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Highly fluorescent N, S-co-doped carbon dots: synthesis and multiple applications

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Table S1 Quantitative comparison of chemical bonds in N, S-CDs

Composition	Chemical bond	Bond fraction (%)	Composition	Chemical bond	Bond fraction (%)
C 1s	C=N/O-C=O	4.88	N 1s	C-N-C	27.90
	C-O	9.59		N=C	9.80
	C-N/C-S	34.53		N-H	62.31
	C-C/C=C	50.99			
O1s	O=C-O	53.17	S 2p	C-S 2p1/2	46.75
	C-O-C	28.44		C-S 2p3/2	53.25
	C=O	18.39			

Table S2 The relationship between excitation wavelength and emission wavelength of N, S-CDs

Excitation wavelength (nm)	310	320	330	340	350	360	370	380	390
Emission Wavelength (nm)	421	431	446	461	465	472	487	506	519

Table S3 The maximal emission wavelengths of N, S-CDs in different solvents under excitation wavelength at 360 nm

solvent	emission wavelength (nm)	solvent	emission wavelength (nm)
Water	450	Ethyl acetate	436
DMSO	432	Tetrahydrofuran	476
Methanol	457	Dichloromethane	428
Ethanol	462	Carbon tetrachloride	436
Acetic acid	420	Heptane	428
Acetone	422	Petroleum ether	408

