Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Room-temperature Phosphorescence by Mn-Doped ZnS Quantum Dots Hybrid with Fenton System for Selective Detection of Fe^{2+}

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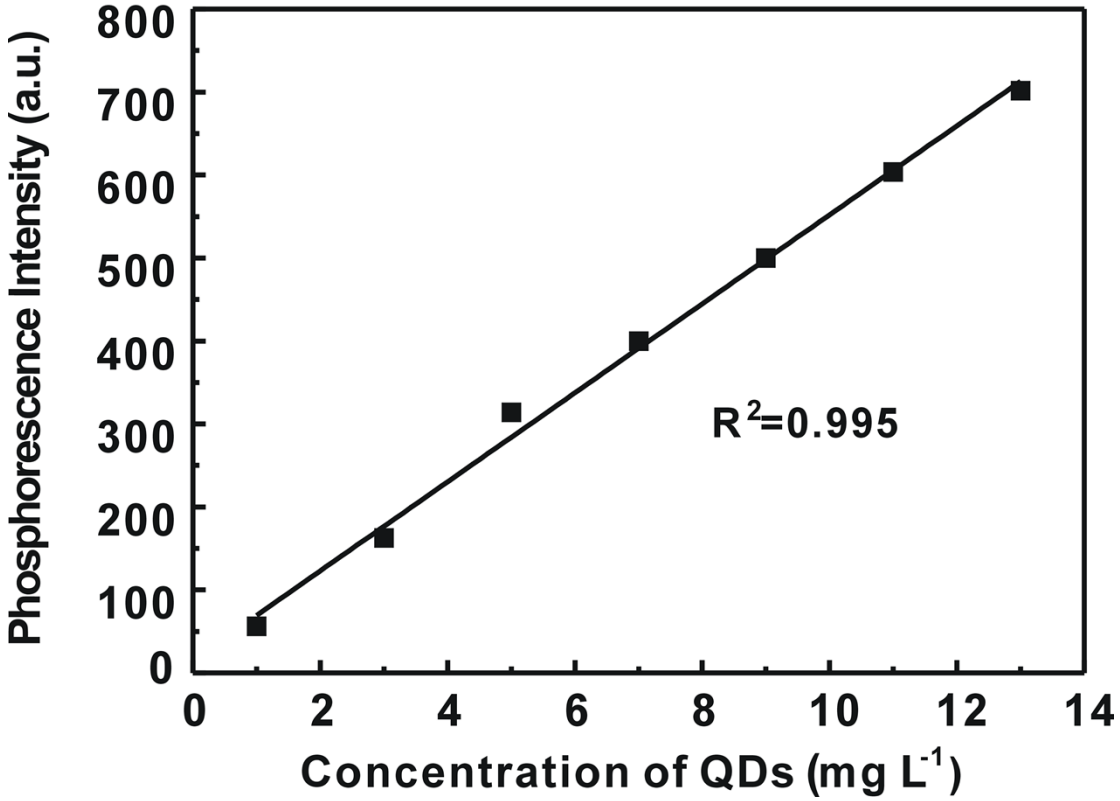

Fig. S1 The line relationship pattern of the concentration-dependent phosphorescence intensity of MPA-Mn:ZnS QDs. The measurement was carried out in Tris-HCl buffer solution (pH 7.4, 10 mM).

