# Colorimetric Cyanide Detection Using an Azobenzene Acid in Aqueous Solutions
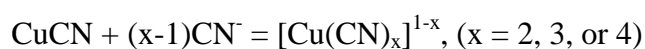
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Equation S1: the reaction between Cu^{2+} and CN^-

$$2Cu^{2+} + 4CN^- = 2CuCN + (CN)_2 \quad (CuCN \text{ is white precipitant}).$$
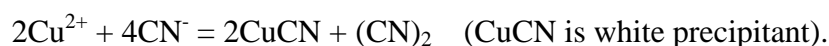
Equation S2: the reaction between CuCN and CN^-

$$CuCN + (x-1)CN^- = [Cu(CN)_x]^{1-x}, (x = 2, 3, \text{ or } 4)$$

The stability constants (K), $[Cu(CN)_2]^-$: $K = 1.00 \times 10^{24}$; $[Cu(CN)_4]^{3-}$: $K = 2.00 \times 10^{30}$.

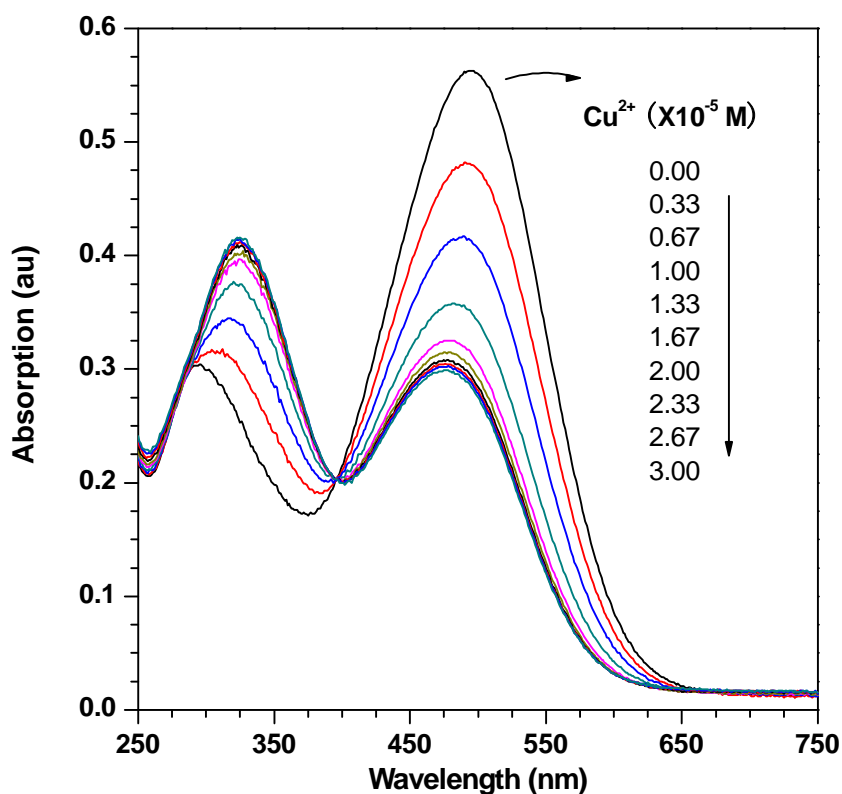**Figure S1.** UV-vis spectra of compound **I** with increasing amounts of Cu^{2+} in water at pH 6.7. The concentration of **I** was 3.0×10^{-5} mol/L.
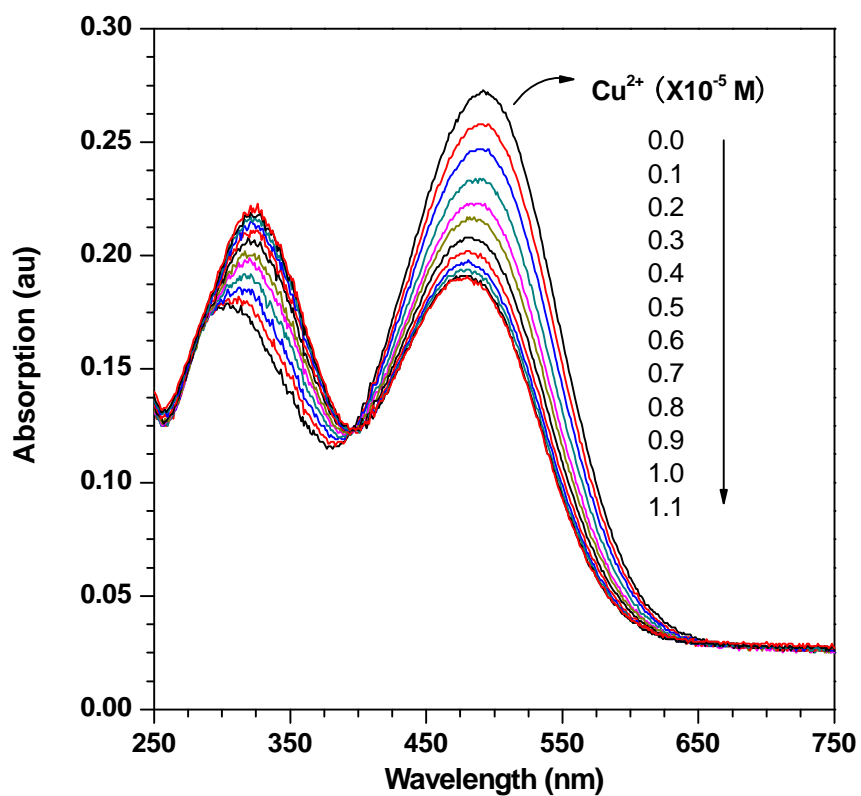
Figure S2. UV-vis spectra of compound **I** with increasing amounts of Cu^{2+} in water at pH 6.7. The concentration of **I** was 1.5×10^{-5} mol/L.
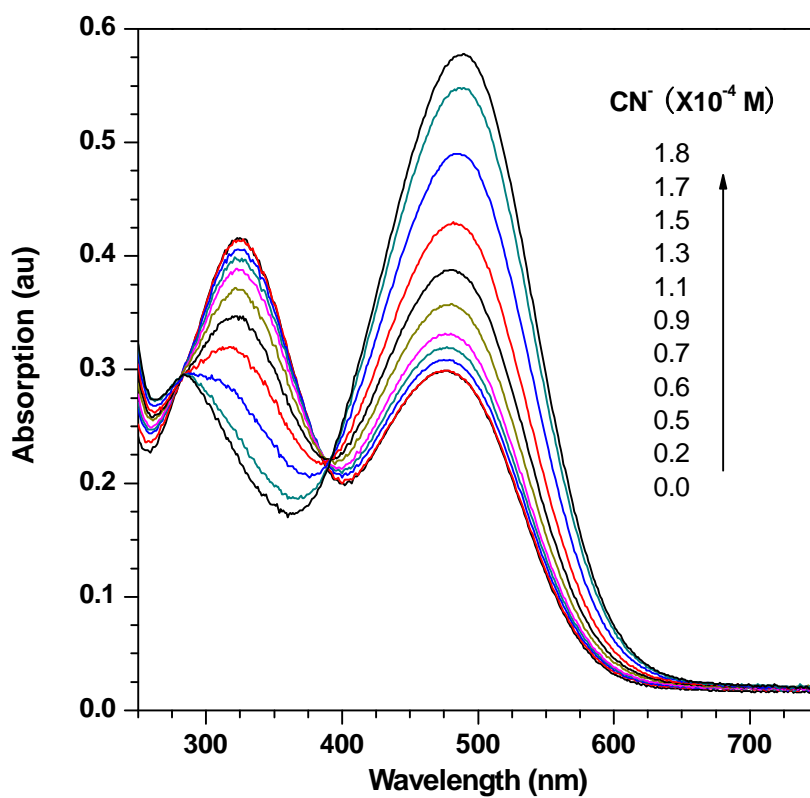

