Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Supporting Information for

Microwave-assisted synthesis of nitrogen-rich carbon dots as effective fluorescent probe for sensitive detection of Ag^+

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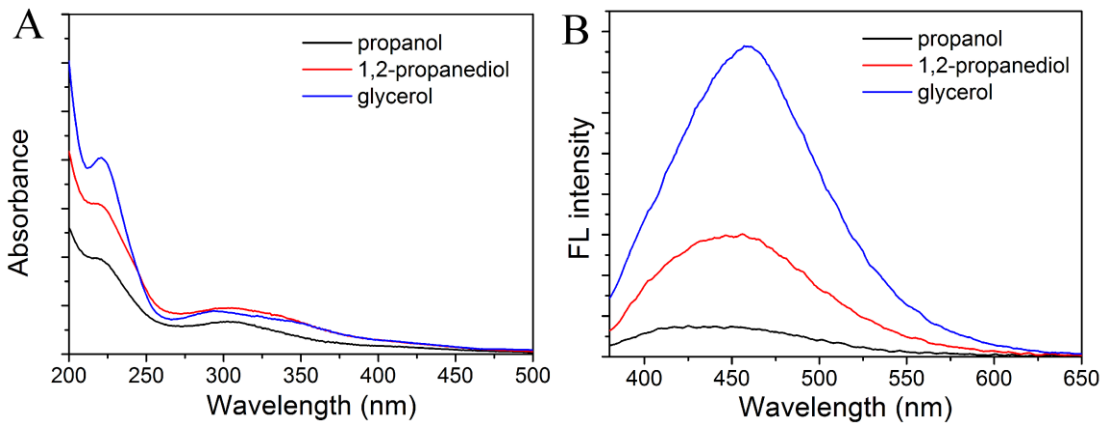


Fig. S1. The UV-vis spectra (A) and fluorescence emission spectra (B) of the nitrogen-rich CDs (N-dots) synthesized with different hydroxyl compounds as additives.

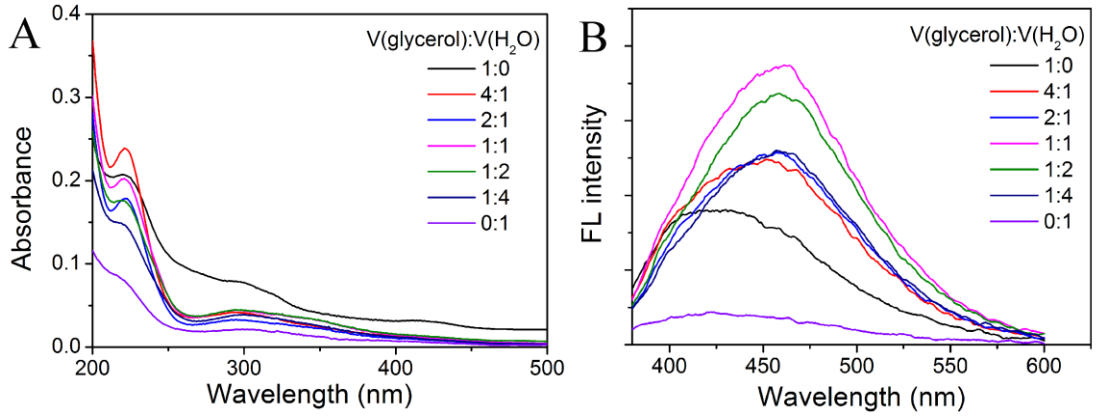


Fig. S2. The UV-vis spectra (A) and fluorescence emission spectra (B) of the N-dots synthesized at different concentrations of glycerol.