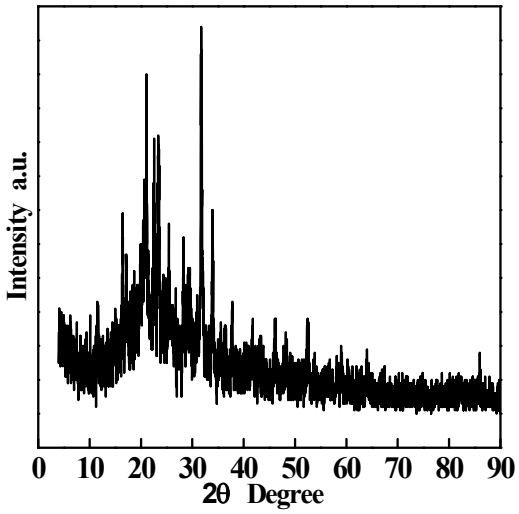

Fig. S1 XRD pattern of N, S-CDs

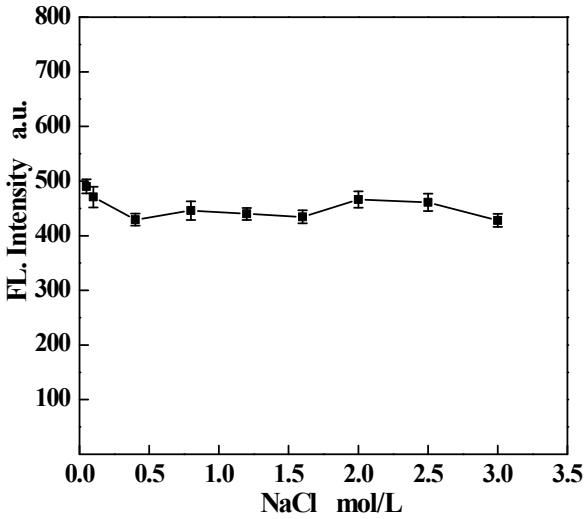

Fig. S2 Effect of NaCl concentration on fluorescent intensity of N, S-CDs

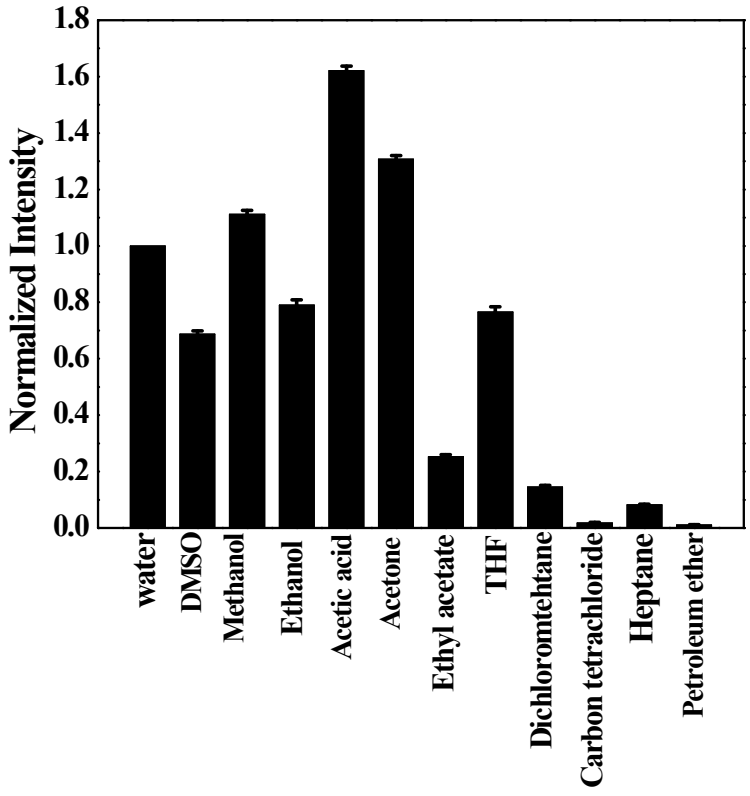

Fig. S3 Influence of different solvents on fluorescent intensity of N, S-CDs

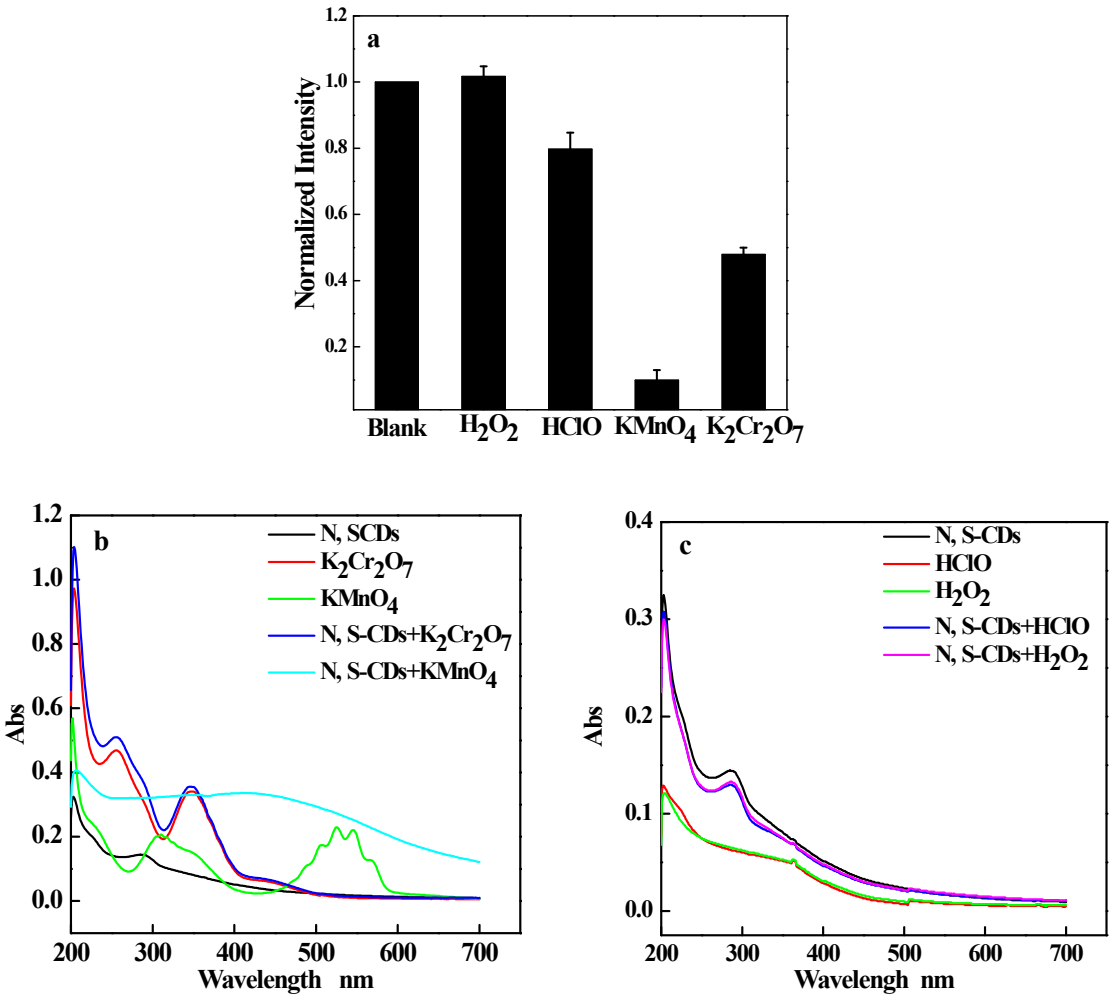

Fig. S4 (a) Normalized fluorescence intensity of N, S-CDs upon the addition of H_2O_2, HClO, $K_2Cr_2O_7$ and $KMnO_4$; (b) UV-vis