Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Facile synthesis of cysteine-functionalized graphene quantum dots for a fluorescence probe for mercury ions.

Tran Van Tam, Soon Ho Hong*, Won Mook Choi*

School of Chemical Engineering, University of Ulsan, 93 Daehak-ro Nam-gu, Ulsan 680-749, Republic of Korea.

* E-mail addresses: shhong@ulsan.ac.kr (S.H. Hong), wmchoi98@ulsan.ac.kr (W. M. Choi)

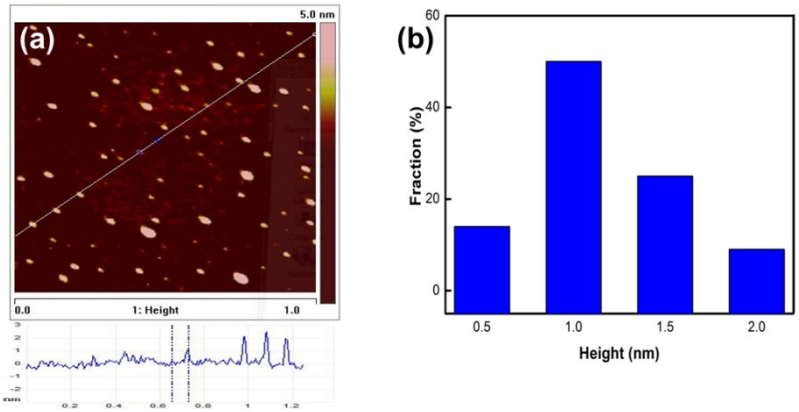

Fig. S1 (a) AFM image and (b) the height distributions of cys-GQDs.

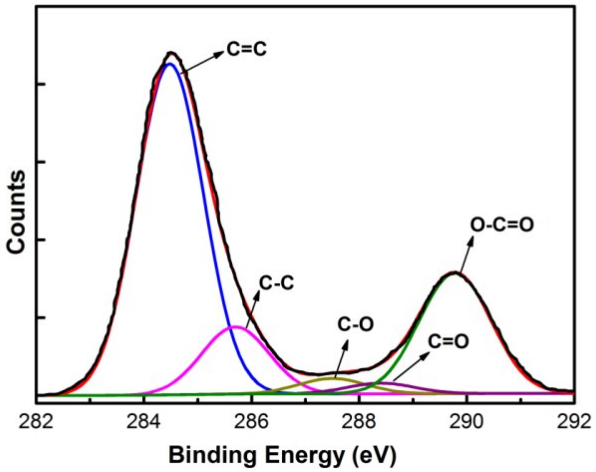

Fig. S2 Core level C1s XPS spectrum of GQDs.

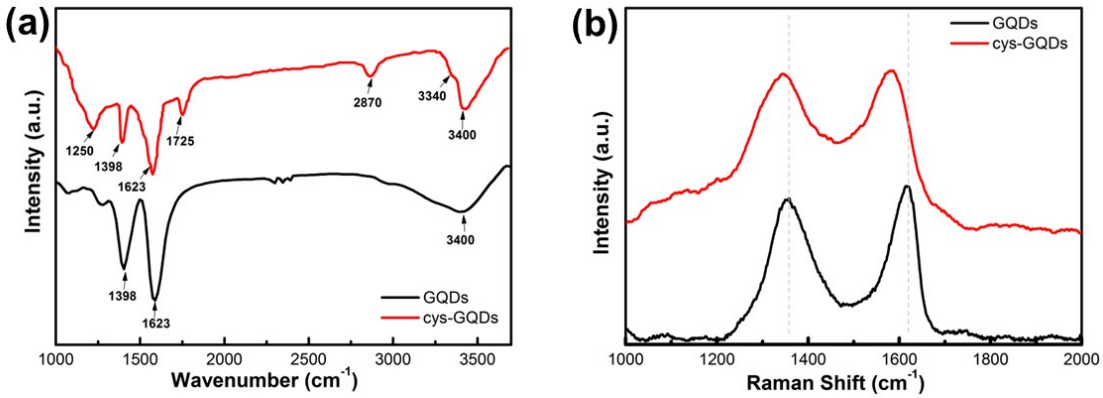

Fig. S3 (a) FT-IR Spectroscopy and (b) Raman Spectroscopy of as-produced GQDs and cys-GQDs.

