Supporting information for

Synthesis and formation mechanistic investigation of nitrogen-doped carbon dots with high quantum yield and yellowish-green fluorescence

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Purification method for the characterization of N-CDs at different formation step

In order to determine whether the raw materials reacted completely, the products were directly analyzed by XRD without any purification procedures.

For TEM and UV-vis analysis, the products were purified by dialysis without centrifugation.

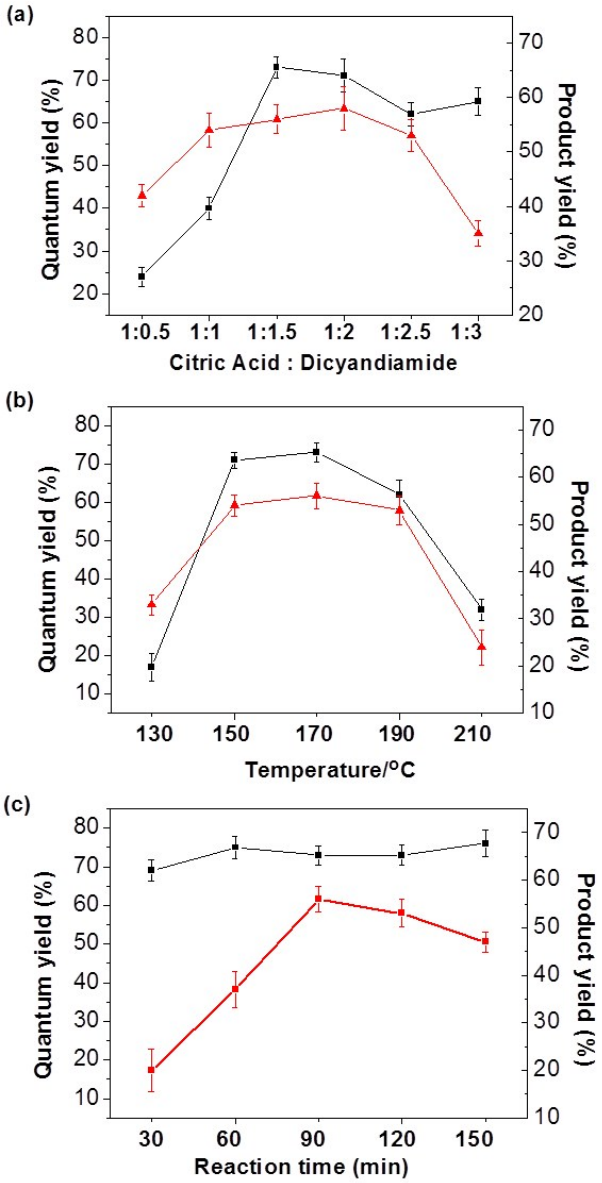


Fig. S1 The quantum yield and product yield of the N-CDs at different preparation conditions. a) N-CDs of different starting material ratios, b) N-CDs of different reaction temperatures, c) N-CDs of different reaction time at 170 °C.

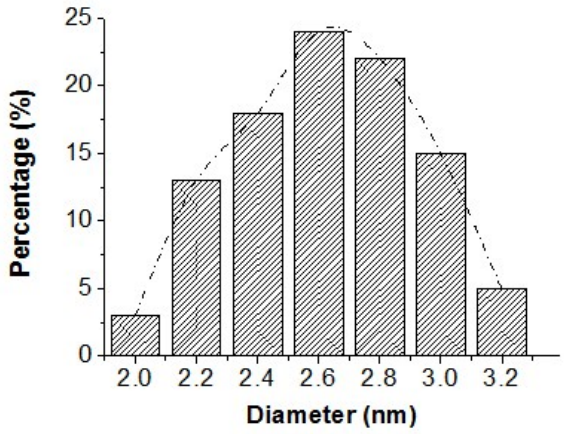
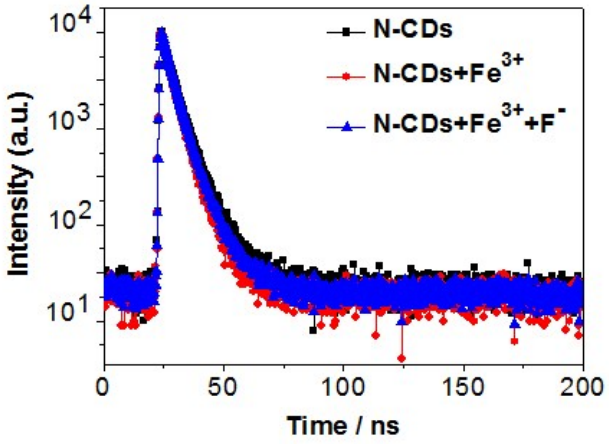


Fig. S2 Size distribution of the N-CDs.



