Supporting Information

for

A Ternary System Based on Fluorophore-Surfactant assemblies-Cu^{2+} for Highly Sensitive and Selective Detection of Arginine in Aqueous Solution

Jianhua Cao, Liping Ding, Wenting Hu, Xiangli Chen, Xiao Chen, Yu Fang*

Key Laboratory of Applied Surface and Colloid Chemistry of Ministry of Education, School of Chemistry and Chemical Engineering, Shaanxi Normal University, Xi'an 710062, P. R. China

*Corresponding author: dinglp33@snnu.edu.cn

Fluorescence quantum yield measurement

The quantum yeild (Φ) of the DIlSD fluorophore in the four different aqueous media was determined by using quinoline sulfate in 0.1 M H_2SO_4 aqueous solution as a reference (Φ_R = 0.557). An excitation of 350 nm was used, and fluorescence emission was integrated from 370 to 680 nm. Φ was calculated from the following equation,

$$\Phi_F = \Phi_R \frac{\int I}{\int I_R} \frac{A_R}{A} \frac{n^2}{n_R^2} \qquad (1)$$

where the subscripts F and R represent the fluorophore and reference respectively, Φ, ∫I, A, and n are flurorescenc quantum yield, integrated fluorescence intensity, absorbance, and refractive index of the solvent, respectively.

Determination of the detection limit of DIlSD/SDS/Cu^{2+} to Arg

The detection limit (DL) of the sensing system has been determined according to the following functions:

$$s_b = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}} \qquad (2)$$

$$S = \frac{\Delta I}{\Delta c} \qquad (3)$$

$$DL = \frac{3 s_b}{S} \qquad (4)$$

The standard deviation (S_b) regarding the present sensing system was determined by measuring the fluorescence intensities (x_i) of the sensing system for more than 11 times, and calculating the corresponding average intensity ($\bar{x}$) firstly. By fitting the intensity data and the average intensity as obtained from equation (2), the value of the standard deviation (S_b) was obtained.

Then, the sensing system was titrated with different concentrations of Arg, and then the fluorescence emission intensities were recorded. Corresponding variations in intensity (ΔI) and those in Arg concentration (Δc) were calculated. By fitting the data into equation (3), S value for the present system was obtained.

Finally, with the values of S_b and S as determined, the DL for the present system was calculated according to equation (4).

