Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Green synthesis of fluorescent carbon quantum dots for the detection of mercury (II) and glutathione

Daraksha Bano, Vijay Kumar, Vikas Kumar Singh, Syed Hadi Hasan*

Nano-Material Research Laboratory, Department of Chemistry, Indian Institute of Technology (BHU), Varanasi -221005, U.P., India.

***Corresponding author's details:**

E-mail; shhasan.apc@itbhu.ac.in, vijuevs@gmail.com

Phone No.: +91-542-6702861

Mobile No.: +91 9839089919

Calculations:

Quantum yield measurement

The quantum yield (QY) is measured by using a quinine sulfate (QS) as a standard having QY equal to 0.54 in 0.1 M H_2SO_4.

$$QY_x = QY_s \cdot \frac{I_x}{I_s} \cdot \frac{A_s}{A_x} \cdot \frac{\eta_x^2}{\eta_s^2} \quad \textbf{(1)}$$

Where 'QY' stands for the FL quantum yield, 'I' used for the integrated FL emission intensity at the excitation of 360 nm, 'A' denotes the optical density, 'η' is the refractive index of a given solvent (for the distilled water $\eta_x/\eta_s = 1$), 'x' for the synthesized CQDs, and 's' used for the standard used.

Stern-Volmer quenching constant

The quenching efficiency of the synthesized CQDs was calculated by the following Stern-Volmer (SV) quenching equation:

$$F_0/F = 1 + K_{SV}[Hg^{2+}] \quad \textbf{(2)}$$

Where 'F' used for the FL emission intensity at various concentrations of absorber Hg^{2+}, F_0 being the absorber at $[Hg^{2+}] = 0$, and K_{SV} is the SV quenching constant

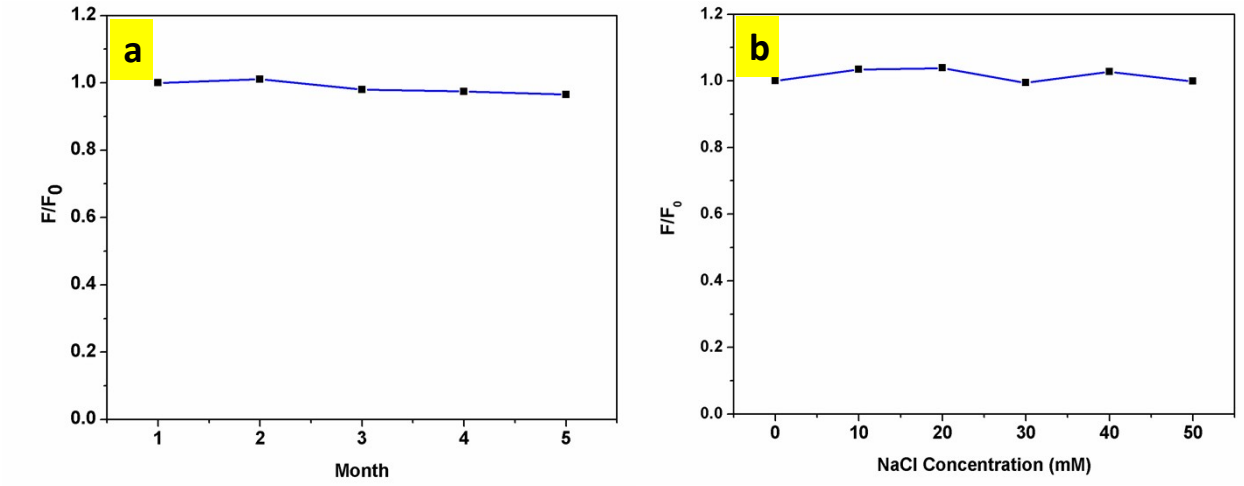

Figure S1 (a) Photostability of CQDs, showing the fluorescence of CQDs remain almost same even after incubating 5 months at 4 °C, (b) stability under the high ionic strength after the addition of different concentration of NaCl (0, 10, 20, 30, 40, 50 mM).

