol/L}), \ 
\text{CuI} \ (4.0 \times 10^{-5} \text{ mol/L})$ and Sodium Ascorbate $\ (3.0 \times 10^{-6} \text{ mol/L})$ in Tris-HCl $\ (10 \text{ mM, pH = 7.0})$ buffer containing 50% (v/v) water/CH$_3$CN in the presence of NaClO $\ (2.0 \times 10^{-5} \text{ mol/L})$ at different time.
**Fig. S18** Absorption spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NaClO (3.0×10^{-5} mol/L) at different time.

**Fig. S19** Absorption spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NaClO (4.0×10^{-5} mol/L) at different time.
**Fig. S20** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NaClO (5.0×10⁻⁵ mol/L) at different time.

**Fig. S21** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NaClO (7.0×10⁻⁵ mol/L) at different time.
Fig. S22 Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of ClO₃⁻ (1.3×10⁻⁴ mol/L). The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L.

Fig. S23 Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of ClO₄⁻ (1.3×10⁻⁴ mol/L). The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L.
Fig. S24 Absorption spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of SO$_4^{2-}$ (1.3×10^{-4} mol/L). The concentration of ClO$^{-}$ was 7.0×10^{-5} mol/L.

Fig. S25 Absorption spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of CO$_3^{2-}$ (1.3×10^{-4} mol/L). The concentration of ClO$^{-}$ was 7.0×10^{-5} mol/L.
**Fig. S26** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NO₂⁻ (1.3×10⁻⁴ mol/L). The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L.

**Fig. S27** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of Ac⁻ (1.3×10⁻⁴ mol/L). The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L.
**Fig. S28** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of P₂O₇⁴⁻ (1.3×10⁻⁴ mol/L). The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L.

**Fig. S29** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different anions (1.3×10⁻⁴ mol/L) after 30min. The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L.
Fig. S30 Absorption spectra of 1 (1.0×10^-5 mol/L), CuI (4.0×10^-5 mol/L) and Sodium Ascorbate (3.0×10^-6 mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH3CN in the presence of different anions (1.3×10^-4 mol/L) after 27min. The concentration of ClO^- was 7.0×10^-5 mol/L.

Fig. S31 Absorption spectra of 1 (1.0×10^-5 mol/L), CuI (4.0×10^-5 mol/L) and Sodium Ascorbate (3.0×10^-6 mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH3CN in the presence of different anions (1.3×10^-4 mol/L) after 24min. The concentration of ClO^- was 7.0×10^-5 mol/L.
Fig. S32 Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different anions (1.3×10⁻⁴ mol/L) after 21 min. The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L.

Fig. S33 Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different anions (1.3×10⁻⁴ mol/L) after 18 min. The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L.
Fig. S34 Absorption spectra of 1 (1.0×10⁻⁵ mol/L), Cul (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different anions (1.3×10⁻⁴ mol/L) after 15min. The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L.

Fig. S35 Absorption spectra of 1 (1.0×10⁻⁵ mol/L), Cul (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of P₂O₇⁴⁻ (7.0×10⁻⁵ mol/L) after 30min. The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L.
Fig. S36 Absorption spectra of 1 (1.0×10^{-5} \text{ mol/L}), CuI (4.0×10^{-5} \text{ mol/L}) and Sodium Ascorbate (3.0×10^{-6} \text{ mol/L}) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH\textsubscript{3}CN in the presence of CO\textsubscript{3}^{2-} (7.0×10^{-5} \text{ mol/L}) after 30 min. The concentration of ClO\textsuperscript{-} was 7.0×10^{-5} \text{ mol/L}.

Fig. S37 Absorption spectra of 1 (1.0×10^{-5} \text{ mol/L}), CuI (4.0×10^{-5} \text{ mol/L}) and Sodium Ascorbate (3.0×10^{-6} \text{ mol/L}) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH\textsubscript{3}CN in the presence of Ac\textsuperscript{-} (7.0×10^{-5} \text{ mol/L}) after 30 min. The concentration of ClO\textsuperscript{-} was 7.0×10^{-5} \text{ mol/L}.
Fig. S38 Absorption spectra of 1 (1.0×10^{-5} mol/L), P_2O_7^{4-} (7.0×10^{-5} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH_3CN in the presence of different amounts of Cu^{2+}.

Fig. S39 Absorption spectra of 1 (1.0×10^{-5} mol/L), P_2O_7^{4-} (7.0×10^{-5} mol/L), Cu^{2+} (5.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH_3CN in the presence of ClO^- (7.0×10^{-5} mol/L) after 30min.
**Fig. S40** Absorption spectra of 1 (1.0×10^{-5} mol/L), P_2O_7^{4-} (7.0×10^{-5} mol/L), Cu^{2+} (4.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH_3CN in the presence of ClO^- (7.0×10^{-5} mol/L) after 30min.