absorption spectra of N, S-CDs, $K_2Cr_2O_7$, $KMnO_4$, N, S-CDs+ $K_2Cr_2O_7$, N, S-CDs+ $KMnO_4$; (c) UV-vis absorption spectra of N, S-CDs, HClO, H_2O_2, N, S-CDs+ HClO, N, S-CDs+ H_2O_2. The concentration of N, S-CDs was 50 μg/mL. Except the $KMnO_4$ of which concentration was 30 μM, the concentrations of other oxidants were 100 μM.

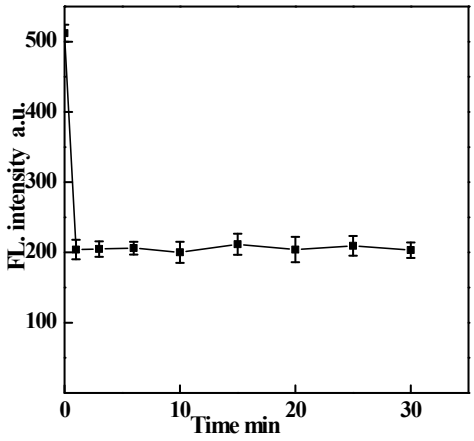

Fig. S5 The incubation time for Cr(Ⅵ) detection versus fluorescent intensity of N,S-CDs