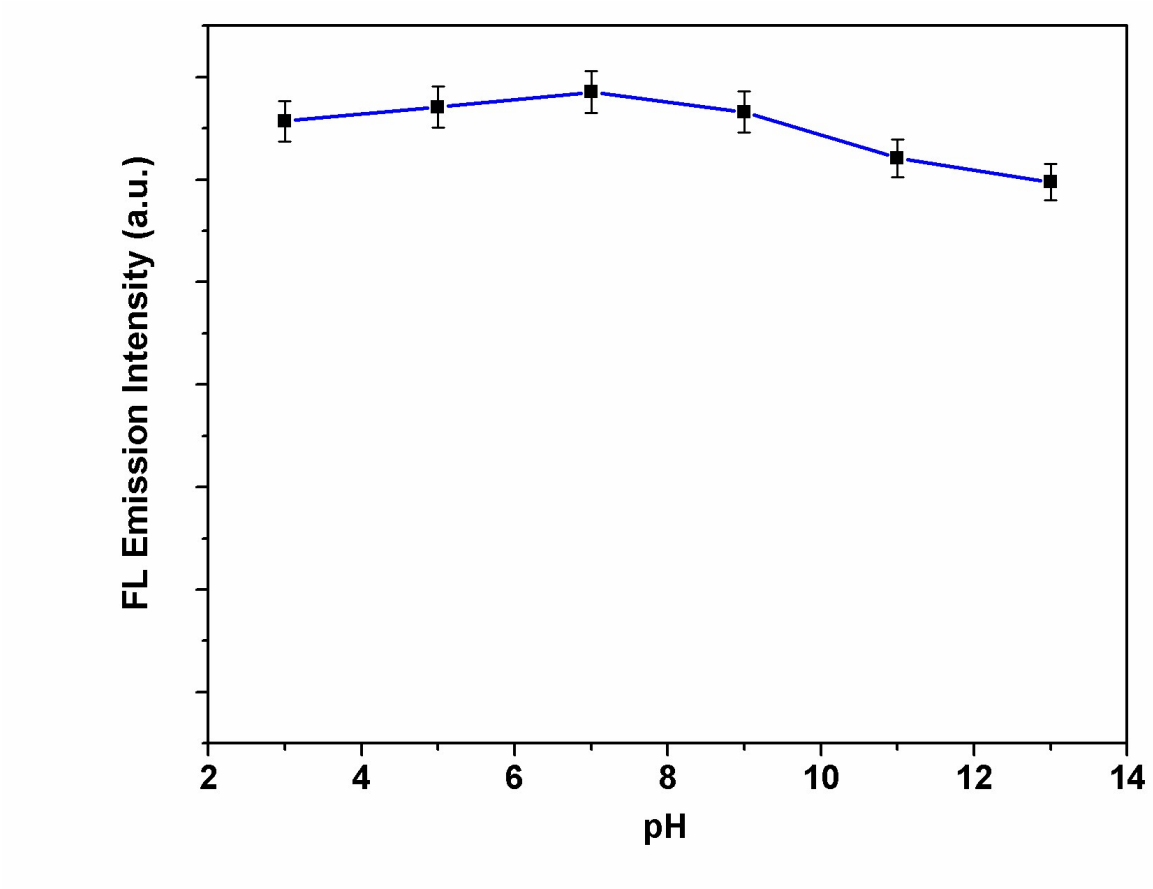

Figure S2 represents the optimization of pH ranges from 3 to 13, showing that prepared CQDs is independent of the pH used.