Figure S3. UV-vis spectra of the solution of compound **I** (3.0×10^{-5} mol/L) and Cu^{2+} (3.0×10^{-5} mol/L) with increasing amounts of CN^- in water at pH 6.7.
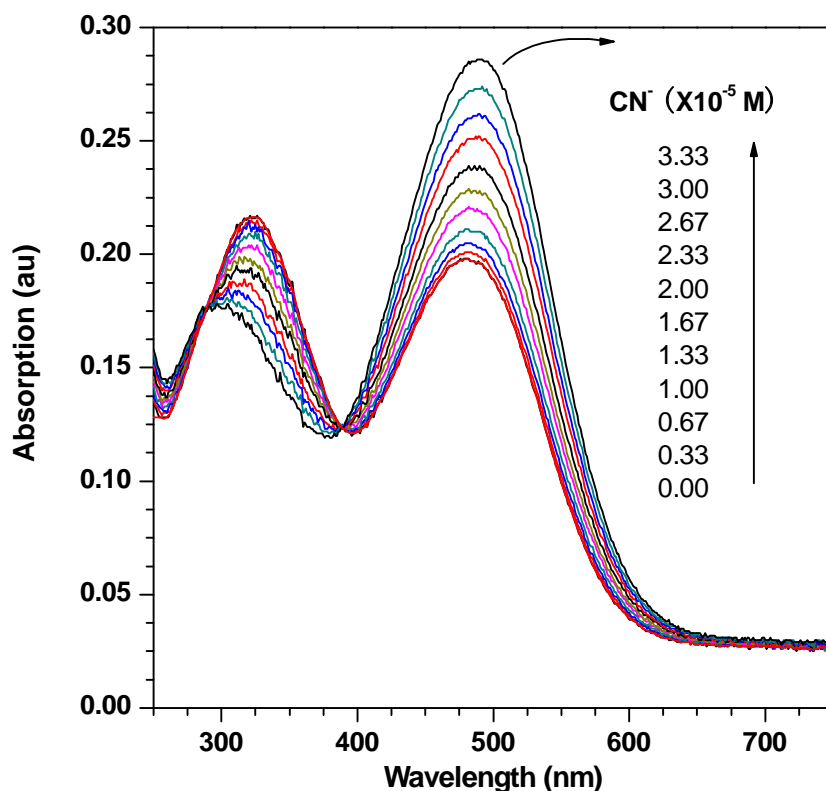
Figure S4. UV-vis spectra of the solution of compound **I** (1.5×10^{-5} mol/L) and Cu^{2+} (7.0×10^{-6} mol/L) with increasing amounts of CN^- in water at pH 6.7.