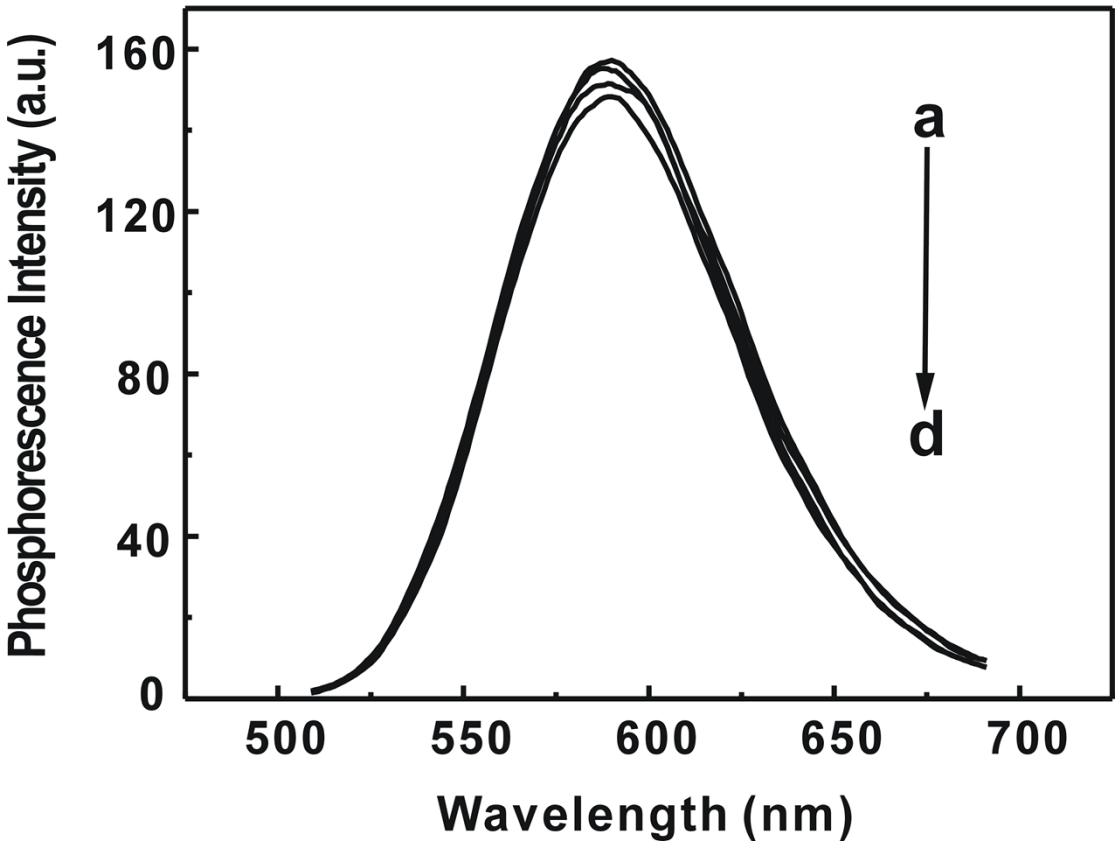

Fig. S2 (A) Phosphorescence spectra of MPA-Mn:ZnS QDs (3 mg L^{-1}): (a) in the absence of Fe^{3+} and H_2O_2; (b) 10 min after addition of 0.1 μM Fe^{3+}; (c) 10 min after addition of 0.5 μM H_2O_2; (d) 10 min after addition of 0.1 μM Fe^{3+} and 0.5 μM H_2O_2. All measurements were carried out in Tris-HCl buffer solution (pH 7.4, 10 mM).