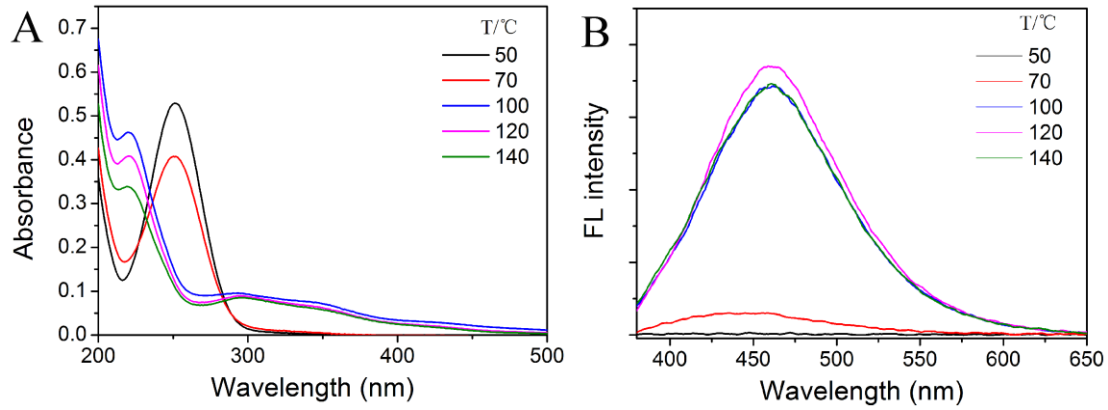


Fig. S3. The UV-vis spectra (A) and fluorescence emission spectra (B) of the N-dots synthesized at different reaction temperatures with glycerol.

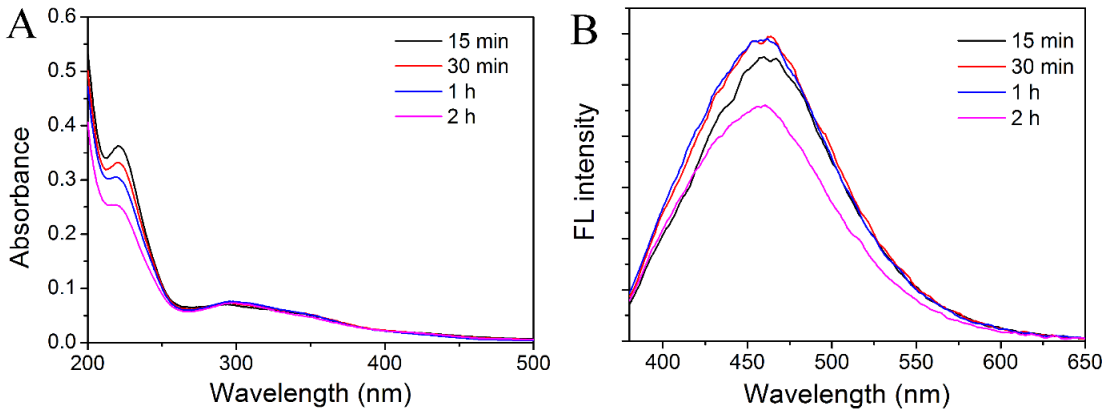


Fig. S4. The UV-vis spectra (A) and fluorescence emission spectra (B) of the N-dots synthesized at different reaction time with glycerol

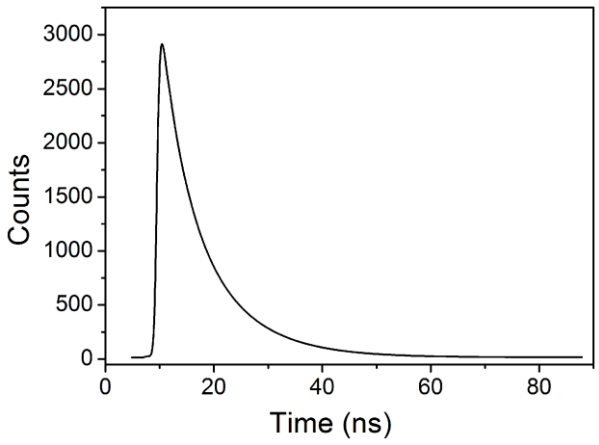


Fig. S5. The fluorescence lifetime spectrum of the N-dots (The concentration of the N-dots was 100 μg/mL).