**Fig. S41** Absorption spectra of 1 (1.0×10^{-5} mol/L), P_2O_7^{4-} (7.0×10^{-5} mol/L), Cu^{2+} (3.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH_3CN in the presence of ClO^- (7.0×10^{-5} mol/L) after 30min.
Fig. S42 Absorption spectra of 1 (1.0×10^{-5} mol/L), \( \text{P}_2\text{O}_7^{4-} \) (7.0×10^{-5} mol/L), \( \text{Cu}^{2+} \) (2.0×10^{-5} mol/L), \( \text{CuI} \) (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH\(_3\)CN in the presence of \( \text{ClO}^- \) (7.0×10^{-5} mol/L) after 30min.

Fig. S43 Absorption spectra of 1 (1.0×10^{-5} mol/L), \( \text{CuI} \) (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH\(_3\)CN in the presence of different amounts of \( \text{H}_2\text{O}_2 \) after 30min.
Fig. S44 Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 27min.

Fig. S45 Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 24min.
**Fig. S46** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 21 min.

**Fig. S47** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 18 min.
**Fig. S48** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 15 min.

**Fig. S49** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (6.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 21 min.
**Fig. S50** Absorption spectra of 1 (1.0×10^{-5} mol/L), CuI (6.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of different amounts of H$_2$O$_2$ after 18 min.

**Fig. S51** Absorption spectra of 1 (1.0×10^{-5} mol/L), CuI (6.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of different amounts of H$_2$O$_2$ after 15 min.
**Fig. S52** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (6.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 12 min.

**Fig. S53** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of 30 μL water. The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L.
**Fig. S54** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of 200 μL water. The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L.

**Fig. S55** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of 30 μL tap-water.
**Fig. S56** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of 100 μL tap-water.

**Fig. S57** Absorption spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10 mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of 200 μL tap-water.
**Fig. S58** Absorption spectra of $\text{I} (1.0 \times 10^{-5} \text{ M})$, $\text{CuI} (4.0 \times 10^{-5} \text{ M})$ and Sodium Ascorbate $\left(3.0 \times 10^{-6} \text{ M}\right)$ in Tris-HCl $(10 \text{ mM, pH} = 7.0)$ buffer containing $50\% \ (\text{v/v})$ water/CH$_3$CN in the presence of different amount tap-water. Inset: Photograph of $1+\text{Cu}^+$, $1+\text{Cu}^++\text{tap~water}$, $1+\text{Cu}^++\text{H}_2\text{O}$.

**Fig. S59** Fluorescence Emission spectra of $\text{I} (1.0 \times 10^{-5} \text{ mol/L})$, $\text{CuI} (4.0 \times 10^{-5} \text{ mol/L})$ and Sodium Ascorbate $\left(3.0 \times 10^{-6} \text{ mol/L}\right)$ in Tris-HCl $(10\text{mM}, \text{pH} = 7.0)$ buffer containing $50\% \ (\text{v/v})$ water/CH$_3$CN in the presence of different amounts of NaClO after 30min. Excitation wavelength (nm):520.
**Fig. S60** Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH\textsubscript{3}CN in the presence of different amounts of NaClO after 27min. Excitation wavelength (nm): 520.

**Fig. S61** Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH\textsubscript{3}CN in the presence of different amounts of NaClO after 24min. Excitation wavelength (nm): 520.
Fig. S62 Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of different amounts of NaClO after 21min. Excitation wavelength (nm): 520.

Fig. S63 Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of different amounts of NaClO after 18min. Excitation wavelength (nm): 520.
**Fig. S64** Fluorescence Emission spectra of 1(1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of different amounts of NaClO after 15min. Excitation wavelength (nm):520.

**Fig. S65** Fluorescence Emission spectra of 1(1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of different amounts of NaClO after 12min. Excitation wavelength (nm):520.
**Fig. S66** Fluorescence Emission spectra of $\mathbf{1}$ ($1.0 \times 10^{-5}$ mol/L), CuI ($4.0 \times 10^{-5}$ mol/L) and Sodium Ascorbate ($3.0 \times 10^{-6}$ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of different amounts of NaClO after 9min. Excitation wavelength (nm): 520.

**Fig. S67** Fluorescence Emission spectra of $\mathbf{1}$ ($1.0 \times 10^{-5}$ mol/L), CuI ($4.0 \times 10^{-5}$ mol/L) and Sodium Ascorbate ($3.0 \times 10^{-6}$ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of different amounts of NaClO after 6min. Excitation wavelength (nm): 520.
Fig. S68 Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of different amounts of NaClO after 3min. Excitation wavelength (nm):520.

Fig. S69 Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN in the presence of NaClO (3.0×10^{-6} mol/L) at different time. Excitation wavelength (nm):520.
**Fig. S70** Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH_{3}CN in the presence of NaClO (6.0×10^{-6} mol/L) at different time. Excitation wavelength (nm): 520.

**Fig. S71** Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH_{3}CN in the presence of NaClO (9.0×10^{-6} mol/L) at different time. Excitation wavelength (nm): 520.
Fig. S72 Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), Cul (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NaClO (1.3×10⁻⁵ mol/L) at different time. Excitation wavelength (nm):520.