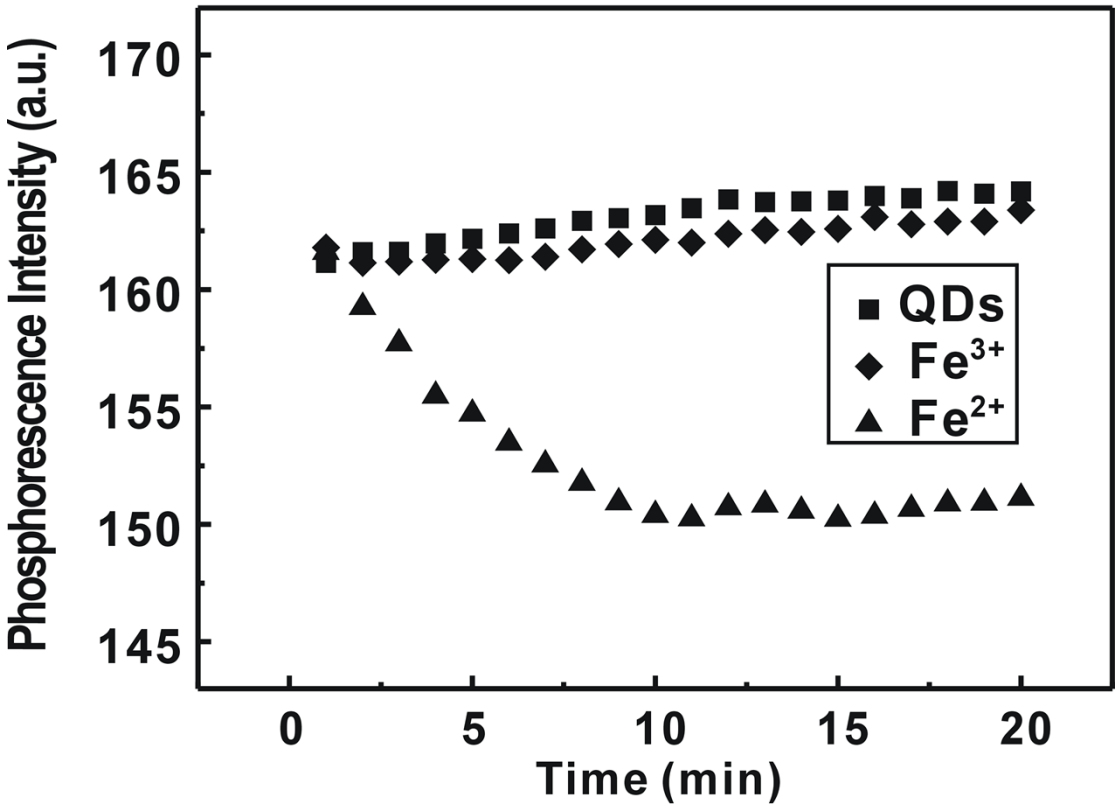

Fig. S3 Time course of the phosphorescence intensity of MPA-Mn:ZnS QDs (3mg L^{-1}) in Tris-HCl buffer solution (pH 7.4, 10 mM) without Fe^{2+} and Fe^{3+},and in the presence of Fe^{2+} (1 μM) or Fe^{3+} (1 μM).