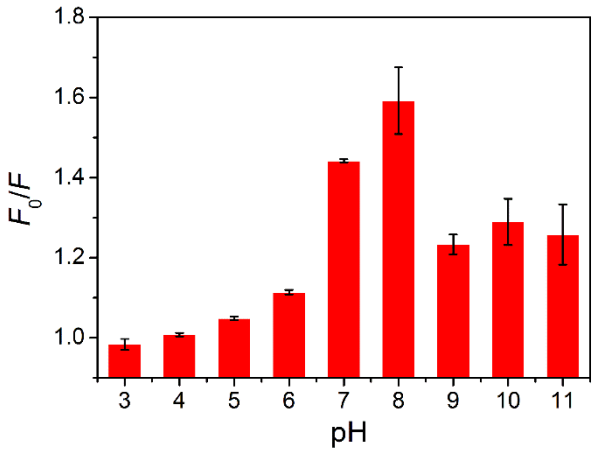


Fig. S6. pH Effect on Ag^+ detection based on the fluorescence quenching efficiency (F_0/F) (The concentrations of the N-dots and Ag^+ were 100 μg/mL and 2 μM, respectively).

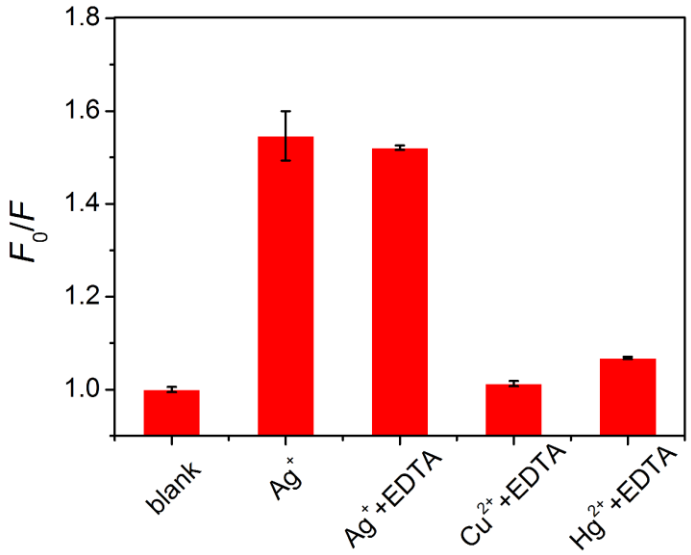


Fig. S7. Fluorescence changes of the probe towards Ag^+, the mixture of Ag^+ and EDTA, the mixture of Cu^{2+} and EDTA, the mixture of Hg^{2+} and EDTA. (The concentration of the N-dots was 100 μg/mL. The concentration of the Ag^+ was 2 μM. The concentrations of Cu^{2+} and Hg^{2+} were 20 μM. The concentration of EDTA was 100 μM.)

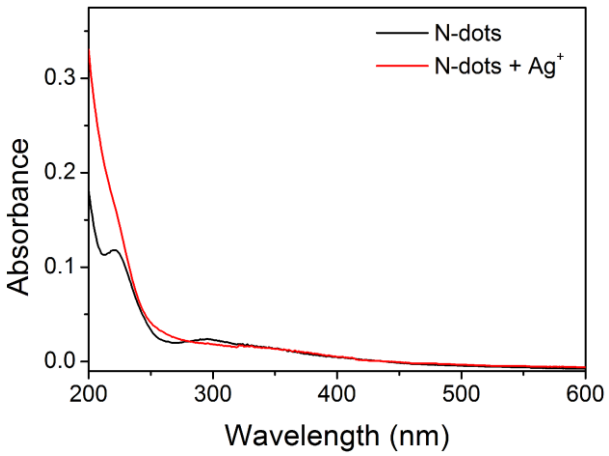


Fig. S8. The UV-vis absorption spectra of the N-dots before and after the addition of 10 μM Ag^+.

