Electronic Supplementary Material (ESI) for Analytical Methods.

High quantum yield nitrogen and boron co-doped carbon dots for sensing of Ag^+, biological imaging and fluorescent inks

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2.1. Apparatus

JEM-2100 transmission electron microscope (JEOL, Japan) was used to obtain the transmission electron microscopy (TEM) of N, B-CDs. X-ray photoelectron spectroscopy (XPS) were obtained from Escalab 250Xi X-ray photoelectron spectroscopy (Thermo Fisher Scientific, USA). X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FT-IR) were studied by Bruker D8 X-ray diffractometer (Bruker, Germany) and VERTEX 70 Fourier transform infrared spectrometer (Bruker, Germany). Ultraviolet-visible absorption spectrum (UV-vis) and fluorescence spectra were obtained by TU-1901 ultraviolet-visible absorption spectrometer (Purkay, Beijing) and RF-5301 fluorescence spectrometer (Shimadzu, Japan). Fluorescence lifetime decay curve was obtained from FLS920 Steady-state transient fluorescence spectrometer (Photon Technology International (PTI), USA).

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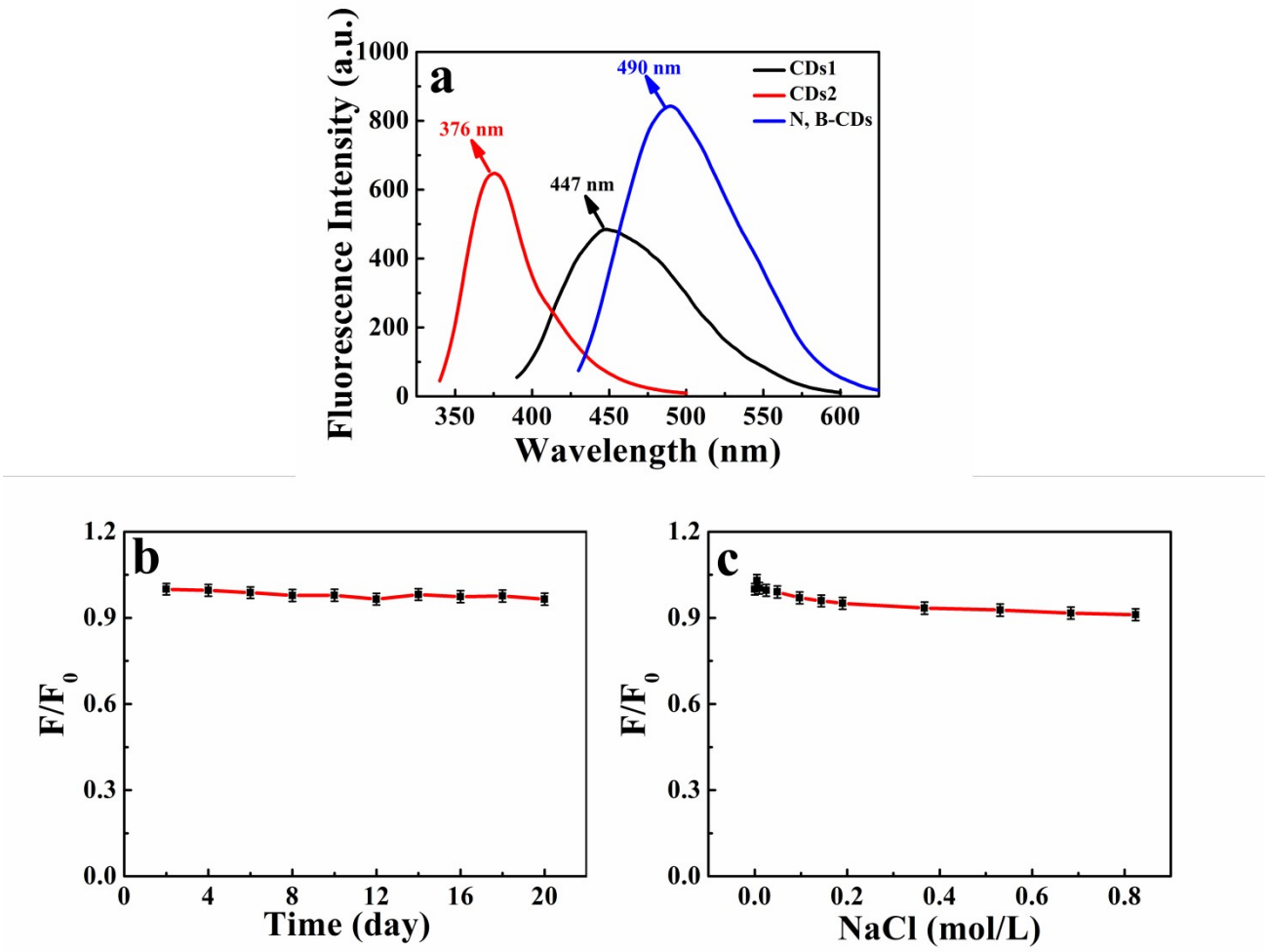