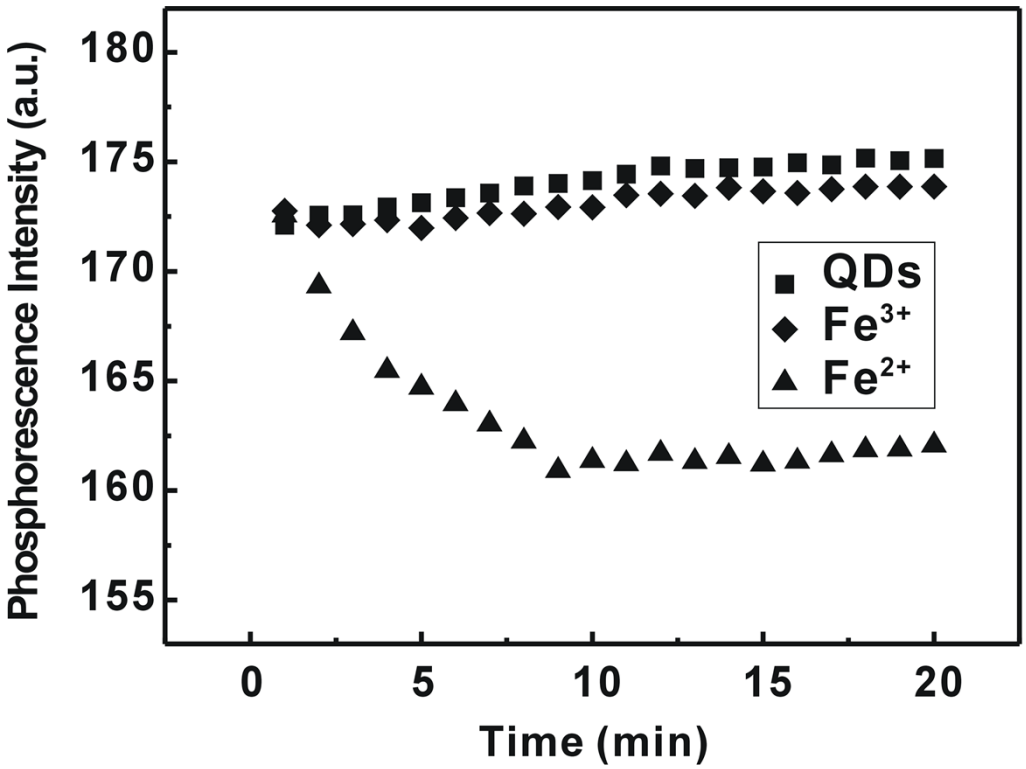

Fig. S4 Time course of the phosphorescence intensity of TGA-Mn:ZnS QDs (3mg L^{-1}) in Tris-HCl buffer solution (pH 7.4, 10 mM) without Fe^{2+} and Fe^{3+},and in the presence of Fe^{2+} (1 μM) or Fe^{3+} (1 μM).