Sample	τ_1/ns	A_1/%	τ_2/ns	A_2/%	$\tau_{average}$/ns
N-CDs	4.29	73.12	8.61	26.88	5.45
N-CDs-Fe^{3+}	3.97	77.78	7.94	22.22	4.85
N-CDs-Fe^{3+}-F^-	3.99	74.15	8.02	25.85	5.03

Fig. S3 FL decay spectrum of the N-CDs, N-CDs-Fe^{3+} and N-CDs-Fe^{3+}-F^-.

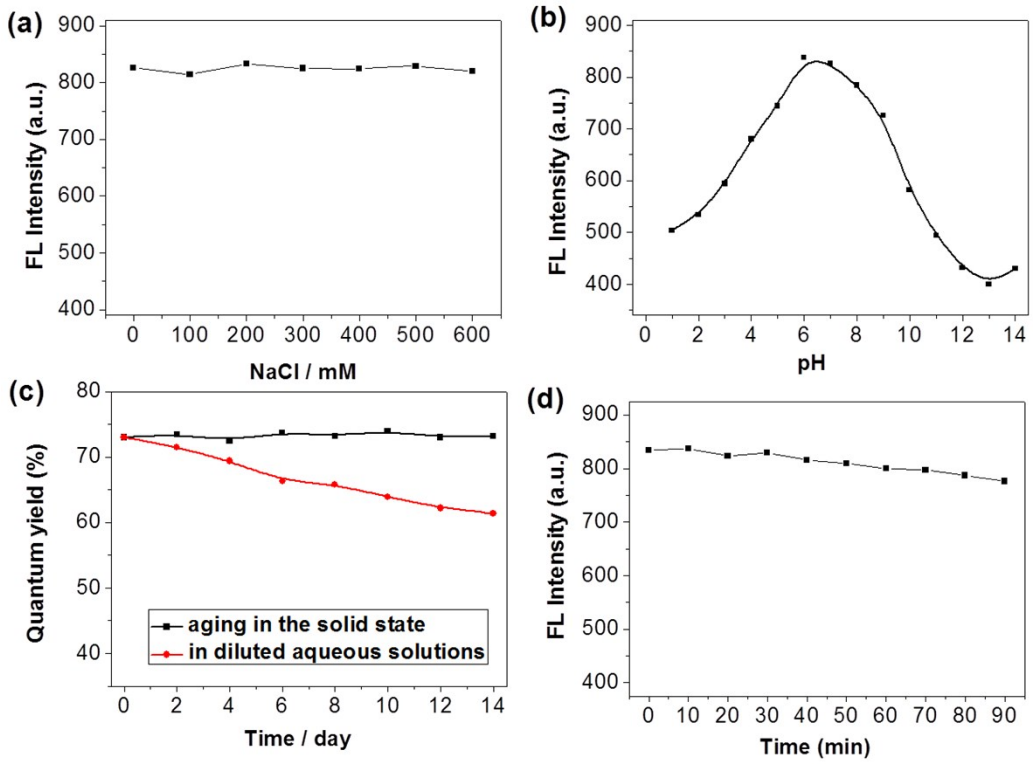


Fig. S4 The effects of ionic strength (concentration of NaCl: 0-0.6 mol L^{-1}) (a), pH (1~14) (b), long-time storage (c) and continuous UV exposure (365 nm) (d) on the fluorescence properties of N-CDs.