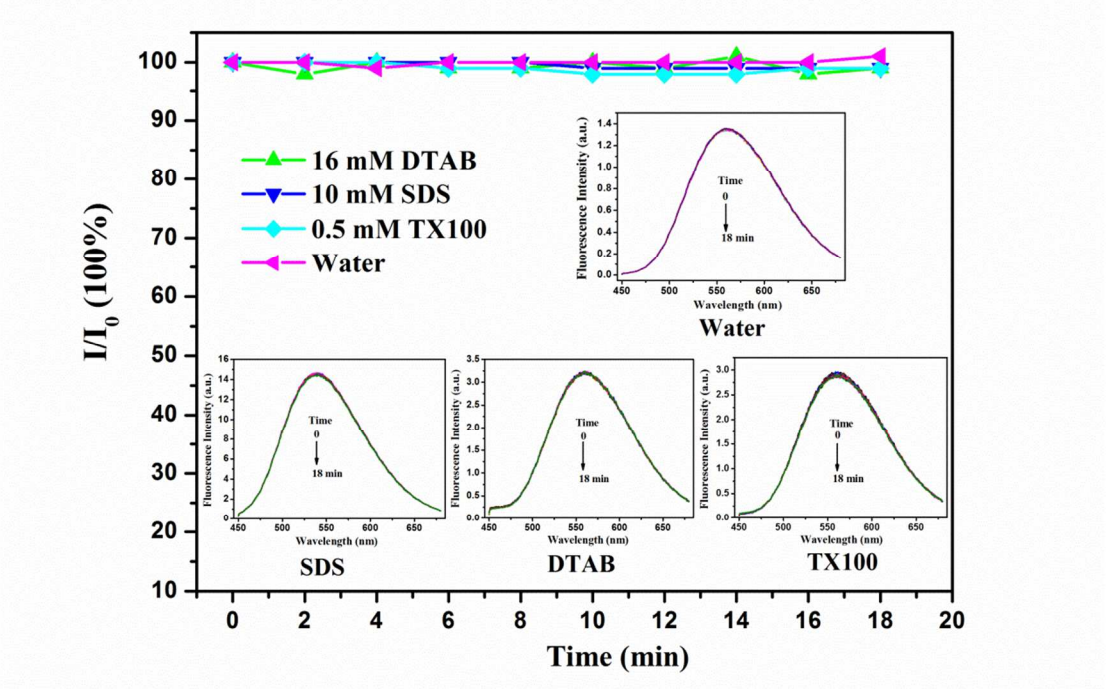

Figure S1. Fluorescence stability of DIlSD (10 μM) in different aqueous solutions buffered with 10 mM HEPES (pH 7.4). Insets: Fluorescence emission spectra of DIlSD (10 μM) in different aqueous media along scanning time.

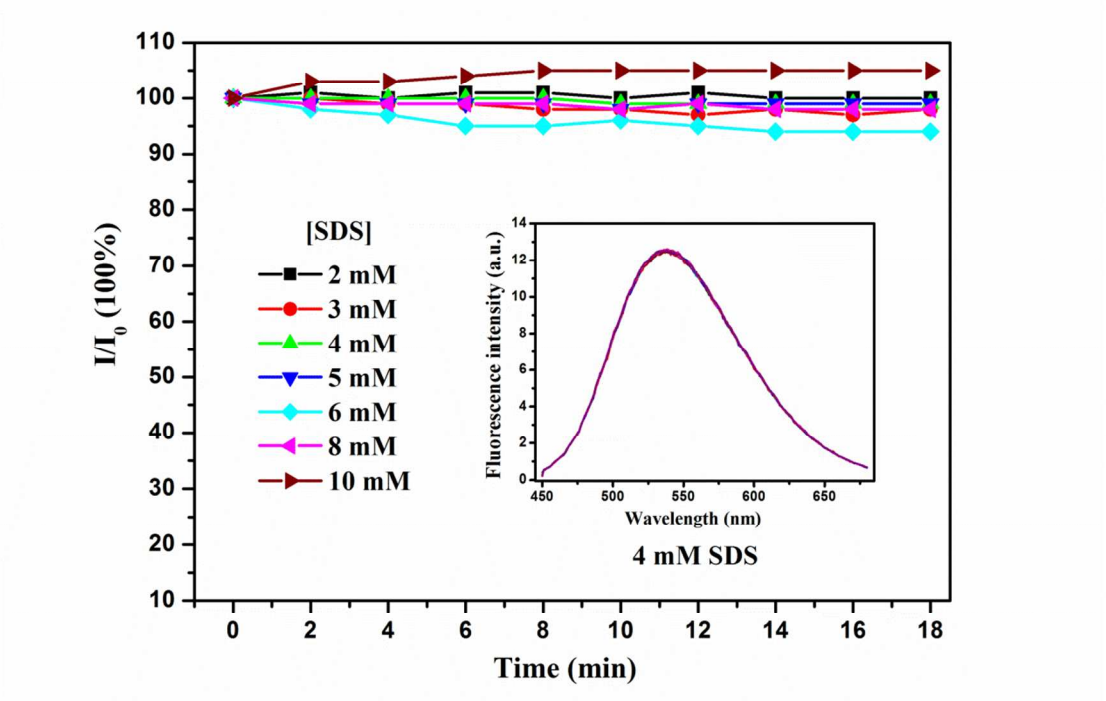

Figure S2. Fluorescence stability of DIlSD (10 μM) in different concentrated SDS aqueous solutions (10 mM HEPES, pH 7.4) along scanning time. Inset: Fluorescence emission spectra of DIlSD (10 μM) in 4 mM SDS aqueous solution along scanning time.