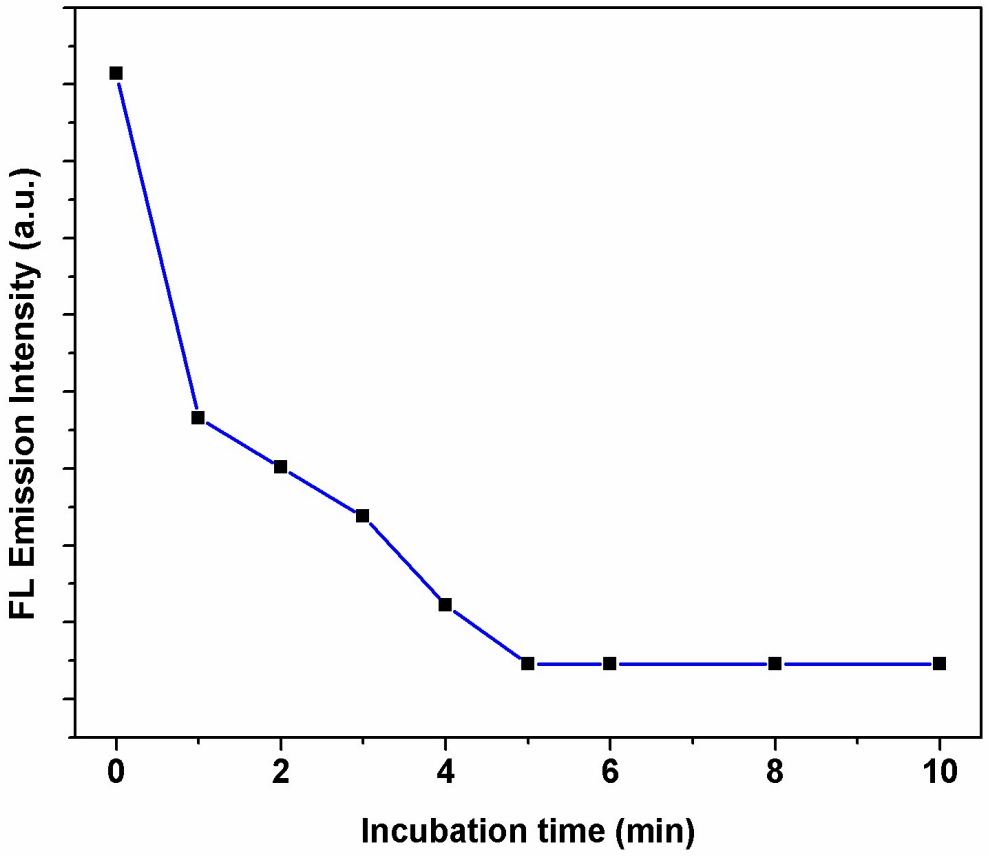

Figure S3 The kinetic stability of CQDs-Hg^{2+} system, indicating 5 min time is optimum to complete the quenching mechanism.