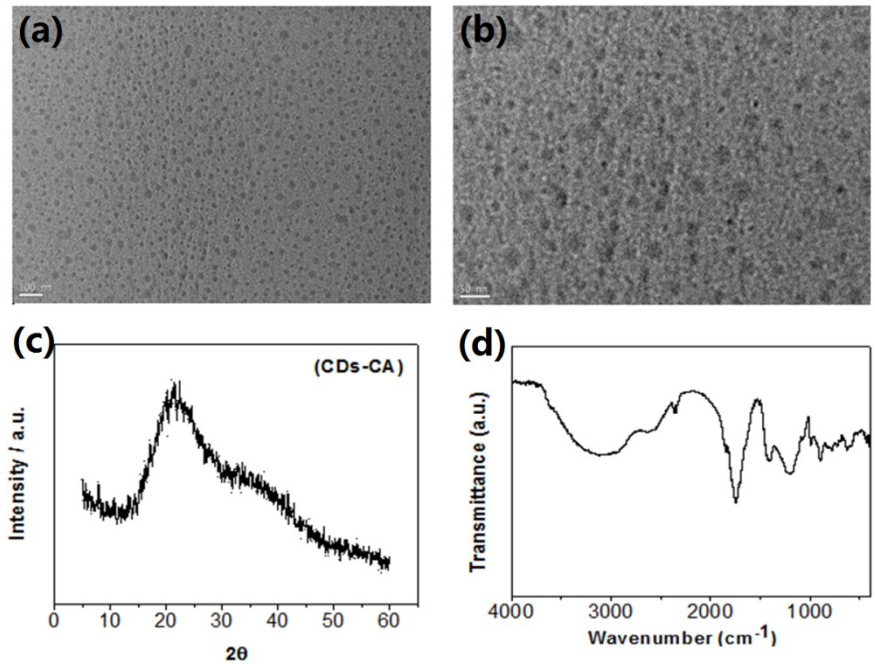


Fig. S5 (a-b)TEM images; (c) XRD profile; (d) FTIR spectrum of the CDs-CA.

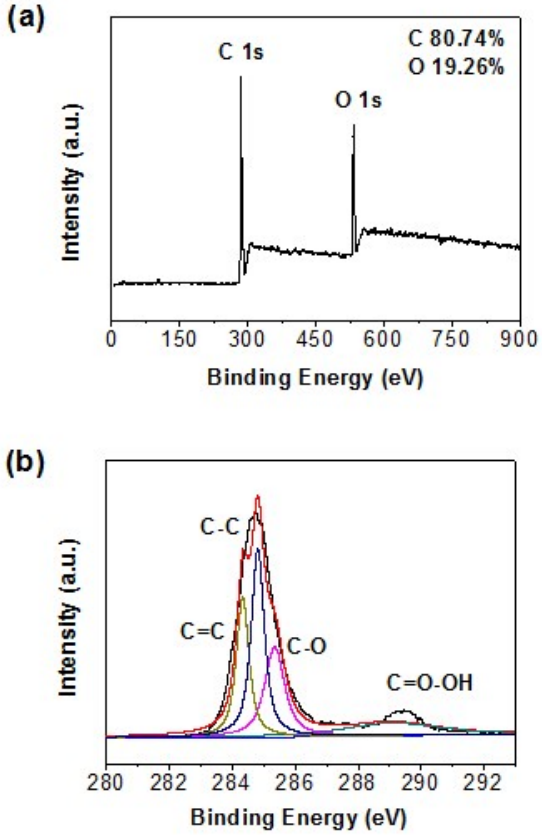


Fig. S6 XPS spectrum (a) and high resolution XPS spectrum of C_{1s} (b) for CDs-CA.