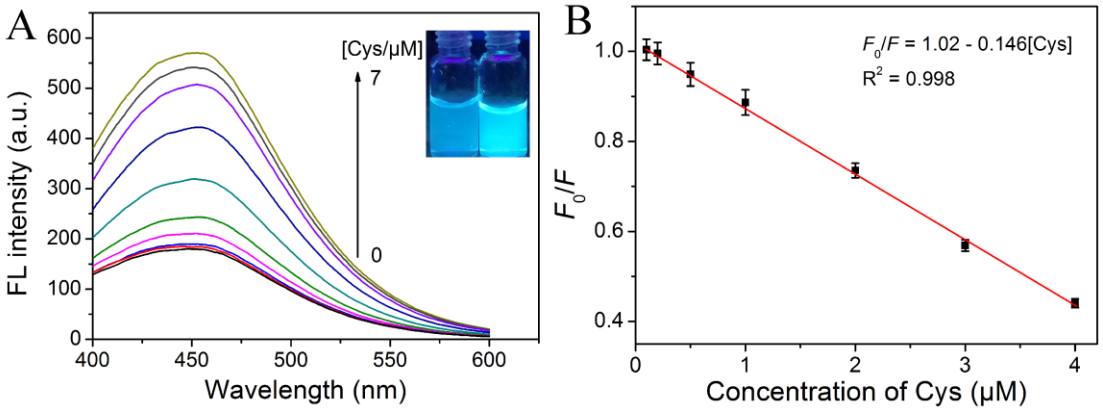


Fig. S9. (A) Fluorescence recovery of the N-dots/Ag^+ system in the presence of different concentrations of Cys. Inset showed the photographs of the N-dots/Ag^+ system in the absence and presence of 7 μM Cys under UV light (365 nm). (B) Relationship between fluorescence restoration of the N-dots versus concentration of Cys, where F_0 was fluorescence intensity of the N-dots/Ag^+ complex and F was the fluorescence intensity of N-dots/Ag^+ complex with the addition of Cys. (The concentrations of the N-dots and Ag^+ were 100 μg/mL and 6 μM, respectively)