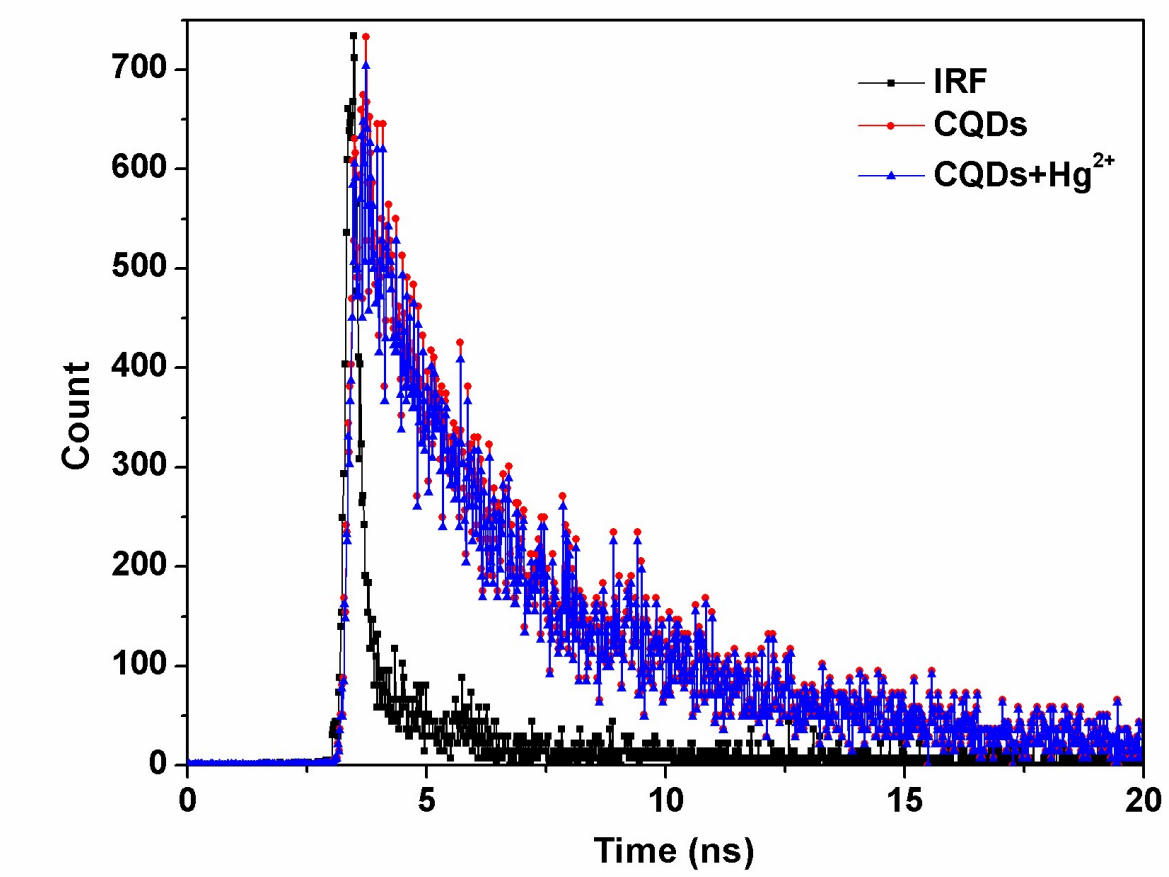

Figure S4 Fluorescence decay curve for the Hg^{2+} detection analysis.

