

Supporting Information

A dual-emission ratiometric fluorescent sensor L/J-CDs for specific response to cetirizine hydrochloride in environmental water samples

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1. Experimental reagents

$\text{CdCl}_2 \cdot 2.5\text{H}_2\text{O}$, $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$, MgSO_4 , KCl , NaCl , ZnCl_2 , Sodium citrate and Acrylamide (AM) were purchased from Shanghai Aladdin Biochemical Technology Co., Ltd. (China). Promethazine hydrochloride, Tobramycin sulfate, Chlorphenamine maleate, Fluconazole, Fluoxetine, Phenprobamate (Phe), Glycine(Gly), Threonine (Thr), Histidine (His), Arginine (Arg) and Methionine (Met) were acquired from Sinopharm Chemical Reagent Co., Ltd. Rhodamine B was purchased from MACKLIN reagent Co., Ltd. (Shanghai). Cetirizine hydrochloride (CTZ) was obtained from Shanghai Yuanye Biotechnology Co., Ltd. All analytical reagents are analytically pure with no further purification required.

2. Experimental facilities

The UV-visible spectrum was observed by a UV-1800 (Japan) spectrophotometer. The fluorescence response signals of the L/J-CDs sensing system were investigated with a Fluoromax-4 fluorescence spectrometer from Horiba, France. Fourier infrared transform spectrophotometer IRAffinity-1S (Japan) was employed to characterize the functional group information of L-CDs and J-CDs. The transmission electron microscope (TEM) Talos F200S (USA) was selected to take topographic images of the carbon dots. Particle size and potential information were obtained from a Malvern particle size potentiostat Zetasizer Nano ZS90 (Malvern Panalytical, Britain).

3. Synthesis of blue fluorescence-emitting carbon dots (L-CDs)

The formulation for the synthesis of L-CDs was slightly modified as previously reported in the literature.¹ 1.5 g of sodium citrate and 0.78 g of acrylamide were

dispersed in 30 mL of deionized water and sonicated for 10 min until completely dissolved. The resulting mixed solution was transferred to a 50mL Teflon reactor and then reacted at 200°C for 3h. After the reaction was accomplished, the product was naturally cooled to room temperature, and then the product was filtered through a 0.22 µm membrane to remove larger particles, and finally stored at 4°C for subsequent studies.

4. Synthesis of orange fluorescence-emitting carbon dots (J-CDs)

J-CDs were prepared with reference to previous publication.² Accurately weigh 0.75 g of Rhodamine B and disperse in 30 mL of deionized water by sonicating for 10 min. The solution obtained above was transferred to a Teflon hydrothermal reactor, placed in a heating oven and slowly heated to 160°C for 2h. Following the completion of the reaction, the dark red product was centrifuged at 10,000 rpm for 10 min and filtered through 0.22 µm membranes. The liquid was then purified on dialysis through dialysis membranes (with a molecular weight cut-off of 1000 Da) and the product was freeze-dried. Ultimately, the acquired solid J-CDs powders were adequately and homogeneously dispersed in 20 mL of purified water and stored at 4 °C for further experiments.

5. Calculation of limit of detection (LOD)

The LOD was calculated using the following equation:

$$LOD = 3\sigma/k$$

Where σ is the standard deviation of blank solution of L/J-CDs and k is the calibration sensitivity toward CTZ in aqueous solution of L/J-CDs . The calibration sensitivity (k) was estimated from the slope of the fluorescence curve.²

Table S1. The Precision of the sensing system for CTZ .

Precision	C _{CTZ} (μ M)	RSD(% , N=6)
Intra-day	90.00	0.95
	180.0	1.1
	270.0	1.1
Inter-day	90.00	1.7
	180.0	1.5
	270.0	0.57