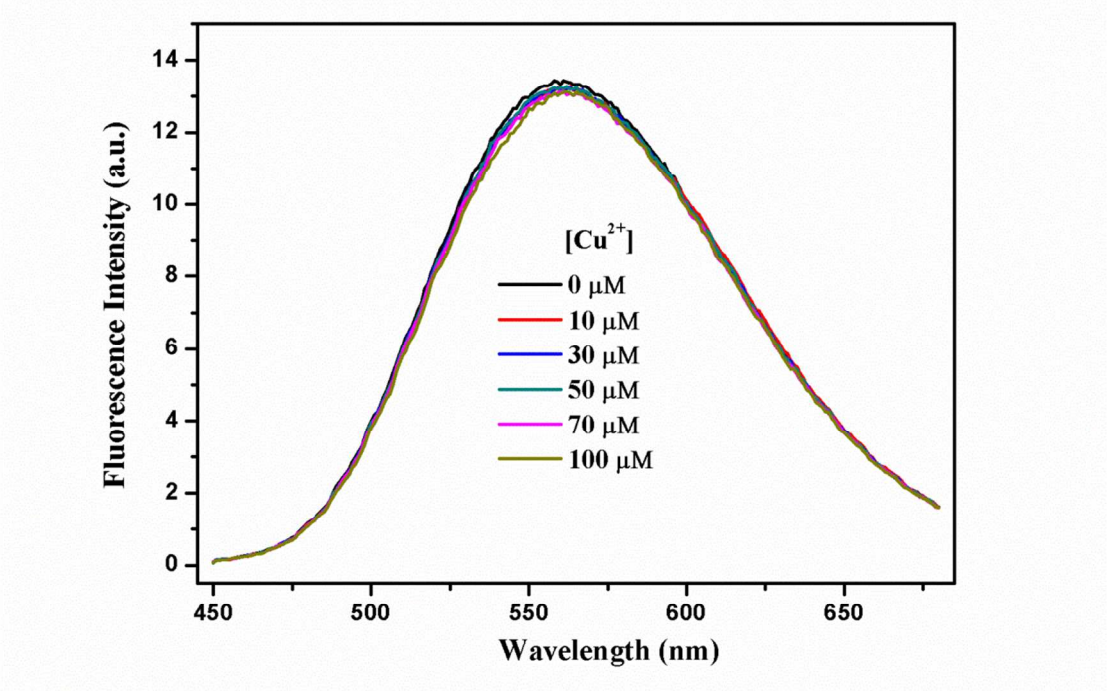

Figure S3. Fluorescence spectra of DIlSD (10 μM) in HEPES buffer solution (10 mM, pH 7.4) upon the titration of Cu^{2+}. (λex = 350 nm)