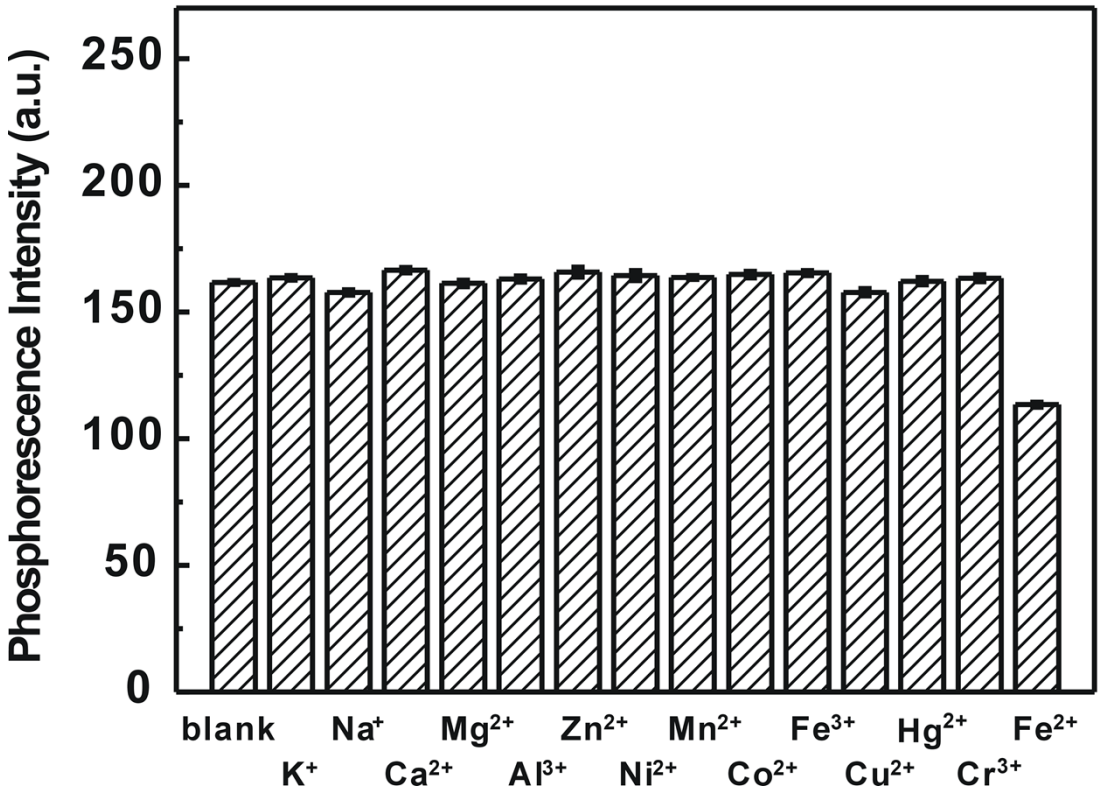

Fig. S5 The response of phosphorescence of MPA-Mn:ZnS QDs (3 mg L^{-1}) with the addition of various other metal ions, including K^+, Na^+, Ca^{2+}, Mg^{2+}, Al^{3+}, Zn^{2+}, Ni^{2+}, Mn^{2+}, Co^{2+}, Fe^{3+},Cu^{2+}, Fe^{2+} , Hg^{2+} and Cr^{3+} in the presence of 0.5 μM H_2O_2 . Herein, the concentrations of K^+ and Na^+ were 1 mM. The concentrations of Ca^{2+}, Mg^{2+} were 400 μM. The concentration of Al^{3+} was 5 μM. The concentrations of Fe^{3+} and Zn^{2+} were 1 μM. The concentrations of Mn^{2+} and Cu^{2+} were 0.2 μM. , The concentration of Co^{2+} was 0.1 μM. The concentrations of Ni^{2+} , Hg^{2+} and Cr^{3+} were 0.05 μM. All measurements were carried out in Tris-HCl buffer solution (pH 7.4, 10 mM).