Fig. S73 Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), Cul (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NaClO (2.0×10⁻⁵ mol/L) at different time. Excitation wavelength (nm):520.
**Fig. S74** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), Cul (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NaClO (3.0×10⁻⁵ mol/L) at different time. Excitation wavelength (nm): 520.

**Fig. S75** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), Cul (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NaClO (4.0×10⁻⁵ mol/L) at different time. Excitation wavelength (nm): 520.
**Fig. S76** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), Cul (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NaClO (5.0×10⁻⁵ mol/L) at different time. Excitation wavelength (nm):520.

**Fig. S77** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), Cul (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NaClO (6.0×10⁻⁵ mol/L) at different time. Excitation wavelength (nm):520.
**Fig. S78** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NaClO (7.0×10⁻⁵ mol/L) at different time. Excitation wavelength (nm):520.

**Fig. S79** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of NaClO (8.0×10⁻⁵ mol/L) at different time. Excitation wavelength (nm):520.
**Fig. S80** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), Cul (3.0×10⁻⁵ mol/L) and Sodium Ascorbate (1.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN. Excitation wavelength (nm):520.

**Fig. S81** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), Cul (6.0×10⁻⁵ mol/L) and Sodium Ascorbate (1.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN. Excitation wavelength (nm):520.
**Fig. S82** Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (6.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN. Excitation wavelength (nm): 520.

**Fig. S83** Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH$_3$CN. Excitation wavelength (nm): 520.
**Fig. S84** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 30min. Excitation wavelength (nm):520.

**Fig. S85** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 27min. Excitation wavelength (nm):520.
**Fig. S86** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), Cul (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 24min. Excitation wavelength (nm): 520.

**Fig. S87** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), Cul (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 21min. Excitation wavelength (nm): 520.
**Fig. S88** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 18min. Excitation wavelength (nm): 520.

**Fig. S89** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of different amounts of H₂O₂ after 15min. Excitation wavelength (nm): 520.
**Fig. S90** Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), Cul (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-5} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH_3CN in the presence of different amounts of H_2O_2 after 12min. Excitation wavelength (nm):520.

**Fig. S91** Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), Cul (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-5} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH_3CN in the presence of different amounts of H_2O_2 after 9min. Excitation wavelength (nm):520.
**Fig. S92** Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH_{3}CN in the presence of ClO_{3}^{-} (1.3×10^{-4} mol/L). The concentration of ClO^{-} was 7.0×10^{-5} mol/L. Excitation wavelength (nm): 520.

**Fig. S93** Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH_{3}CN in the presence of ClO_{4}^{-} (1.3×10^{-4} mol/L). The concentration of ClO^{-} was 7.0×10^{-5} mol/L. Excitation wavelength (nm): 520.
**Fig. S94** Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH_{3}CN in the presence of CO_{3}^{2-} (1.3×10^{-4} mol/L). The concentration of ClO^{-} was 7.0×10^{-5} mol/L. Excitation wavelength (nm):520.

**Fig. S95** Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH_{3}CN in the presence of NO_{2}^{-} (1.3×10^{-4} mol/L). The concentration of ClO^{-} was 7.0×10^{-5} mol/L. Excitation wavelength (nm):520.
**Fig. S96** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of P₂O₇⁴⁻ (1.3×10⁻⁴ mol/L). The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L. Excitation wavelength (nm):520.

**Fig. S97** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of SO₄²⁻ (1.3×10⁻⁴ mol/L). The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L. Excitation wavelength (nm):520.
Fig. S98 Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of Ac⁻ (1.3×10^{-4} mol/L). The concentration of ClO⁻ was 7.0×10^{-5} mol/L. Excitation wavelength (nm):520.

Fig. S99 Fluorescence Emission spectra of 1 (1.0×10^{-5} mol/L), CuI (4.0×10^{-5} mol/L) and Sodium Ascorbate (3.0×10^{-6} mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of the mix anions (1.3×10^{-4} mol/L). The concentration of ClO⁻ was 7.0×10^{-5} mol/L. Excitation wavelength (nm):520.
Fig. S100 Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of 30μL water. The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L. Excitation wavelength (nm):520.

Fig. S101 Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of 200μL water. The concentration of ClO⁻ was 7.0×10⁻⁵ mol/L. Excitation wavelength (nm):520.
**Fig. S102** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of 30μL tap-water. Excitation wavelength (nm):520.

**Fig. S103** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of 100μL tap-water. Excitation wavelength (nm):520.
**Fig. S104** Fluorescence Emission spectra of 1 (1.0×10⁻⁵ mol/L), CuI (4.0×10⁻⁵ mol/L) and Sodium Ascorbate (3.0×10⁻⁶ mol/L) in Tris-HCl (10mM, pH = 7.0) buffer containing 50% (v/v) water/CH₃CN in the presence of 200μL tap-water. Excitation wavelength (nm): 520.