Figure S5. UV-vis spectra of complex **I** (A) at the presence of different cations mixture (1.0×10^{-5} mol/L) in water at pH 7.4 (20 mM HEPES, 135 mM NaCl). The concentration of compound **I** was 6.0×10^{-5} mol/L, and that of Cu^{2+} was 1.0×10^{-5} mol/L.
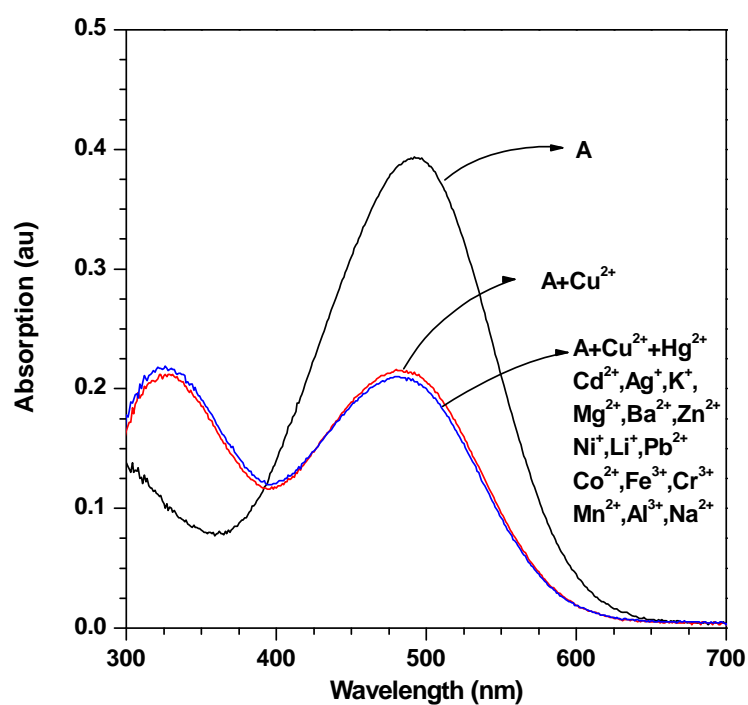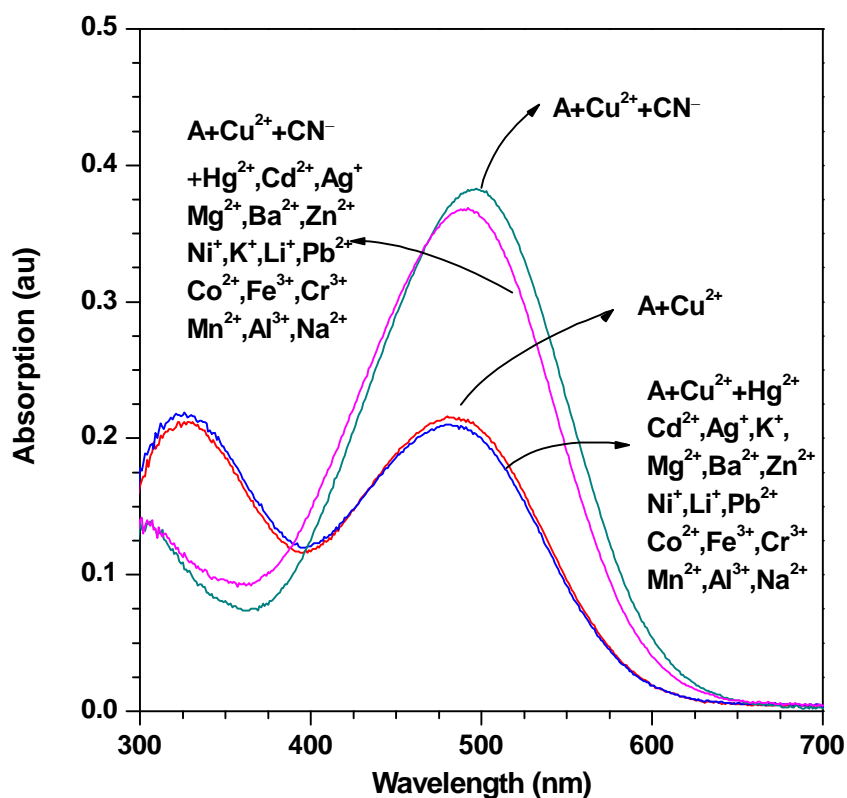
Figure S6. UV-vis spectra of complex **I** (A) at the presence of different cations mixture (1.0×10^{-5} mol/L) in water at pH 7.4 (20 mM HEPES, 135 mM NaCl). The concentration of compound **I** was 6.0×10^{-5} mol/L (Cu^{2+}: 1.0×10^{-5} mol/L; CN^-: 6.0×10^{-5} mol/L).

Figure S7. Different solutions of compound **I** and copper ions (1.0×10^{-4} and 5.0×10^{-5} mol/L, respectively) in water at pH 7.4 (20 mM HEPES, 135 mM NaCl) in the presence of different concentrations of CN^-. From left to right ($\times10^{-5}$ mol/L): no copper ions and no cyanide, 0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0 and 9.0.

Figure S8. From left to right: compound **I** (1.0×10^{-4} mol/L), compound **I** (1.0×10^{-4} mol/L)+ Cu^{2+}(5.0×10^{-5} mol/L), compound **I** (1.0×10^{-4} mol/L)+ Cu^{2+}(5.0×10^{-5} mol/L)+ CN^{-}(6.0×10^{-5} mol/L) at pH 7.4 (20 mM HEPES, 135 mM NaCl).

Figure S9. Different solutions of compound **I** and copper ions in water at pH 7.4[20 mM HEPES, 135 mM NaCl] (1.0×10^{-4} and 5.0×10^{-5} mol/L, respectively) in the presence of anion (6.0×10^{-5} mol/L). From left to right: no copper ions and no anion; no anion, CN^{-}, SCN^{-}, F^{-}, ClO_4^{-}, HSO_4^{-}, Br^{-}, $H_2PO_4^{-}$, NO_2^{-}, SO_4^{2-}, I^{-}, Cl^{-}, IO_3^{-}, the mixture.