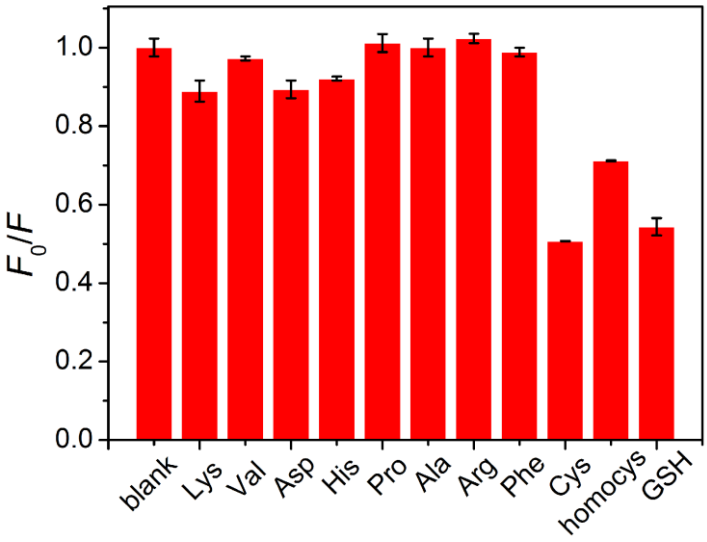
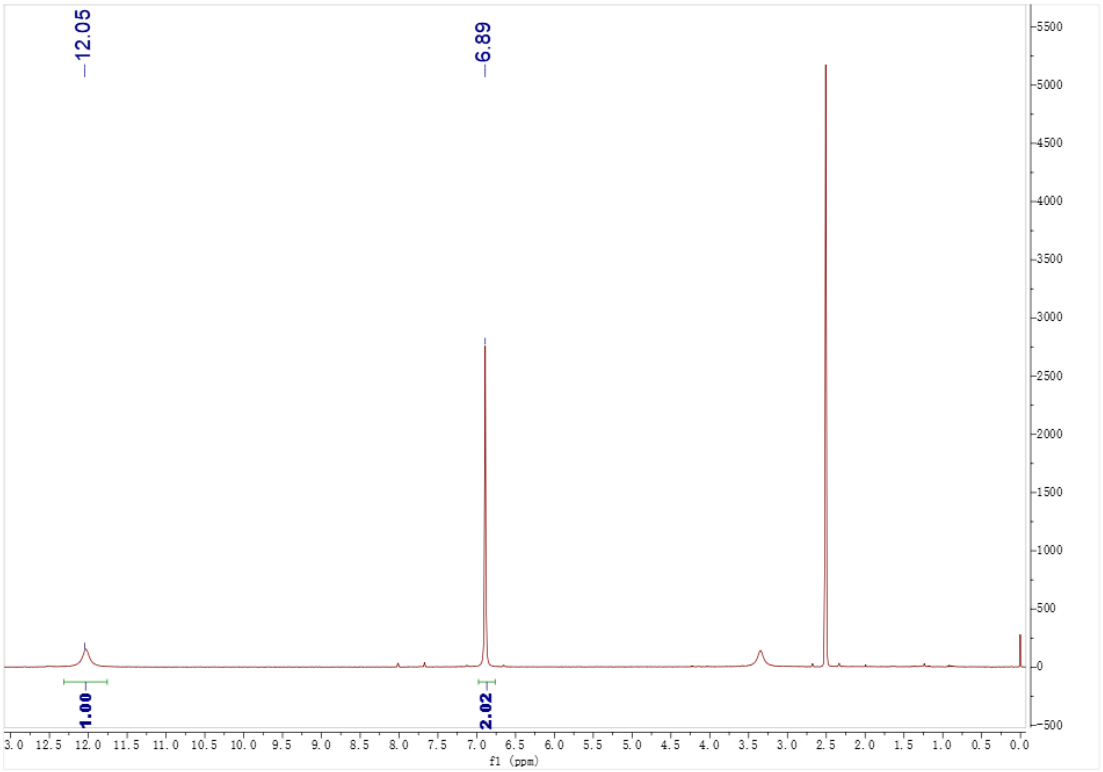
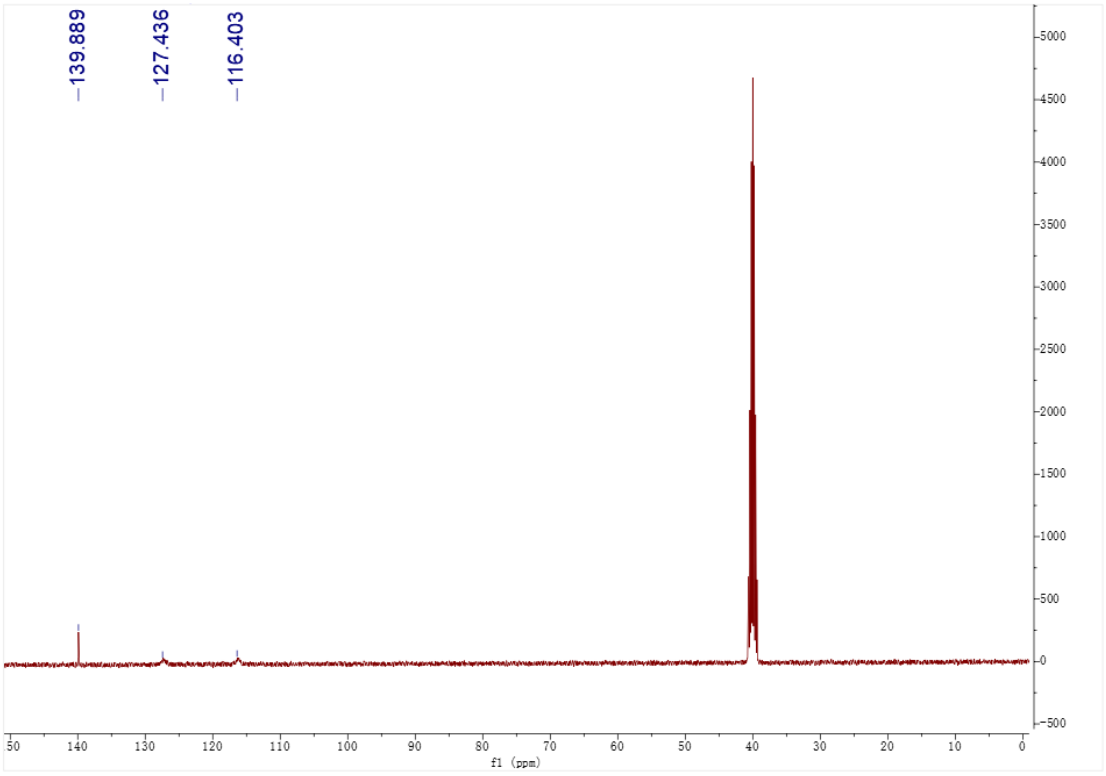


