Supplementary Information

Rational designed strategy to dispel mutual molestation of mercuric and ferric ions towards robust, pH-stable fluorescent carbon nanodots

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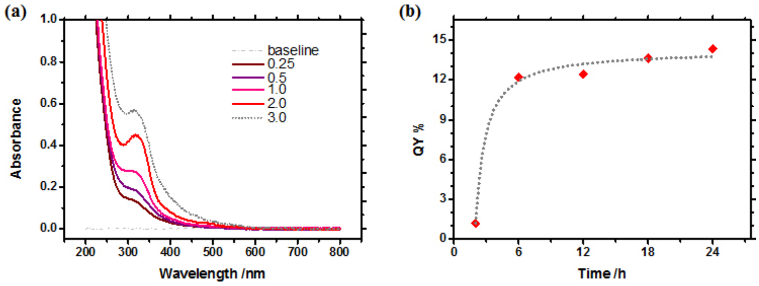

Fig. S1 (a) The optical absorption evolution of C-dots obtained at various CA/melamine mole ratio and (b) Quantum yields of C-dots as a function of Reaction time.

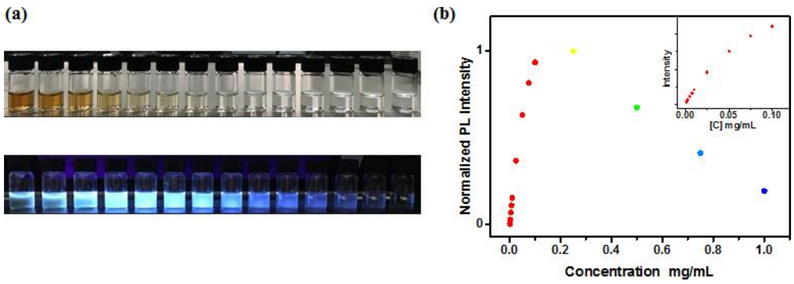

Fig. S2 (a) Photographs of the C-dots aqueous solution with different concentrations under natural light (top) and 365 nm UV light (down) illumination, and (b) their corresponding PL spectra.

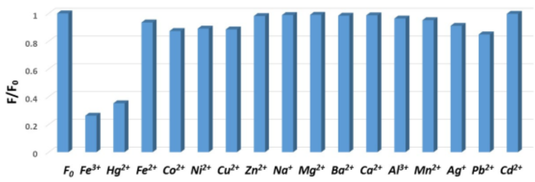

Fig. S3 Relative fluorescence intensities (F/F_0) of the C-dots (0.05 mg mL^{-1}) treated with diverse metal ions (0.15 mM) in water.

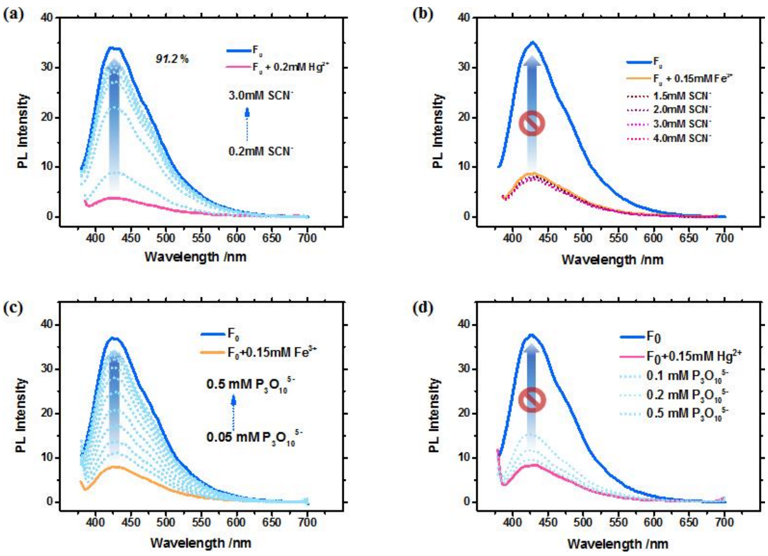

Fig. S4 The PL intensity regeneration of (a) C-dots/Hg^{2+} quenched mixture recovered by SCN^- when the concentration increased from 0.2 mM to 3.0 mM, (b) C-dots/Fe^{3+} quenched mixture recovered by SCN^- when the concentration increased up to 4.0 mM; (c) C-dots/Fe^{3+} quenched mixture recovered by $P_3O_{10}^{5-}$ when the concentration increased from 0.05 mM to 0.5 mM, (d) C-dots/Hg^{2+} quenched mixture recovered by $P_3O_{10}^{5-}$ when the concentration increased up to 0.5 mM.

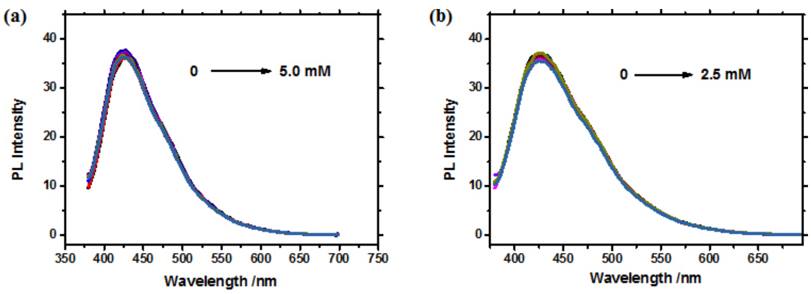

Fig. S5 The PL intensity evolution of the C-dots when interfering with (a) $P_3O_{10}^{5-}$ up to 5.0 mM, (b) SCN^- up to 2.5 mM.