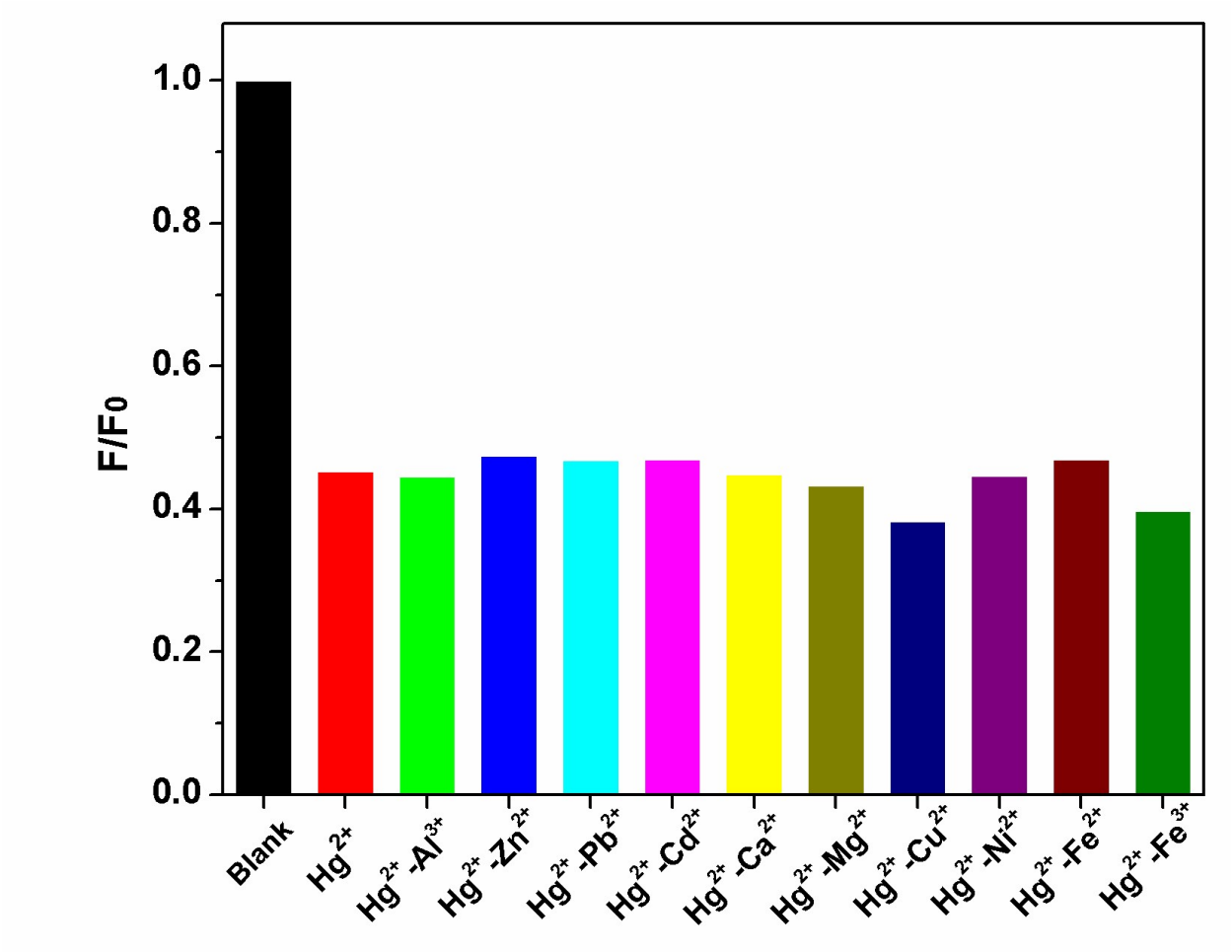

Figure S5 Interference study under various conditions $[Hg^{2+}]$ = 0.05 mM, $[Al^{3+}]$ = $[Pb^{2+}]$ = $[Ca^{2+}]$, $[Mg^{2+}]$ = 5 mM, $[Zn^{2+}]$ = $[Cd^{2+}]$ = $[Ni^{2+}]$ = $[Fe^{2+}]$= 10 mM, $[Cu^{2+}]$ = $[Fe^{3+}]$ = 0.01 mM.

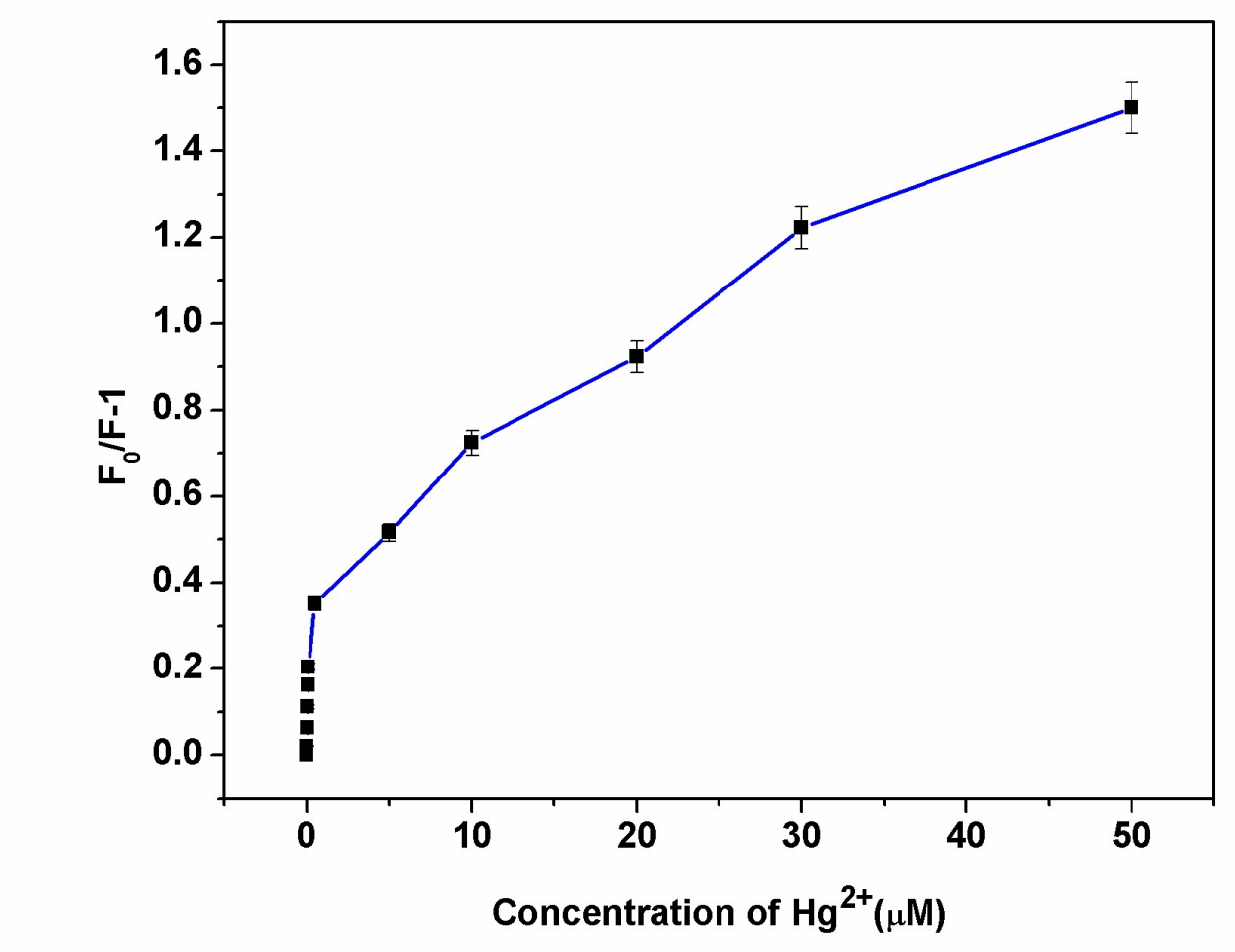

Figure S6 The relationship between the FL emission intensity variation and the Hg^{2+} concentration.