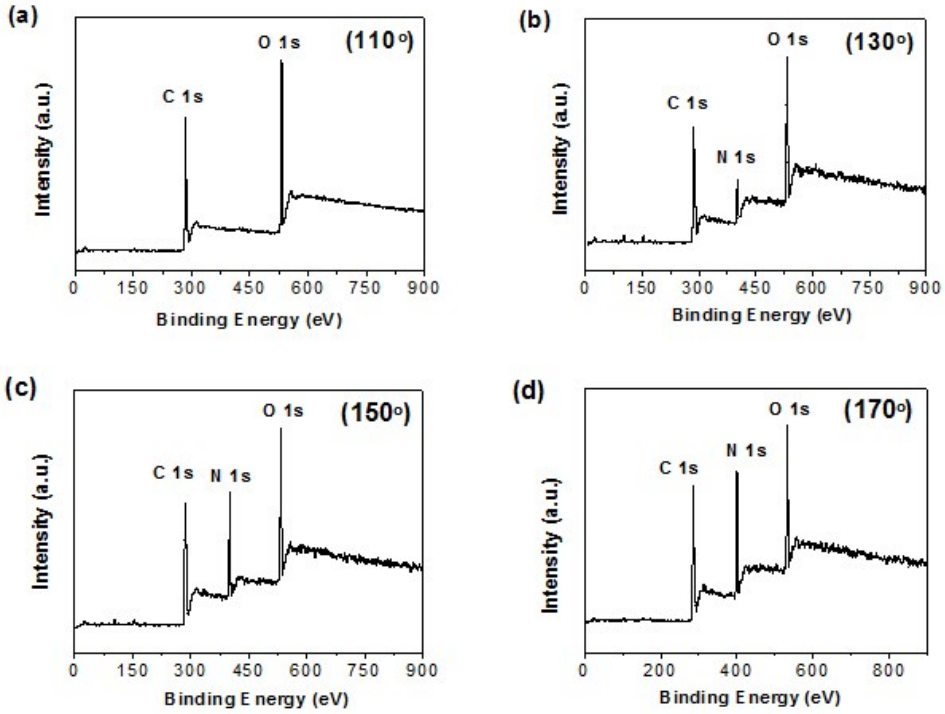


Fig. S7 XPS spectrum for the products obtained at 110 °C (a), 130 °C (b),150 °C (c) and 170 °C (d) after dialysis.