The Quantum yield of cys-GQDs

The quantum yield (Q) of GQDs and cys-GQDs were calculated using following equation. Quinine sulfate in 0.5 M H_2SO_4 was a reference fluorophore of known quantum yield (Q= 0.54 at 340 nm). I is the measured integrated emission intensity, n is the refractive index of solvent, and A is the absorption at 340nm. The concentration of GQDs, cys-GQDs and quinine sulfate are the same at 0.003 mg/ml. Excitation wavelengths was 365 nm.

$$Q = Q_A \frac{I\, A_R n^2}{I_R\, A\, n_R^2}$$

Table S1. The quantum yield of GQDs and cys-GQDs

Sample	Emission intensity (I)	Absorption (A)	Refractive index (n)	Quantum yield (Q)
Quinine sulfate	30110	1.5906	1.33	0.54
cys-GQDs (0.8 wt%)	6073	0.62515	1.33	0.28
GQDs	4523	1.4675	1.33	0.088

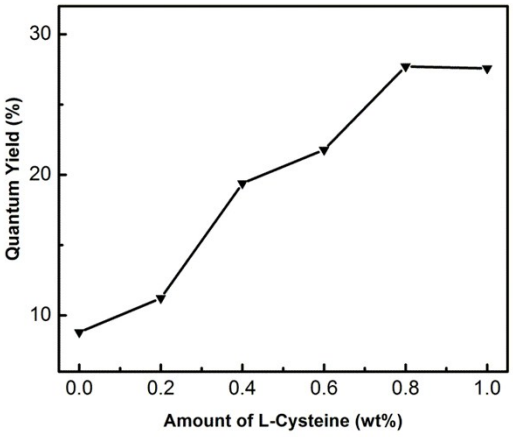

Fig. S4 Quantum yied of as-prepared cys-GQDs with different amount of L-cysteine.

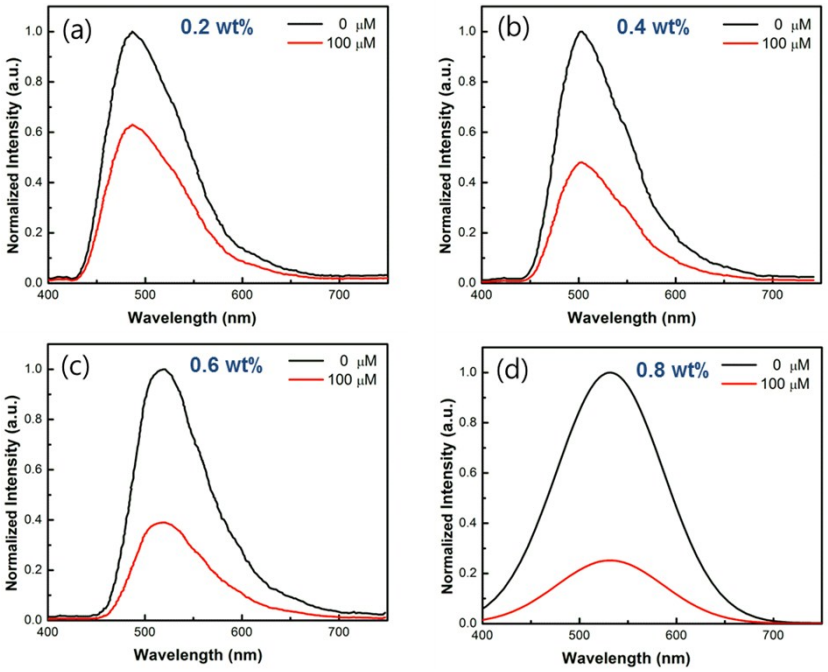

Fig. S5 Fluorescence intensity changes of cys-GQDs with different amount of L-Cysteine (0.2, 0.4, 0.6, 0.8 wt%) in the presence of 100 μM of Hg^{2+}, respectively.

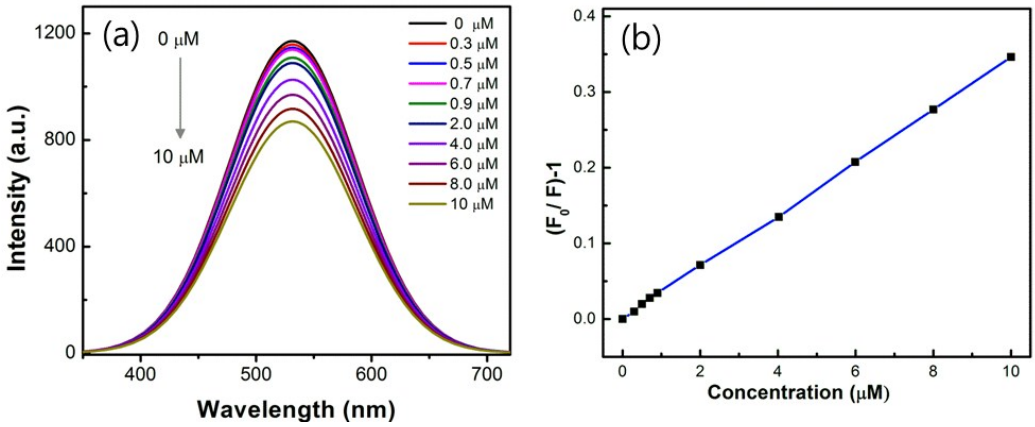

Fig. S6 (a) Fluorescence spectra of cys-GQDs in the river water upon various concentrations of Hg^{2+} and (b) the linear relationship between the fluorescence quenching efficiency and Hg^{2+}concentration.