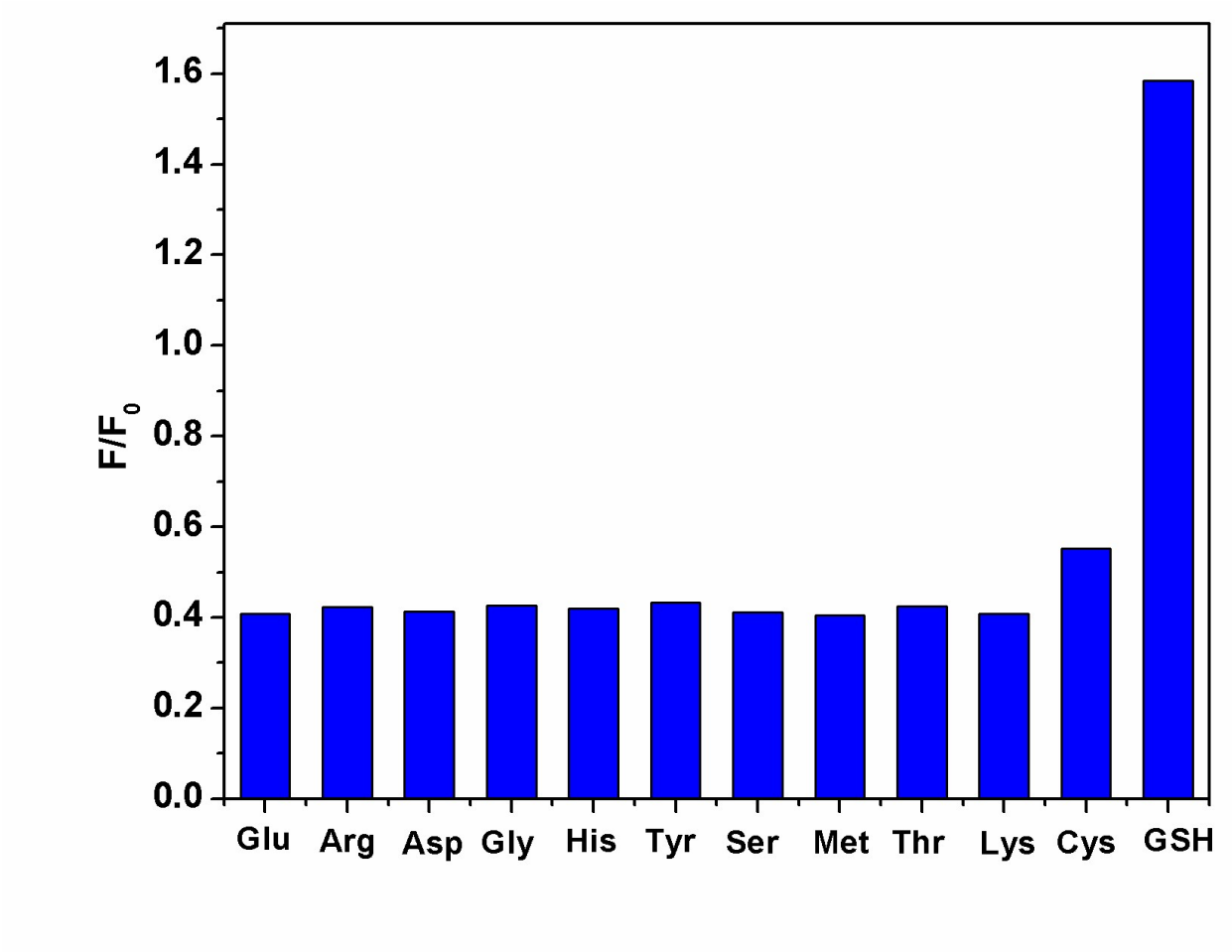

Figure S7 The fluorescence response of CQDs/Hg^{2+} solution towards different essential amino acids of concentration 40 μM where F and F_0 are fluorescence intensities of CQDs/Hg^{2+}/amino acid and CQDs respectively.