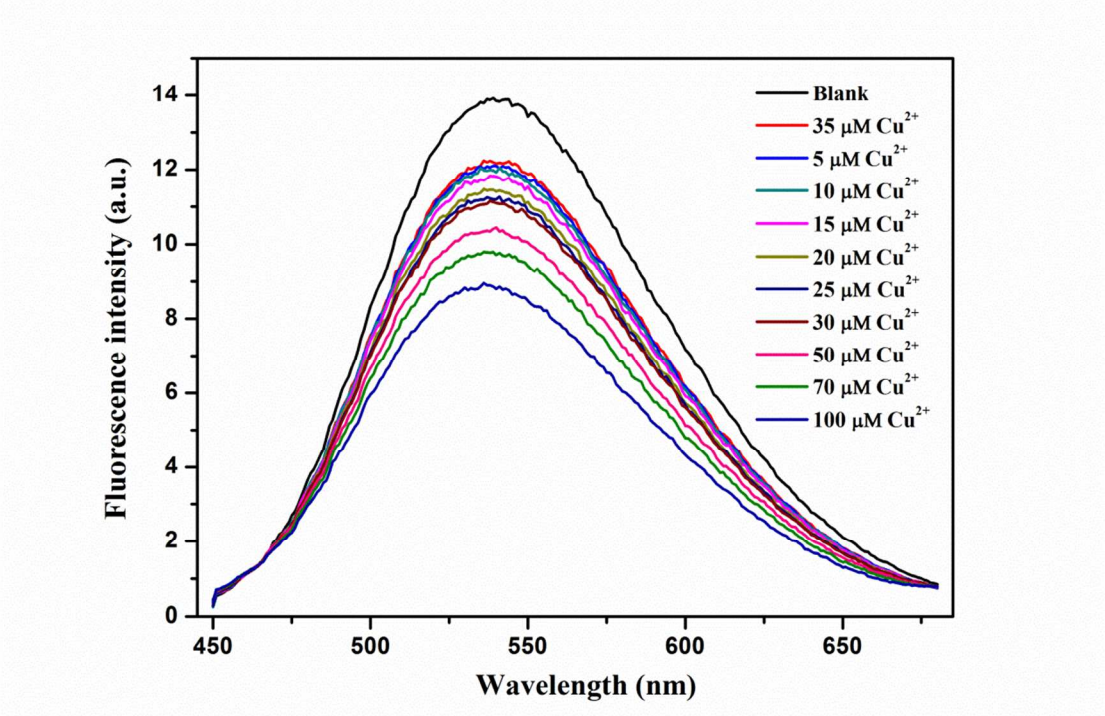

Figure S4. Fluorescence variation by titration of Cu^{2+} to the 35 μM Cu^{2+}-quenched DIlSD/SDS sensor system ([DIlSD] = 10 μM; [SDS] = 4 mM, λex = 350 nm)

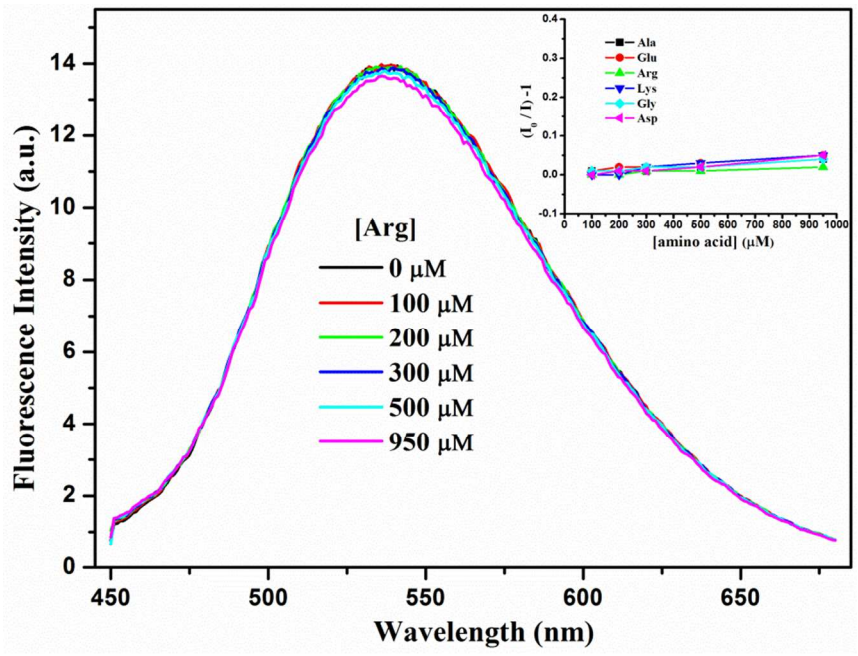

Figure S5. Fluorescence emission spectra of DIlSD/SDS system upon titration of Arg in the absence of Cu^{2+} ([DIlSD] = 10 μM; [SDS] = 4 mM, λex = 350 nm)

