Electronic Supplementary Information

A novel fluorescent turn-on biosensor based on QDs@GSH-GO fluorescence resonance energy transfer for sensitive glutathione *s*-transferases sensing and cellular imaging

Lifang Chang[a], Xiwen He[a], Langxing Chen*[a,b], and Yukui Zhang[a,c]

[a]Research Center for Analytical Sciences, College of Chemistry, Tianjin Key Laboratory of Biosensing and Molecular Recognition, State Key Laboratory of Medicinal Chemical Biology, Nankai University, Tianjin 300071, China.

[b]Collaborative Innovation Center of Chemical Science and Engineering (Tianjin), Tianjin 300071, China.

[c]Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian, 116023, China..

*Fax: +86-0-22-23502458; E-mail:lxchen@nankai.edu.cn.

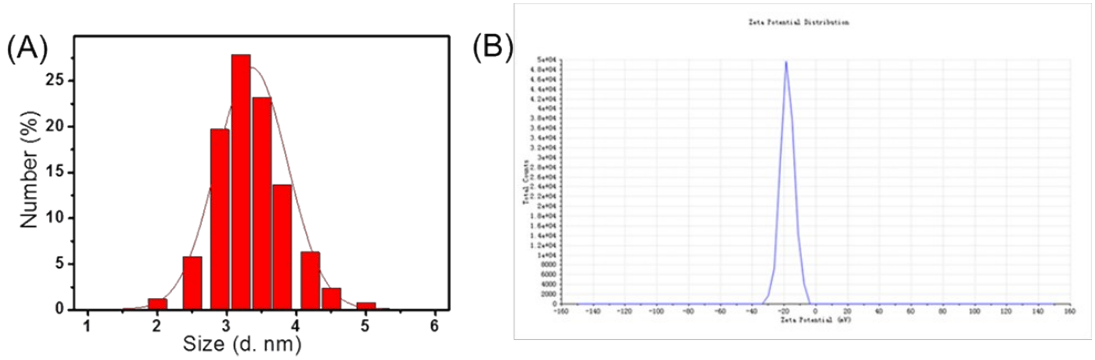

Fig. S1 The statistics of Mn-doped ZnS QDs diameters (A) and the zeta potential (B).

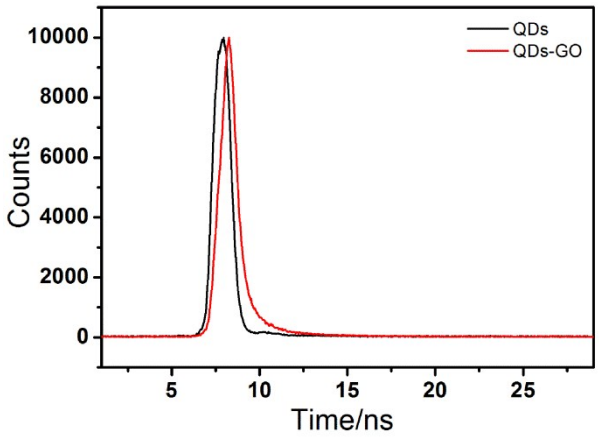

Fig. S2 The decay curves of QDs (black line) and QDs-GO (red line) at 607 nm emission.

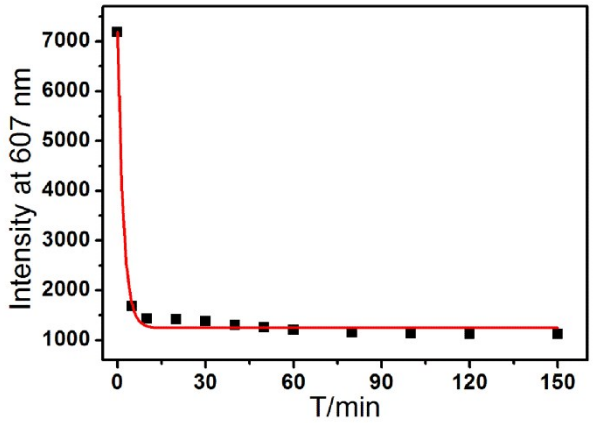

Fig. S3 Effect of the interaction time between QDs@GSH and GO on the fluorescence intensity. The concentrations of the QDs@GSH and GO were 50 mg L^{-1} and 0.24 mg mL^{-1}, respectively.