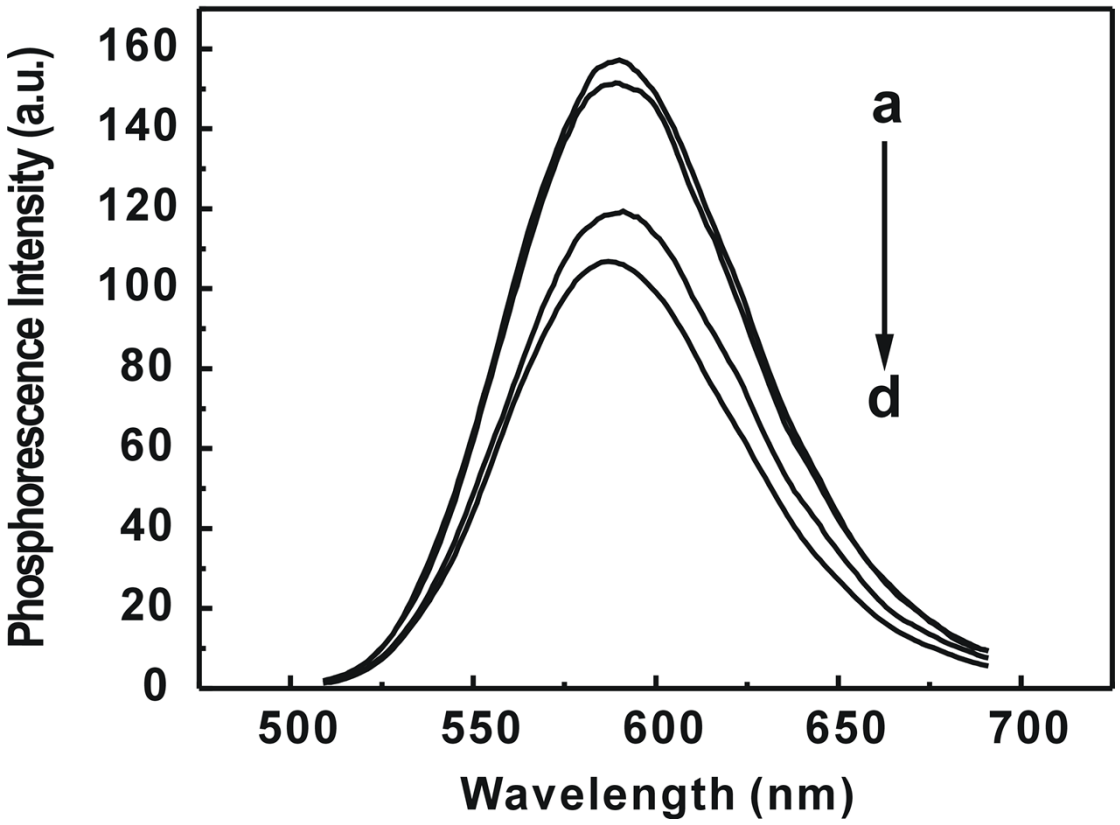

Fig. S6 (a) Phosphorescence spectra of MPA-Mn:ZnS QDs (3 mg L^{-1}) in the absence of Fe^{2+} and H_2O_2; (b) Fenton system was firstly mixed with Vc and then QDs was added into the above mixed solution; (c) Fenton system was firstly mixed with QDs and then Vc was added into the above mixed solution; (d) Fenton system mixed directly with QDs solution without Vc. Fenton system：（0.1 μM Fe^{2+} and 0.5 μM H_2O_2）and Vc: 0.5 μM. All measurements were carried out in Tris-HCl buffer solution (pH 7.4, 10 mM).

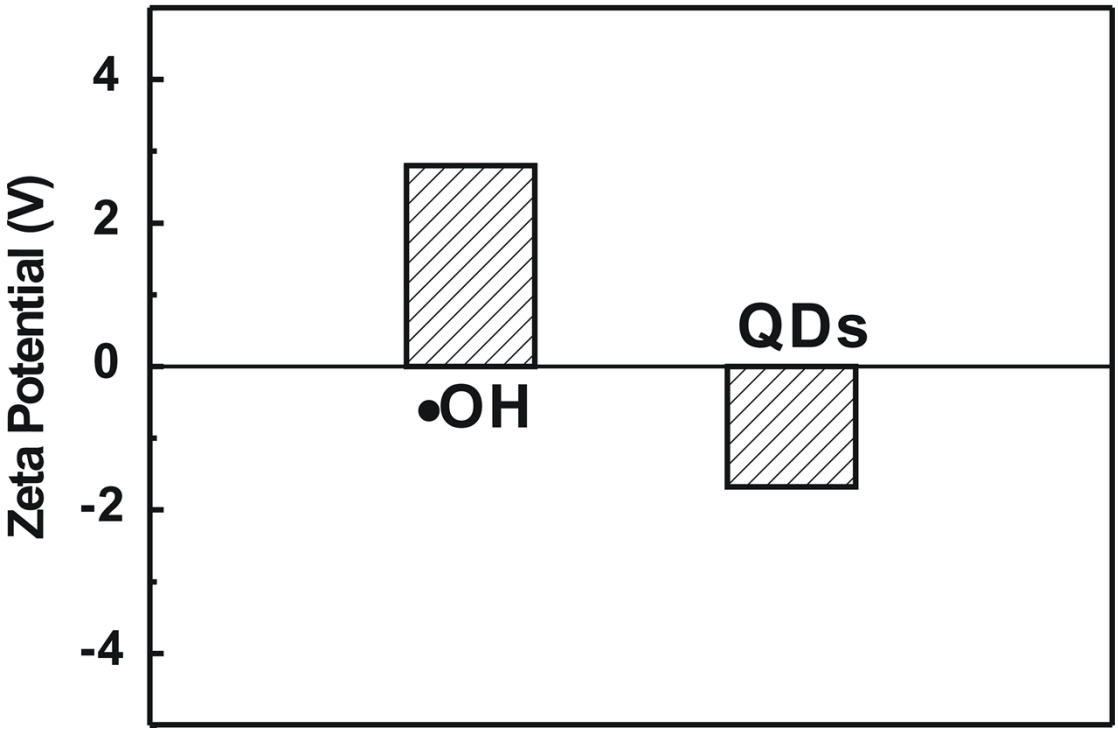

Fig. S7 The zeta potential of •OH and MPA-Mn:ZnS QDs (3 mg L^{-1}). The measurement was carried out in Tris-HCl buffer solution (pH 7.4, 10 mM).