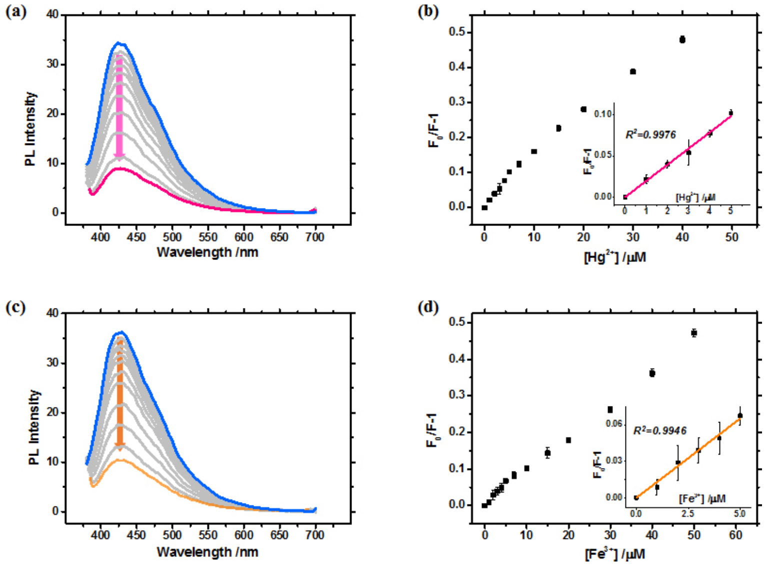

Fig. S6 (a) The PL spectra variation of the C-dots (0.05 mg mL^{-1}) towards titration of Hg^{2+} (0 - 0.2 mM); (b) The relationship between $F/F_0 - 1$ and Hg^{2+} concentration with the linear range from 0.0 to 5.0 μM (inset). The quenching constant and LOD were calculated as 1.97×10^4 M^{-1} and 0.80 μM, respectively; (c) The PL spectra variation of the C-dots (0.05 mg mL^{-1}) towards titration of Fe^{3+} (0 - 0.15 mM); (d) The relationship between $F/F_0 - 1$ and Fe^{3+} concentration with the linear range from 0.0 to 5.0 μM (inset). The quenching constant and limit of detection (LOD) were calculated as 1.30×10^4 M^{-1} and 1.21 μM, respectively.

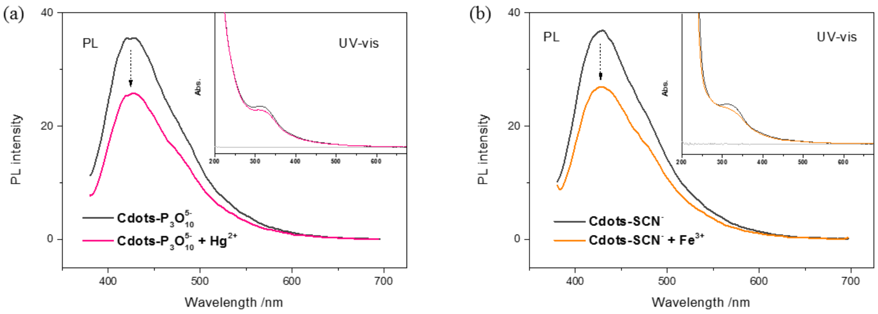

Fig. S7 PL and UV-vis spectra of the C-dots-SCN^- and C-dots-$P_3O_{10}^{5-}$ system in the absence (black curve) and presence of 40 μM (a) Hg^{2+} (magenta curve) or (b) Fe^{3+} (orange curve), respectively.

Table S1 Comparison of different probes based on the C-dots (CDs) system for the determination of Fe^{3+} or Hg^{2+}.

Sources to Prepare C-dots	Probe Component	Analyte	Limit of Detection (LOD)	Reference
CA derived C-dots + Hydrazine	CDs/Cysteine	Fe^{3+}	90 nM	S1
Jinhua Bergamot	CDs/Tris-HCl	Fe^{3+}	0.075 μM	S2
CA	CDs/NaAc-HAc	Fe^{3+}	2.8 μM	S3
CA + Melamine	CDs-SCN^-	Fe^{3+}	1.17 μM	This work
Pigeon Feathers	CDs/HEPES	Hg^{2+}	10.3 nM	S4
L-proline	CDs/gold nanoclusters	Hg^{2+}	28 nM	S5
CA + Urea + L-Cysteine	CDs/SHPP	Hg^{2+}	2 μM	S6
CA	CDs/PBS	Hg^{2+}	5.7 μM	S3
CA + Melamine	CDs-$P_3O_{10}^{5-}$	Hg^{2+}	0.78 μM	This work

CA: citric acid; Tris-HCl: tris(hydroxymethyl)aminomethane hydrochloride buffer solution; HEPES: 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid; SHPP: sodium hexametaphoshpate; PBS: Phosphate buffered saline.

Table S2 The lifetime decay data comparison of the C-dots, C-dots-SCN^- and C-dots-$P_3O_{10}^{5-}$ system in the absence and presence of 40 μM Fe^{3+} or Hg^{2+}.

Sample	*τ(ns)*	χ^2
C-dots	3.73	*1.193*
C-dots,+Fe^{3+}	3.72	*1.215*
C-dots,+Hg^{2+}	3.81	*1.118*
C-dots-SCN^-	3.71	*1.153*
C-dots-SCN^-,+Fe^{3+}	3.72	*1.289*
C-dots-$P_3O_{10}^{5-}$	3.79	*1.156*
C-dots-$P_3O_{10}^{5-}$,+Hg^{2+}	3.8	*1.135*

References

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