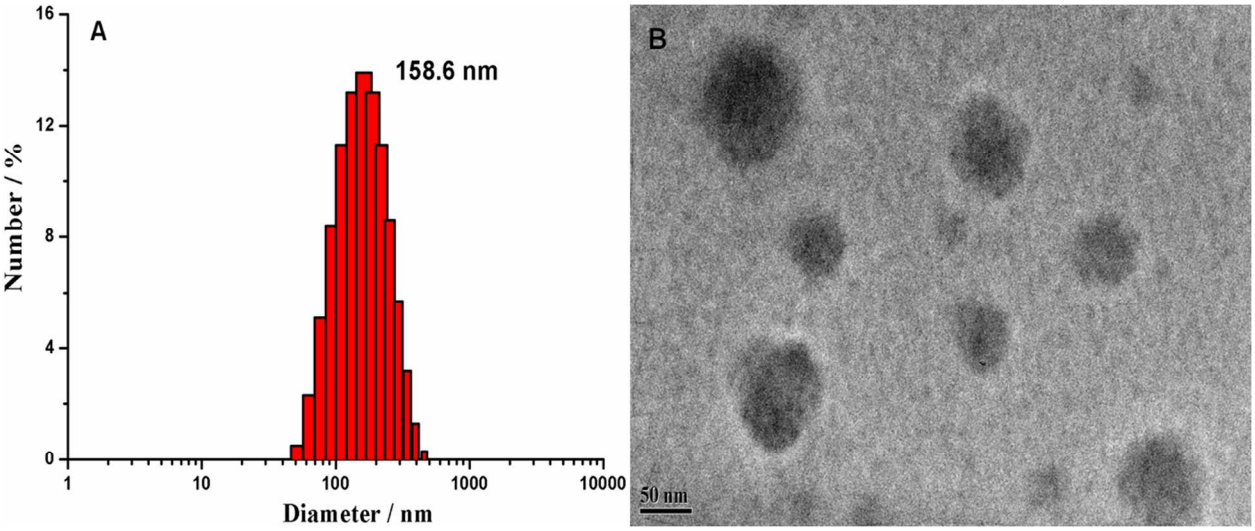

Figure S6. Particle size distribution (a) and TEM image (b) of DIlSD/SDS/Cu^{2+} ternary system in HEPES buffer solution (10 mM, pH 7.4)

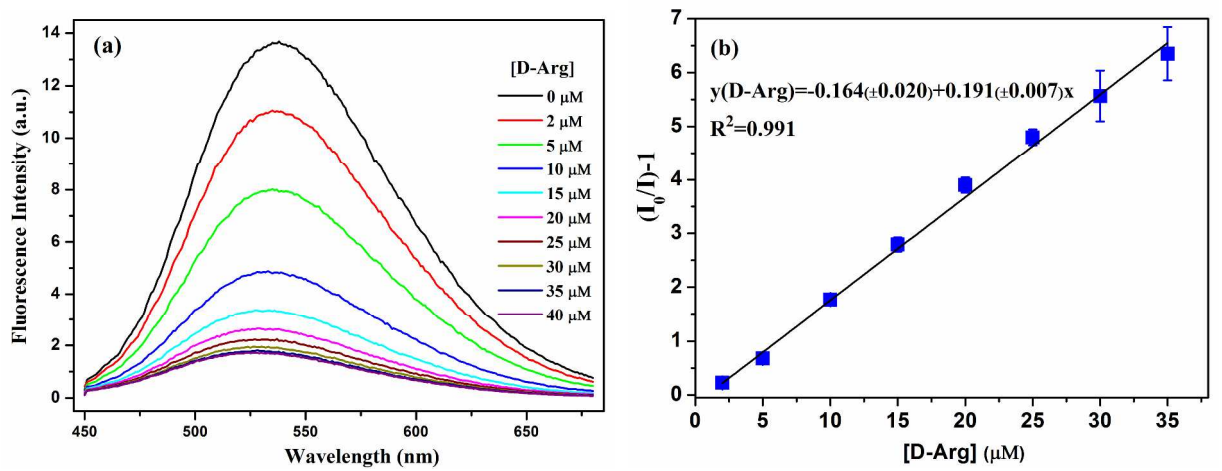

Figure S7. (a) Fluorescence emission spectra of DIlSD/SDS/Cu^{2+} upon the titration of D-Arg (λex = 350 nm); (b) Stern-Volmer plot of fluorescence variation of DIlSD/SDS/Cu^{2+} as a function of D-Arg concentration.

