## Supporting Information

CdTe Quantum Dots (QDs) Based Kinetic Discrimination of Fe<sup>2+</sup> and Fe<sup>3+</sup>, and CdTe QDs-Fenton Hybrid System for Sensitive Photoluminescent Detection of Fe<sup>2+</sup> in Water Samples

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Figure S1 Fluorescence emission and UV absorption spectra of GSH-CdTe QDs.



Figure S2 Fluorescence spectra of the GSH-CdTe QDs at various concentrations (3-120 nM).



**Figure S3** Transition metal ions induced time-dependent fluorescence change of GSH-CdTe QDs (3.4 nm, 30 nM). Concentration:  $AI^{3+}$ , 200  $\mu$ M;  $Zn^{2+}$ , 100  $\mu$ M;  $Mn^{2+}$ , 10  $\mu$ M;  $Cu^{2+}$ , 1  $\mu$ M;  $Co^{2+}$ , 10  $\mu$ M;  $Ni^{2+}$ , 20  $\mu$ M. All measurements were carried out in Tris-HCl buffer solution (pH 7.4, 10 mM).



**Figure S4** Time course of the fluorescence of TGA-CdTe (A, 45 nM) and MPA-CdTe (B, 45 nM) QDs in Tris-HCl buffer solution (10 mM, pH 7.4) in the presence of Fe<sup>2+</sup> (10  $\mu$ M) and Fe<sup>3+</sup> (10  $\mu$ M).



**Figure S5**  $Fe^{2+}$  (10 µM) and  $Fe^{3+}$  (10 µM) induced time-dependent fluorescence change of GSH-CdTe QDs (3.4 nm, 30 nM) in a simulated matrix (K<sup>+</sup>, Na<sup>+</sup>, Ca<sup>2+</sup>, Mg<sup>2+</sup>, total concentration of 50 µM).



**Figure S6** Cyclic voltammograms of the Au electrode in Tris-HCl buffer solution (pH 7.4) containing 3  $\mu$ M GSH-CdTe QDs (3.4 nm). The potential sweep direction was -0.18 > -1.53 > 1.25 > -0.18 V.



**Figure S7** pH-dependent fluorescence quenching (left) of GSH-CdTe QDs (3.4 nm, 30 nM) in the presence of 0.1  $\mu$ M Fe<sup>2+</sup> and 10  $\mu$ M H<sub>2</sub>O<sub>2</sub>; and fluorescence intensity evolution of GSH-CdTe QDs (3.4 nm, 30 nM) in the absence of Fe<sup>2+</sup> and H<sub>2</sub>O<sub>2</sub>.



Figure S8 Size-dependent fluorescence quenching of GSH-CdTe QDs (30 nM) in the presence of 0.1  $\mu$ M Fe<sup>2+</sup> and 10  $\mu$ M H<sub>2</sub>O<sub>2</sub>.



Figure S9  $H_2O_2$ -concentration dependent fluorescence quenching of GSH-CdTe QDs (3.4 nm, 30 nM) in the presence of 0.1  $\mu$ M Fe<sup>2+</sup>.

Element	Concentration (g g <sup>-1</sup> )	Concentration ( $\mu$ M)
К	2.3 × 10 <sup>-6</sup>	58.8
Na	6.3× 10 <sup>-6</sup>	273.9
Са	1.5 × 10 <sup>-5</sup>	374.2
Mg	4.1 × 10 <sup>-6</sup>	168.7
AI	5 × 10 <sup>-8</sup>	1.85
Zn	2 × 10 <sup>-8</sup>	0.306
Ni	3 × 10 <sup>-10</sup>	5.1× 10 <sup>-3</sup>
Mn	7 × 10 <sup>-9</sup>	0.127
Со	1 × 10 <sup>-10</sup>	1.7 × 10 <sup>-3</sup>
Fe	4 × 10 <sup>-8</sup>	0.716
Cu	7 × 10 <sup>-9</sup>	0.11

Table S1 Average Abundance of Common Metal ions in River Water Matrix<sup>a</sup>

a: data from "Taylor, S. R.; McLennan, S. M. *The continental crust: its composition and evolution*; Blackwell Scientific Publications: New York, 1999, pp 15-16."

The electrochemical measurement of the ECL experiments was carried out with a Model LK98BII Microcomputer-based Electrochemical Analyzer (Tianjin Lanlike High-Tech Company, Tianjin, China). A traditional three-electrode system was employed with Pt wire as the counter electrode, Ag/AgCl/KCl (sat) as the reference electrode, and a modified 3mm-diameter carbon disk as the working electrode.

Table S2 Operating conditions for flow in	ijection ICP-MS
ICP-MS spectrometer	X series, Thermo Elemental, Cheshire, UK
Radio frequency power	700 W, cold plasma
Plasma gas flow rate	15.0 L min <sup>-1</sup>
Auxiliary gas flow rate	1.08 L min <sup>-1</sup>
Nebulizer gas flow rate	0.96 L min <sup>-1</sup>
Isotope	<sup>57</sup> Fe
Scanning mode	Profile TRA
Flow injection analyzer	FIA 3110, Vital instruments
Fe <sup>3+</sup> and Fe <sup>2+</sup> separation conditions	$\mathrm{Fe}^{3+}$ was solely preconcentrated with 0.2 mol L $^{-1}$ HCl, both $\mathrm{Fe}^{3+}$
	and ${\rm Fe}^{2^+}$ were preconcentrated with 0.003 mol ${\rm L}^{\text{-}1}$ HCl, then ${\rm Fe}^{2^+}$
	concentration of $\mathrm{Fe}^{2^+}$ was obtained by subtracting of $\mathrm{Fe}^{3^+}$ from
	total amount
Reagent conditions	APDC, 0.1% (m/V); washing solution, 0.002 mol $L^{-1}$ HNO <sub>3</sub> ,
	eluent, 1 mol L <sup>-1</sup> HNO <sub>3</sub>
FIA conditions	sample loading time 35 s; wash time, 30 s; elution time, 35 s; KR
	length, 0.5 m