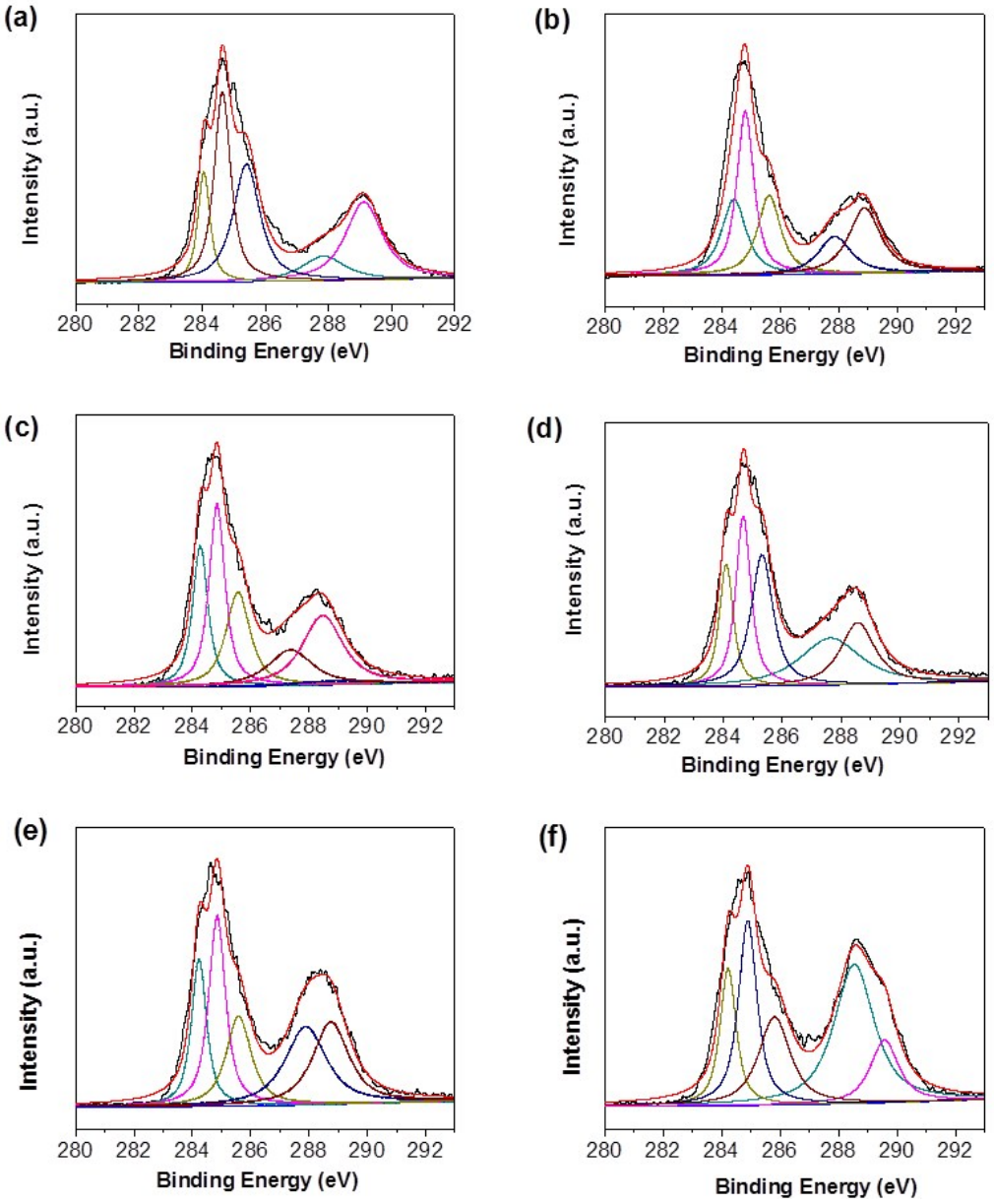


Fig. S8 High resolution XPS spectrum of C_{1s} for the products obtained at 130 ^{o}C (a), 150 ^{o}C (b), 170 (c), 170 for 30 min (d), 60 min (e) and 90 min (f).

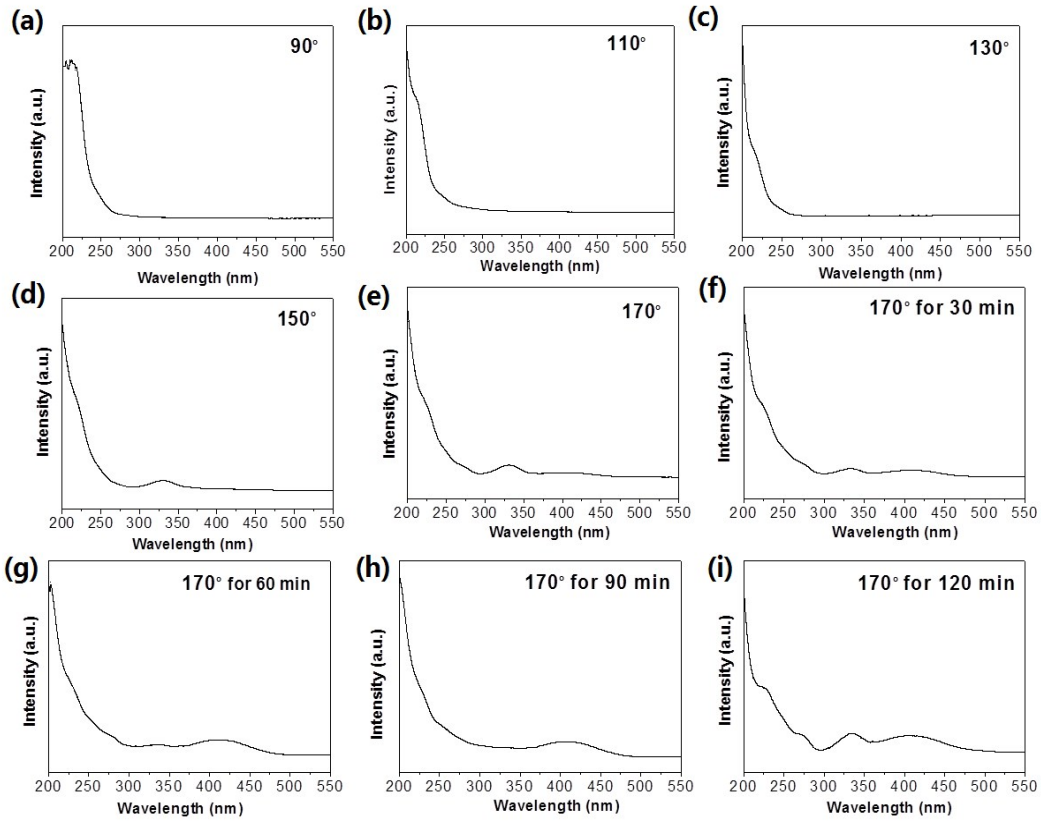


Fig. S9 UV-vis absorption spectra of the products at different reaction stages: the temperature reached 90 ºC (a), 110 ºC (b), 130 ºC (c), 150 ºC (d), 170 ºC (e) and maintained at 170 ºC for 30 min (f), 60 min (g), 90 min (h) and 120 min (i).