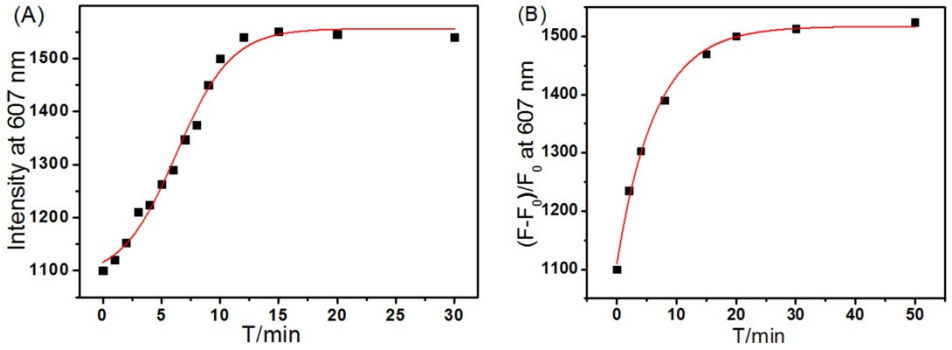

Fig. S4 Plot of fluorescence emissions (607 nm) against interaction time of the QDs-GO system in the presence of 100 nM GST (A) and 1 nM ATP6V1F (B) in 10 mM PBS (pH = 7.4).