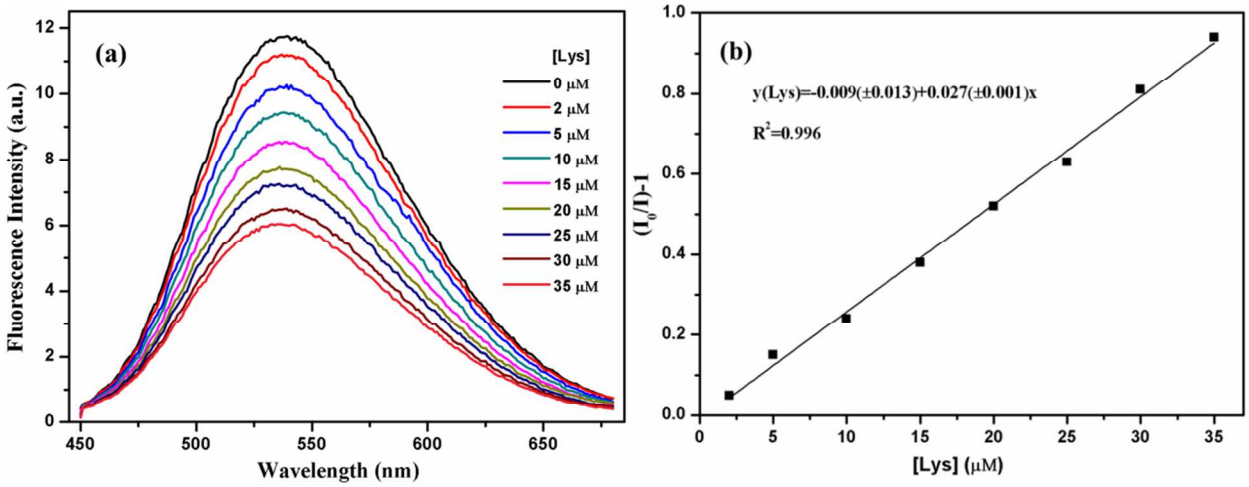

Figure S8. (a) Fluorescence emission spectra of DIlSD/SDS/Cu^{2+} upon the titration of Lys (λex = 350 nm); (b) Stern-Volmer plot of fluorescence variation of DIlSD/SDS/Cu^{2+} as a function of Lys concentration.

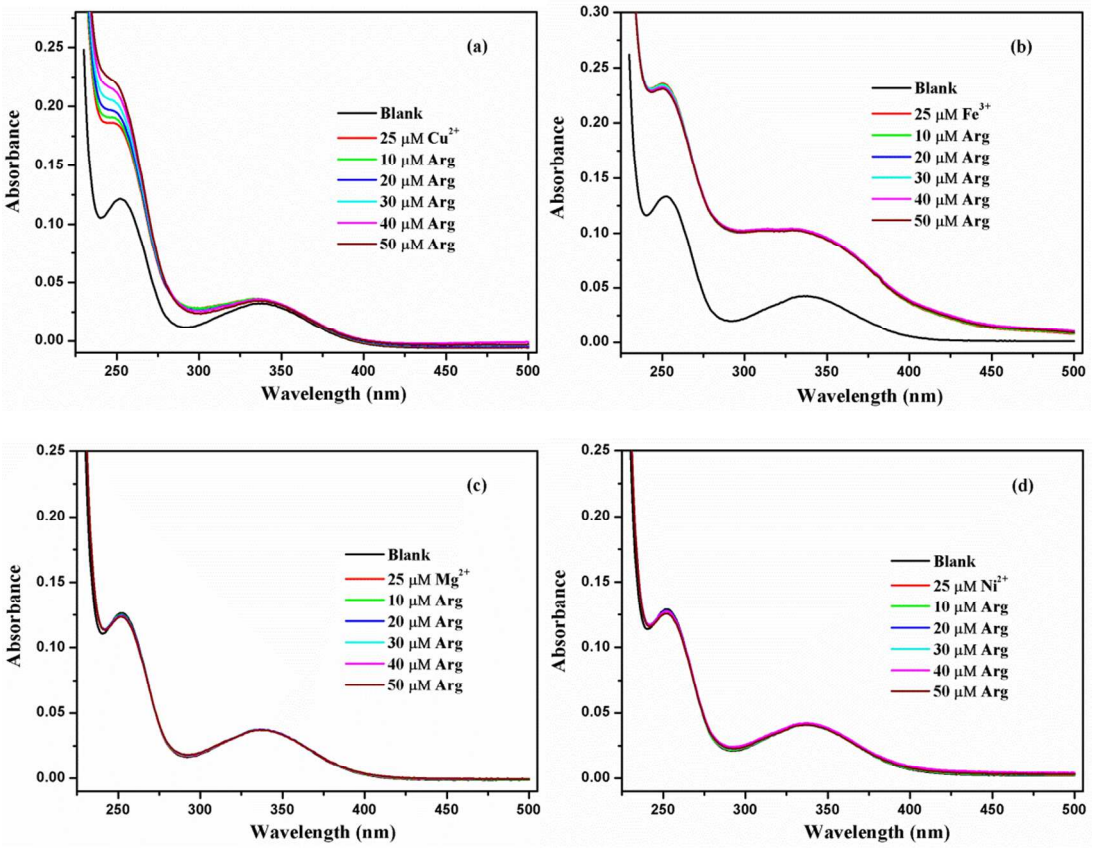

Figure S9. UV-vis absorption spectra of DIlSD/SDS upon the titration of Arg in the presence of 25 μM of Cu^{2+} (a), Fe^{3+} (b), Mg^{2+} (c), and Ni^{2+} (d).