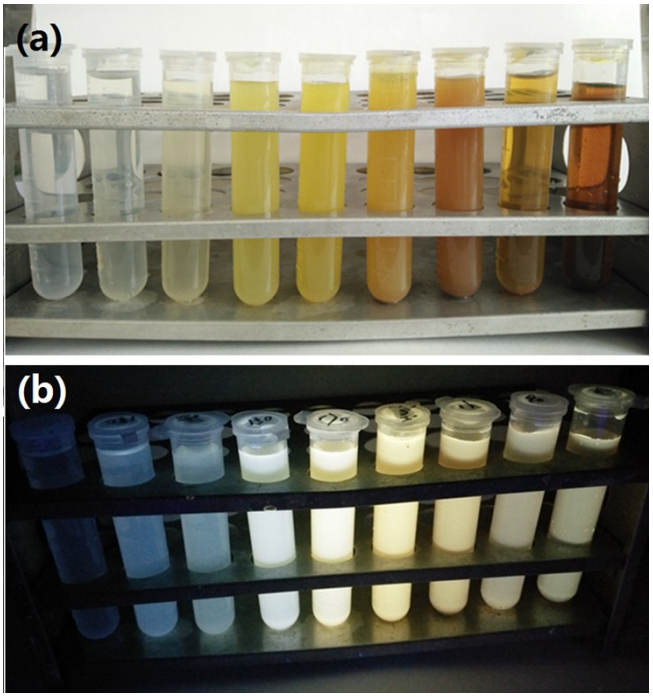


Fig. S10 Photographs of the products under daylight (a) and UV light (b). (left to right: 90 ^{o}C, 110 ^{o}C, 130 ^{o}C, 150 ^{o}C, 170 ^{o}C and maintained at 170 ^{o}C for 30 min, 60 min, 90 min and 120 min).

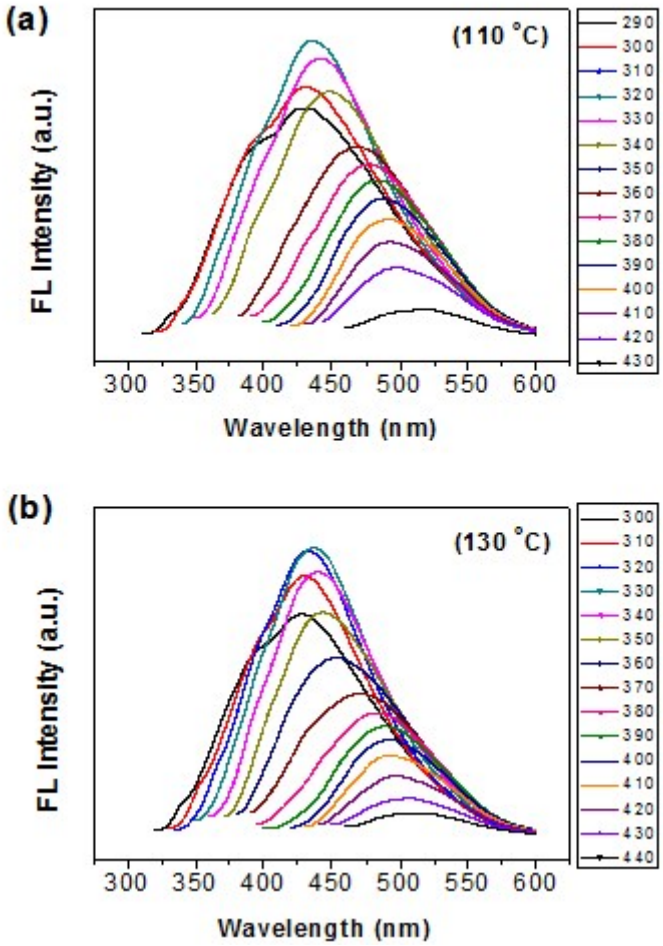


Fig. S11 Fluorescence spectra of the products obtained at 110 °C (a) and 130 °C (b).