Fig. S1. (a) Fluorescence emission spectrum of N, B-CDs, CDs 1 and CDs 2; Effect of (b) storage time and (c) concentration of NaCl on the fluorescence intensity of N, B-CDs.

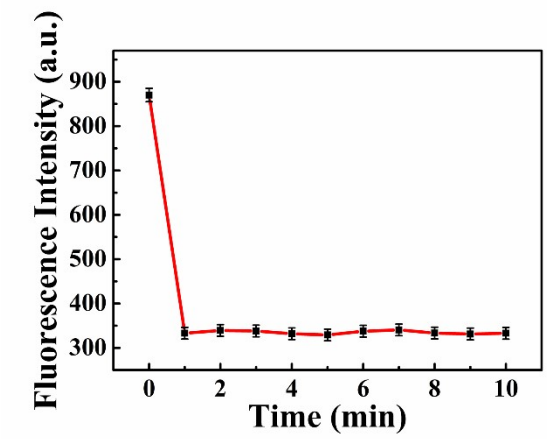

Fig. S2. Change of fluorescence intensity of N, B-CDs with time after adding Ag^{+}. (λex = 430 nm, λem = 490 nm)

Table S1

Comparison of optical properties of other B-doped CDs.

Materials 1	Materials 2	Excitation (nm)	Emission (nm)	QY (%)	Ref.
Adenine	3-aminophenylboric acid	305	380	/	[23]
3-aminophenylboronic acid	/	490	540	15.4	[21]
Phenylboronic acid	/	247	323	12	[16]
Cresyl violet	Boric acid	520	616	18	[24]
Citric acid	Sodium tetraphenylborate	350	443	42	[25]
Ammonium citrate tribasic	3-aminophenylboric acid	430	490	33.04	This work

Table S2

Comparison of different carbon dots used for the detection of Ag^{+}.

Methods	Linear range (μM)	LOD (nM)	QY (%)	Ref.
CQD/Au NC	1-30	50	/	[4]
N, S-CDs	100-1000	1.16×10^{4}	/	[27]
N-CQDs	0-10 and 10-30	1.19×10^{3} and 660	5.11	[11]
Aa N, P-CDs	0-25	74.35	7.25	[28]
CQDs	0-0.01 and 0.01-3.0	1.4	9.01	[10]
TAPI-dots	0-1 and 1-8	10.3	74.9	[3]
N-CDs	0-25	50	19	[2]
NPCl-CQDs	6.6×10^{2}-1.46×10^{3} and 1.50×10^{3}-4.20×10^{3}	26.38×10^{3}	6.65	[18]
S, N/CDs	0.1-25	37	5.55	[1]
N, B-CDs	0.99-26.04	9.03	33.04	This work

Table S3

Comparison of other methods used for the detection of Ag^+.

Methods	Linear range (μM)	LOD (nM)	QY (%)	Ref.
HNCNs/PDDA/SWCNTs	10-200	1.97	/	[29]
CNNS/PAM/PAA	0-100	6.31×10^3	/	[30]
Au@Ag NP-SERS	10^{-4}-0.1	0.05	/	[31]
B15C5-MWCNTs	0.27-10^5	/	/	[32]
N, B-CDs	0.99-26.04	9.03	33.04	This work

Table S4

Detection of Ag^+ in real water samples. (n=3)

Sample	Spiked (μM)	Fluorescent			UV-vis			ICP-MS
		Found (μM)	Recoveries (%)	RSD (%)	Found (μM)	Recoveries (%)	RSD (%)	Found (μM)
Lingde Lake	2.0	2.02±0.05	100.89	2.01	2.01±0.07	100.50	1.97	2.01
	5.0	5.37±0.19	107.40	3.27	5.26±0.10	105.20	2.57	5.05
	8.0	8.07±0.16	100.82	1.79	8.03±0.13	100.38	1.99	7.96
	10.0	10.50±0.26	104.98	2.20	10.35±0.11	103.50	2.39	10.03