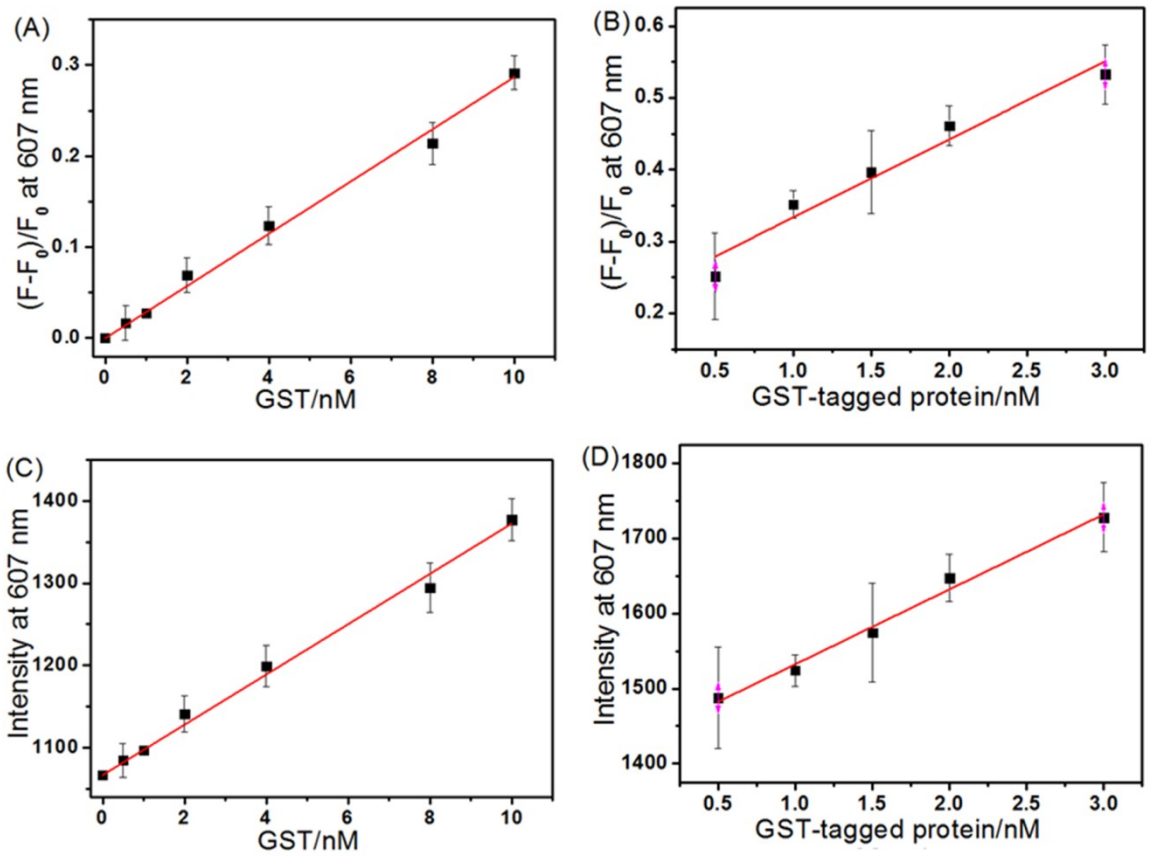

Fig. S5 Linear relationships between the fluorescence intensity and the concentrations of GST in the range of 0.0-10.0 nM (R = 0.996) (A) and ATP6V1F in the range of 0.5-3.0 nM (R = 0.990) (B). The error bars represented the standard deviations of three independent experiments. (C) Fluorescence emission at 607 nm for the QDs@GSH-GO system at different concentrations of GST (0, 0.5, 1.0, 2.0, 4.0, 8.0, 10 nM) added. A linear range of GST could be obtained in the 0.0-10.0 nM (y = 1066.5 + 30.6x, R = 0.996). (D) Fluorescence emission at 607 nm for the QDs@GSH-GO system at different concentrations of ATP6V1F (0.5, 1.0, 1.5, 2.0, 3.0 nM) added. A linear range of ATP6V1F could be obtained in the 0.5-3.0 nM (y = 1442.2 + 88.5x, R = 0.990). The detection limits of the QDs-GO system for both GST and ATP6V1F were then measured to be 2.1×10^{-10} M and 0.72 $\times10^{-10}$ M, respectively. The values were calculated with the equation: detection limit = $3\sigma/m$, where σ is the standard deviation of blank measurement (σ = 2.12, derived from nine measurements (1112, 1116, 1115, 1114, 1118, 1115, 1116, 1114, 1111)), *m* is the slope between intensity versus sample concentration.

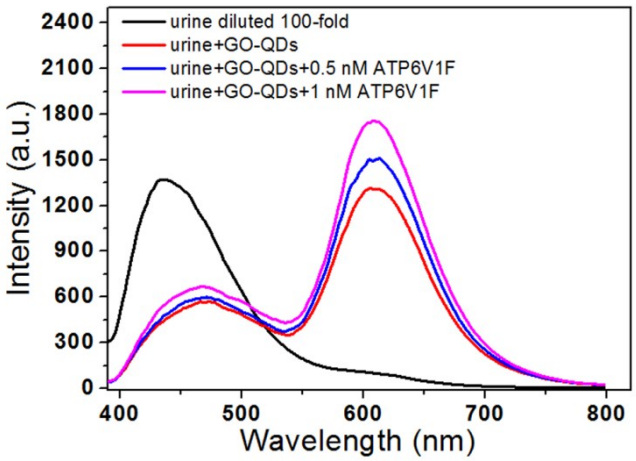

Fig. S6 Fluorescence spectra of urine sample (black), QDs@GSH-GO adding into urine sample (red), QDs@GSH-GO adding into urine sample spiked 0.5 nM ATP6V1F (blue) and 1.0 nMATP6V1F (pink). All urine samples conducted in this experiment were diluted by 100-fold with 10 mM PBS buffer (pH = 7.4).

Table S1 The lifetimes of QDs and QDs-GO FRET system

	χ^2	τ_1 (ns)	Rel%	τ_2 (ns)	Rel%	τ (ns)
QDs	1.217	0.1337	15.26	2.1872	84.74	1.87
QDs-GO	1.157	0.5133	47.98	2.1863	52.02	1.38

χ^2 is defined as a coefficient; τ_1 and τ_2 stand for the two different lifetimes of the QDs, respectively; Rel% is the relative amount of the two lifetimes; τ is the average lifetime.