Fig. S10. Selectivity of the N-dots/Ag^+ complex toward Cys. (The concentrations of the N-dots and Ag^+ were 100 μg/mL and 2 μM, respectively. 4 μM for Cys, Hcy and GSH. 100 μM for other cations)

Fig. S11. The NMR spectra of the 2-azidoimidazole.



^{1}H NMR (400 MHz, DMSO-d_6) δ 12.05 (s, 1H), 6.89 (s, 2H).



^{13}C NMR (101 MHz, DMSO) δ 139.89, 127.44, 116.40.

Table S1. The QYs of the N-dots synthesized using different hydroxyl compounds as additives with 50% water in volume (Other reaction conditions: 120 ℃, 30 min, 50 W).

Additive	propanol	1,2-propanediol	glycerol
QY (%)	10.9	22.2	27.9

Table S2. The QYs of the N-dots synthesized at different concentrations of glycerol (Other microwave reaction conditions: 120 ℃, 30 min, 50 W).

V(glycerol):V(H_2O)	1:0	4:1	2:1	1:1	1:2	1:4	0:1
QY (%)	10.8	25.7	27.6	27.9	24.5	24.3	8.7

Table S3. The QYs of the N-dots synthesized at different reaction temperatures (Other reaction conditions: 50% glycerol/water (v/v), 30 min, 50 W)

T (℃)	50	70	100	120	140
QY (%)	-	18	22	27.9	27.4

Table S4. The QYs of the N-dots synthesized at different reaction time (Other reaction conditions: 50% glycerol/water (v/v), 120 ℃, 50 W)

Reaction time (min)	15	30	60	120
QY (%)	25	27.9	27	23

Table S5. Fluorescence lifetime value and relative content of the N-dots in the absence and presence of Ag^+ (The concentrations of the N-dots and Ag^+ were 100 μg/mL and 10 μM, respectively).

	Param	Value/ns	Rel.%
CDs	τ1	3.41	16.39
	τ2	9.33	83.61
CDs + Ag^+	τ1	3.91	23.49
	τ2	9.87	76.61

Table S6. Comparison of the present approach with other reported methods for the Ag^+ sensing.

Sensing material	Method	Linear range	LOD	Reference in main text
BSA@AuNCs	Colorimetry	0.5-10 μM	0.204 μM	[48]
AuNPs	Colorimetry	0.13-1.12 μM	62.0 nM	[49]
Peptide-AuNPs	Colorimetry	10-1000 nM	7.4 nM	[50]
S-GQDs	Fluorometry	0.1-130.0 μM	30 nM	[51]
N-doped CDs	Fluorometry	1-7 μM	0.20 μM	[47]
N-CDs	Fluorometry	30-90 μM	0.45 μM	[46]
N-dots	Fluorometry	0-20 μM	0.48 μM	[15]
N-doped CDs	Fluorometry	1-1000 μM	10 nM	[45]
N-dots	Fluorometry	20 nM-6 μM	6.3 nM	This work