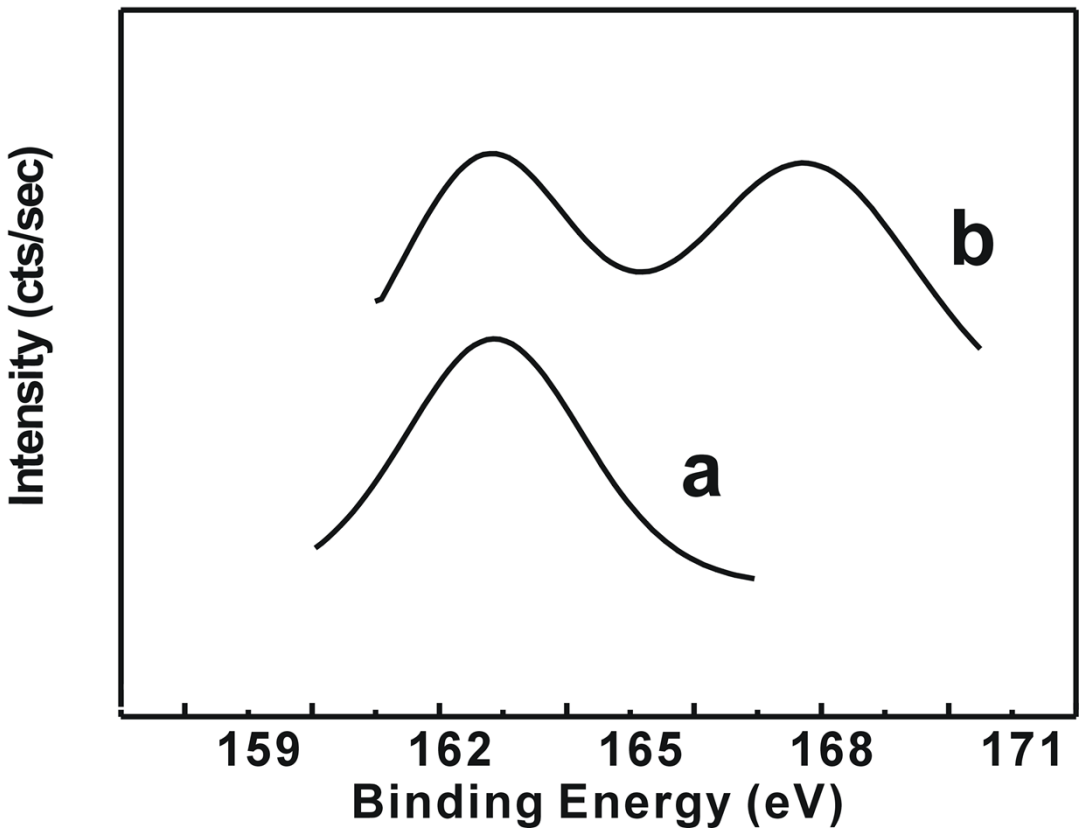

Fig. S8 XPS spectra of S 2p for MPA-Mn:ZnS QDs in the absence (curve a) and presence (curve b) of Fe^{2+} (5 μM) and H_2O_2 (25 μM). All measurements were carried out in Tris-HCl buffer solution (pH 7.4, 10 mM).

Table S1 Average Abundance of Common Metal ions in River Water Matix[a]

Element	Concentration(g g^{-1})	Concentration(μM)
K	2.3×10^{-6}	58.8
Na	6.3×10^{-6}	273.9
Ca	1.5×10^{-5}	374.2
Mg	4.1×10^{-6}	168.7
Al	5.0×10^{-8}	1.85
Zn	2.0×10^{-8}	0.306
Ni	3.0×10^{-10}	5.1×10^{-3}
Mn	7.0×10^{-9}	0.127
Co	1.0×10^{-10}	1.7×10^{-3}
Fe	4.0×10^{-8}	0.716
Cu	7.0×10^{-9}	0.11

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."

Table S2 ICP-MS instrumental parameters

ICP-MS instrument	Thermo Elemental X Series ICP-MS
Plasma RF power/ W	1280
Plasma gsa flow rate/L min^{-1}	13
Auxiliary gas flow rate/L min^{-1}	0.90
Nebulizer gas flow rate /L min^{-1}	0.92
He flow rate/mL min^{-1}	5.26
Sampler(Ni)/mm	1.14
Skimmer(Ni)/mm	0.89
Sampling depth/step	100
Resolution	Normal
Isotope monitored	Fe^{56}