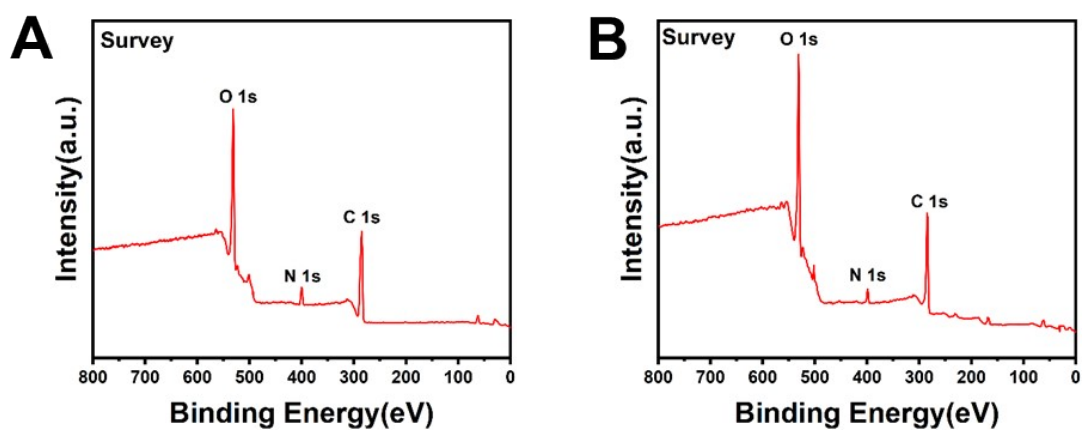


Fig.S1. The survey XPS spectra of L-CDs (A) and J-CDs (B).

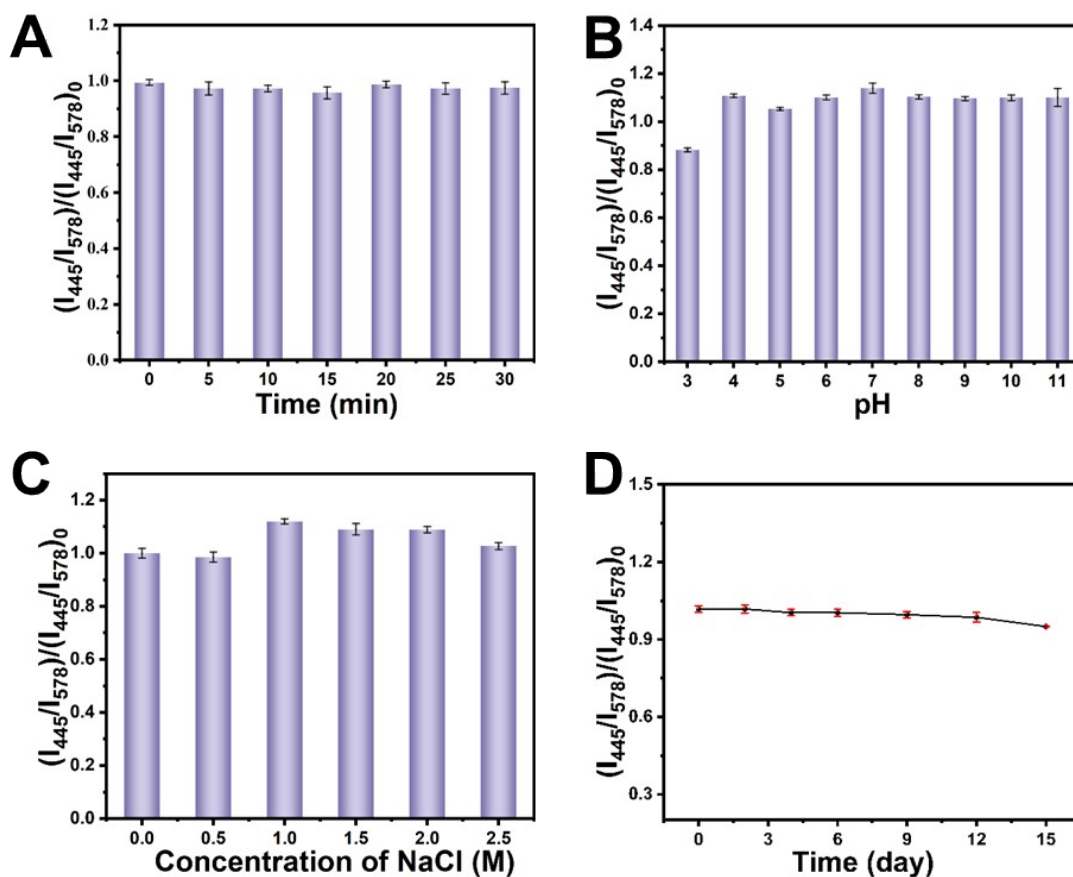


Fig.S2. Photoluminescence stability investigation of L/J-CDs ratiometric fluorescent sensors. The effect of (A) 365 nm UV lamp irradiation time on the fluorescence intensity of L/J-CDs; (B) different pH on the fluorescence intensity of L/J-CDs; (C) high concentration of sodium chloride solution on the fluorescence intensity of L/J-CDs. (D) Storage time stability of L/J-CDs.