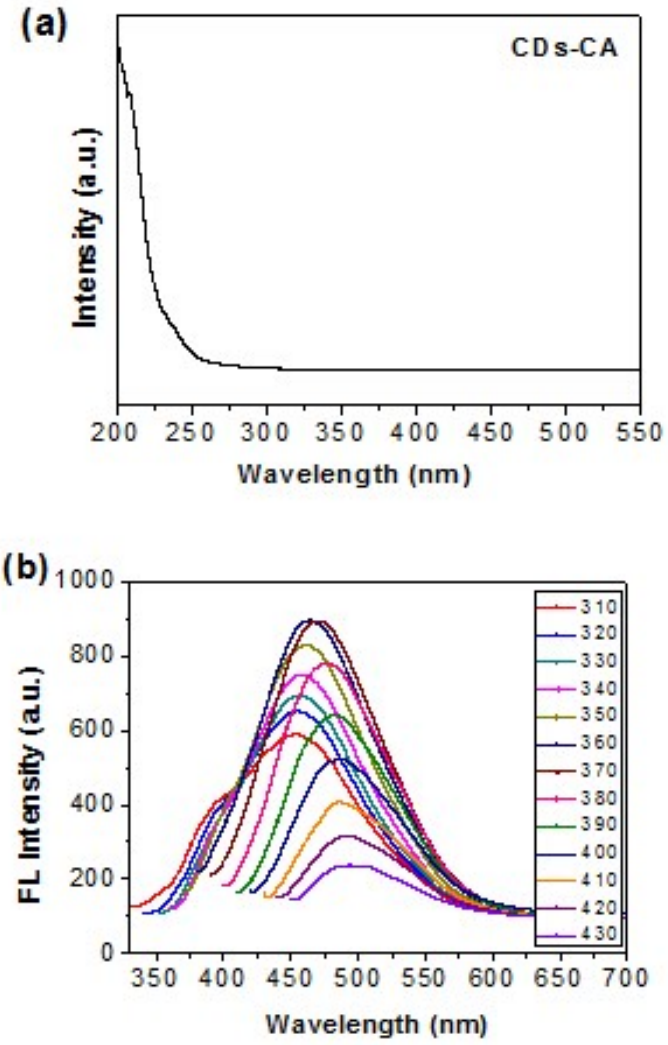


Fig. S12 UV-vis absorption spectra (a) and fluorescence spectra (b) of the CDs-CA.

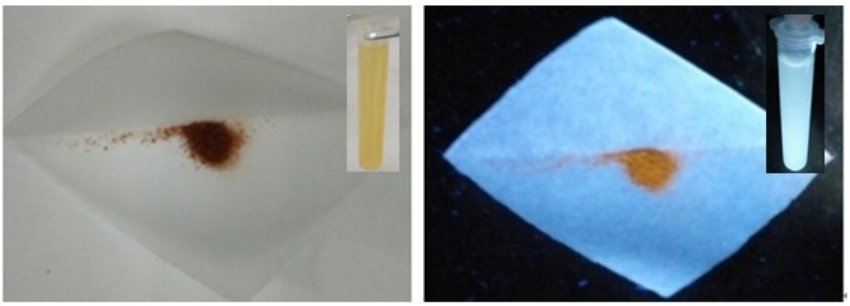


Fig. S13 Photographs of the precipitates collected by centrifugation under daylight (a) and UV light (b).

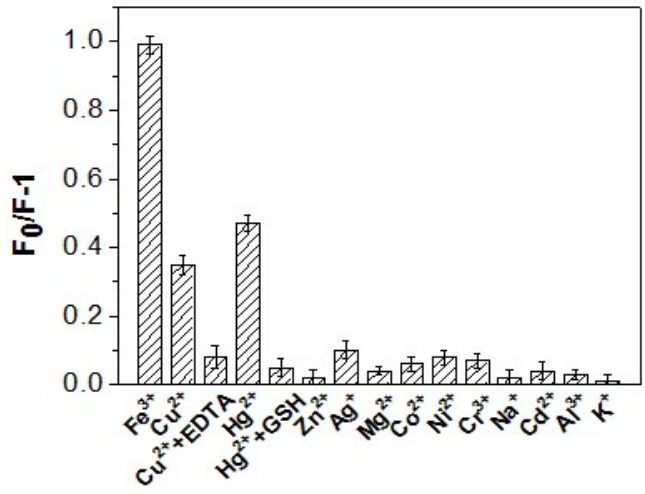


Fig. S14 Selective fluorescent response of aqueous N-CDs solution towards different metal ions (excitation at 410 nm; $[M^{n+}]$=35μM). F_0 and F represent the fluorescence intensity of N-CDs in the absence and presence of interference.