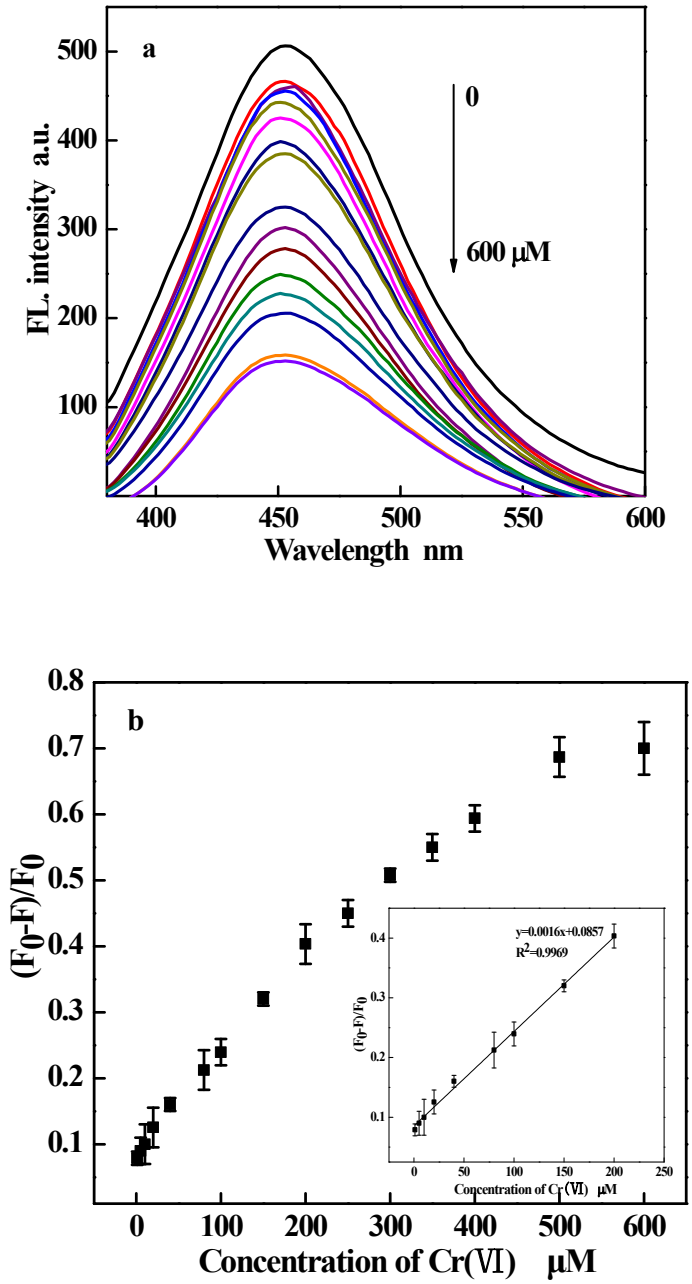

Fig. S6 The Cr (Ⅵ) detection in Taihu lake water: (a) Fluorescence spectra of N, S-CDs(50 μg/mL) upon addition of different concentration of Cr (Ⅵ); (b) The relationship between $(F_0-F)/F_0$ and concentration of Cr (Ⅵ), inset: a linear relationship with the concentration of Cr (Ⅵ) ranged from 0.5-200 μM.

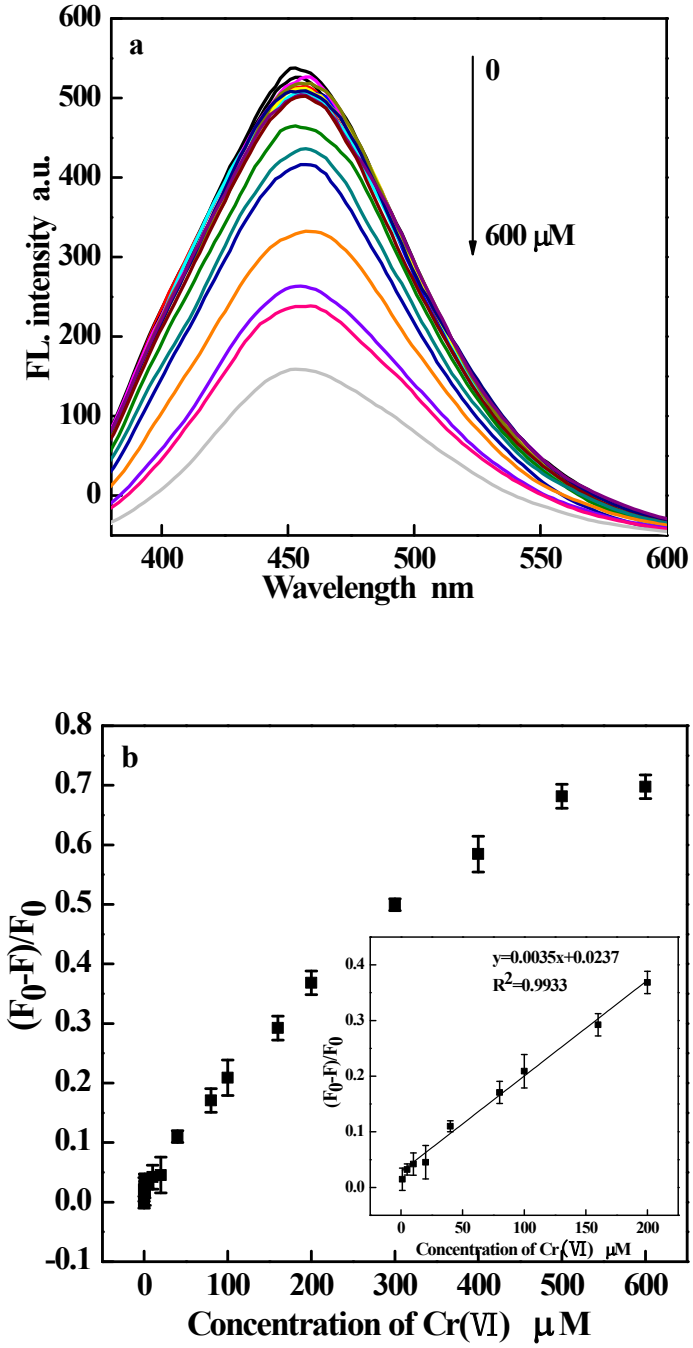

Fig. S7 The Cr (Ⅵ) detection in human serum: (a) Fluorescence spectra of N, S-CDs(50 μg/mL) upon addition of different concentration of Cr(Ⅵ); (b) The relationship between $(F_0-F)/F_0$ and concentration of Cr (Ⅵ), inset: a linear relationship with the concentration of Cr (Ⅵ) ranged from 0.5-200 μM.