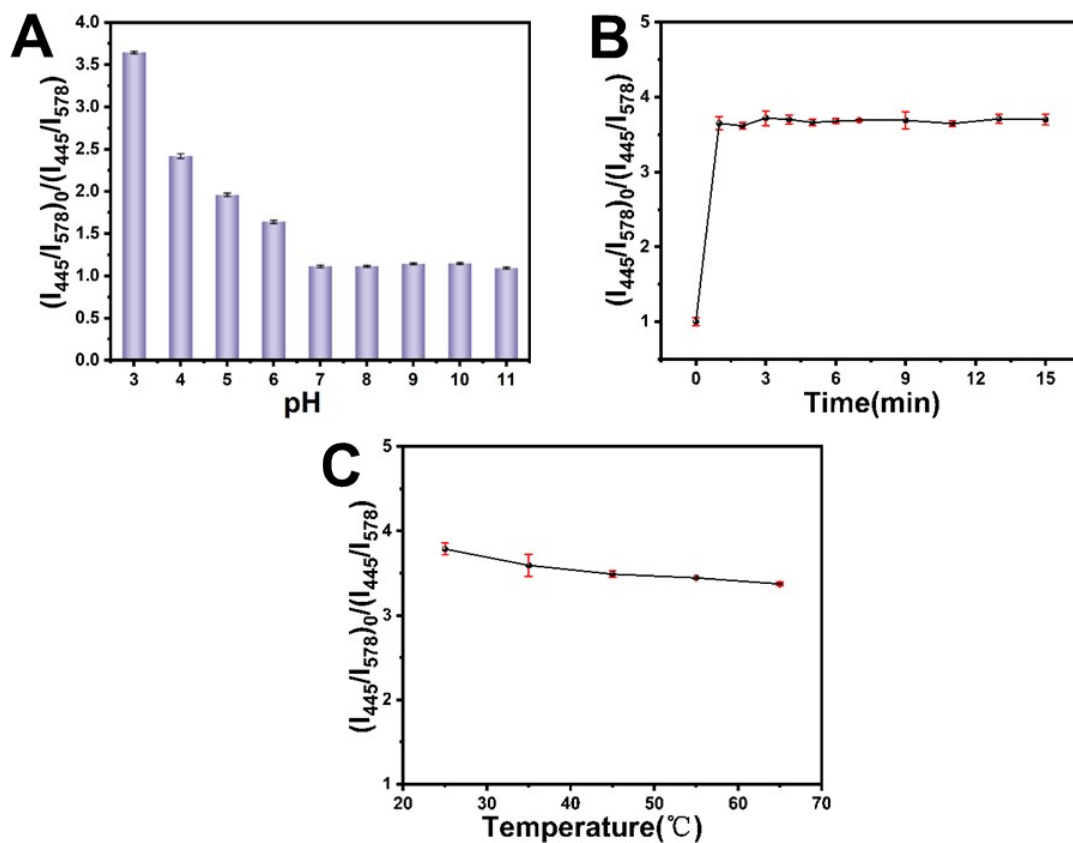


Fig.S3. Optimization of reaction conditions for the ratiometric fluorescence sensing system of L/J-CDs to the detection of CTZ. The effect of different pH (A), reaction time (B) and temperature (C) on CTZ ratiometric fluorescence detection system.

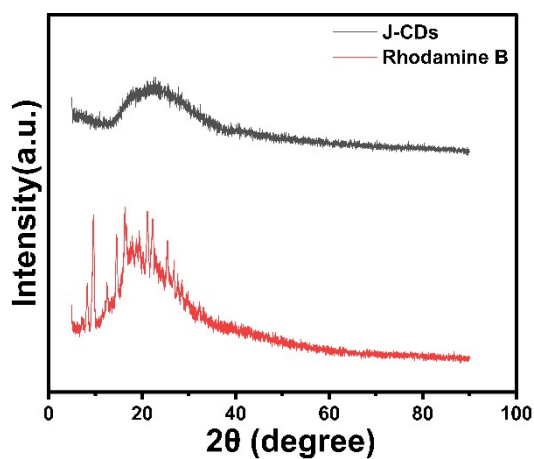


Fig.S4. The XRD pattern of J-CDs and Rhodamine B.

References

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- 2 Wang L, Zheng S, Cai Z, et al. Ratiometric fluorescence sensor and smartphone-based microfluidic sensing platform based on oxidation induced Ce(III)/Ce(IV) phosphatase-like activity and complexation effect activation for sarcosine detection[J/OL]. Sensors and Actuators B: Chemical, 2023, 394: 134461. DOI:10.1016/j.snb.2023.134461.