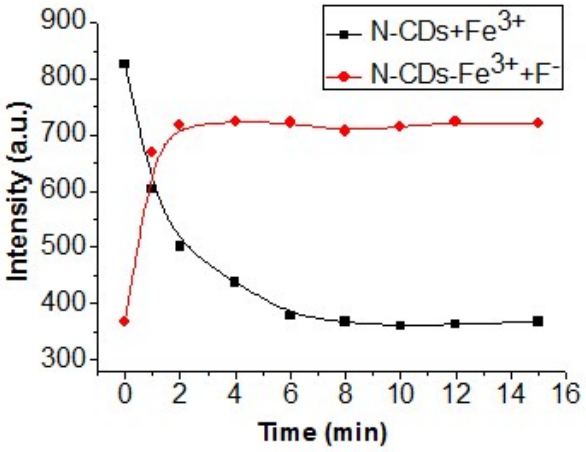


Fig. S15 Effect of Fe^{3+} on the FL intensity of N-CDs for different incubation times (black line) and time-dependent FL intensity of N-CDs- Fe^{3+} (50μM) system with the addition of F^- (60 μM).

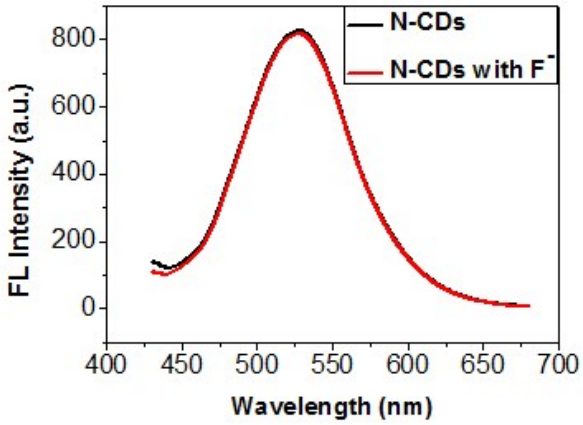


Fig. S16 Effect of 40 μM F^- on the FL intensity of N-CDs.

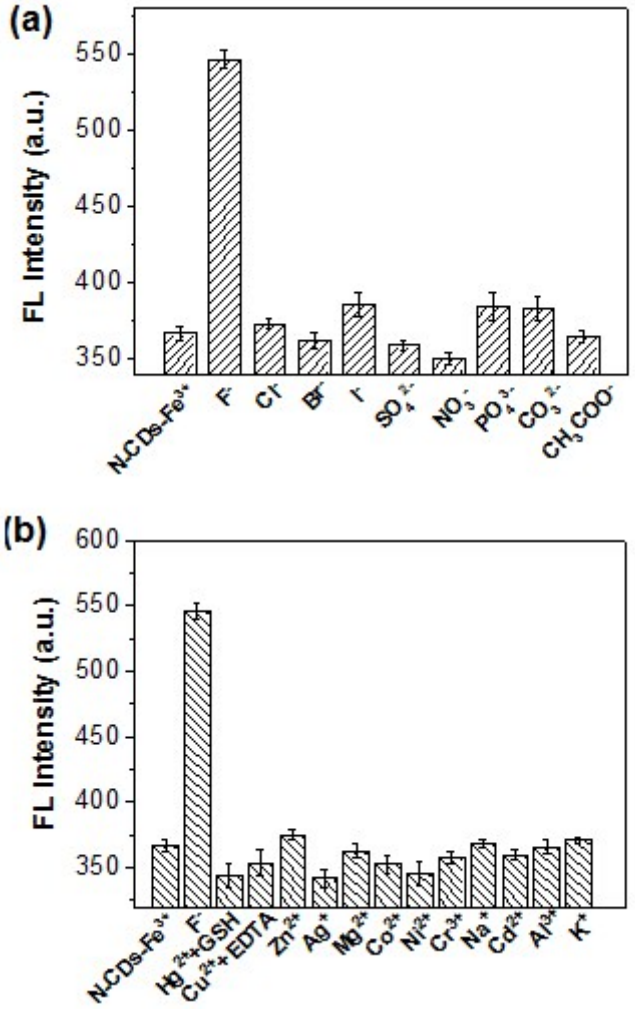


Fig. S17 Fluorescence response of the N-CDs-Fe^{3+} system in the presence of different kinds of anions (40 μM) (a) and metal ions (b).

Table S1 Results of fluoride anions (F-) detection in water samples.

Samples	Fluoride ion-selective electrode method	Our proposed method				
	Found	Found (μmol L^{-1})	Added (μmol L^{-1})	Total found (μmol L^{-1})	Recovery (%)	RSD
Guanlan Lake	17.78	17.94	10	28.34	104.0	3.4
			20	38.12	100.9	3.5
Yan Lake	20.23	20.55	10	31.38	108.3	4.2
			20	40.13	97.9	4.4