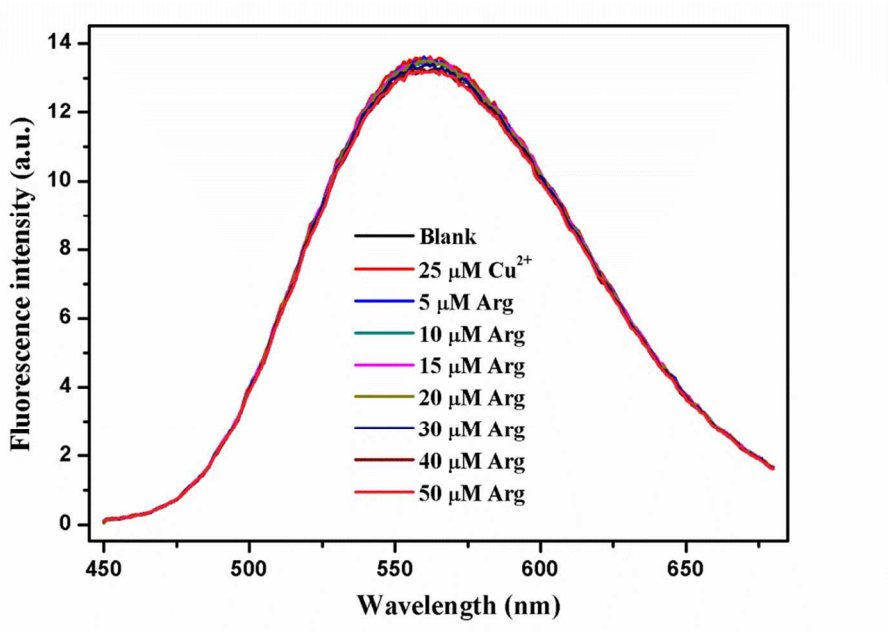

Figure S10. Fluorescence emission spectra of DIlSD/Cu^{2+} (10 μM/25 μM) upon the titration of Arg.

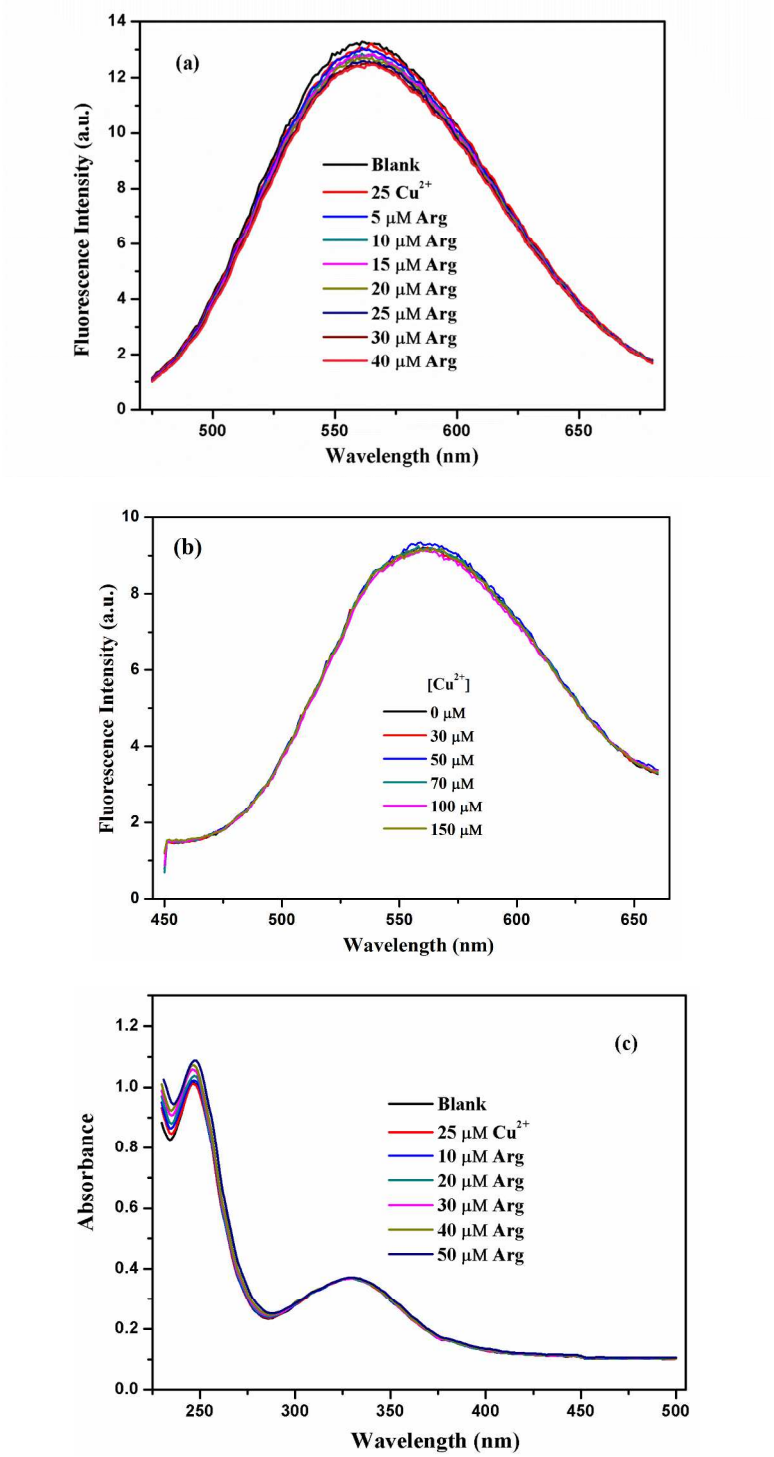

Figure S11. (a) Fluorescence emission spectra of DBrSD/SDS/Cu^{2+} (10 μM/4 mM/25 μM) upon the titration of Arg (λex = 350 nm). (b) Fluorescence emission spectra of DBrSD/SDS (10 μM/4 mM) upon the titration of Cu^{2+} (λex = 350 nm). (c) UV-vis absorption of DBrSD/SDS (10 μM/4 mM) upon the titration of Arg in the presence of Cu^{2+} (25 μM).

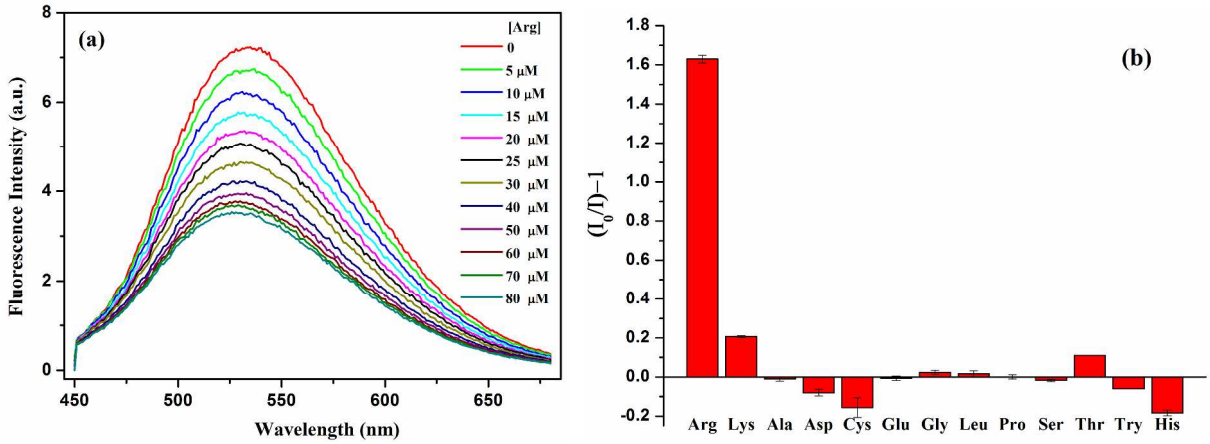

Figure S12. (a) Fluorescence emission spectra of DIlSD/SDS/Cu^{2+} (10 μM/4 mM/25 μM) upon the titration of Arg in dilluted bovine serum solution (10 mM HEPES, pH 7.4) (λex = 350 nm). (b) Fluorescence variation of DIlSD/SDS/Cu^{2+} to various amino acids (30 μM) in dilluted bovine serum solution (10 mM HEPES, pH 7.4).