

Supplementary Material

A facile fluorescent sensor based on nitrogen-doped carbon dots derived from *Listeria monocytogenes* for highly selective and visual detection of iodide and pH

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pH reversibility test

The pH reversibility test referred to the previous literatures¹⁻³, and the method in detail is as follows:

The pH of NCDs-LM solution between pH 5 and pH 9 was adjusted back and forth by 2 M HCl or NaOH, and then measured by pH meter. The fluorescence spectra were recorded with $\lambda_{ex} = 490$ nm.

The captions of figures and tables

Fig. S1 (a) The fluorescence emission spectra of the NCDs-LM, NCDs-LM-Hg²⁺ and NCDs-LM-Hg²⁺-I⁻ mixture in aqueous solution. (b) The fluorescence stability of the NCDs-LM, NCDs-LM-Hg²⁺ and NCDs-LM-Hg²⁺-I⁻ solutions.

Fig. S2 (a) UV-vis absorption spectra of NCDs-LM (100 $\mu\text{g}/\text{mL}$), NCDs-LM-Hg²⁺ and NCDs-LM-Hg²⁺-I⁻ mixture in aqueous solution. (b) Fluorescence decay curves of NCDs-LM (100 $\mu\text{g}/\text{mL}$), NCDs-LM-Hg²⁺ and NCDs-LM-Hg²⁺-I⁻ mixture ($\lambda_{ex}=490$ nm, $\lambda_{em}=550$ nm).

Table S1 Comparison of the LOD with the reported methods of I⁻ determination.

Table S2 The fluorescence lifetimes of NCDs-LM ($\lambda_{ex} =490$ nm, $\lambda_{em} =550$ nm) at different pH.

Table S3 Comparison of the pH range with the reported methods of pH determination.

Fig.S1.

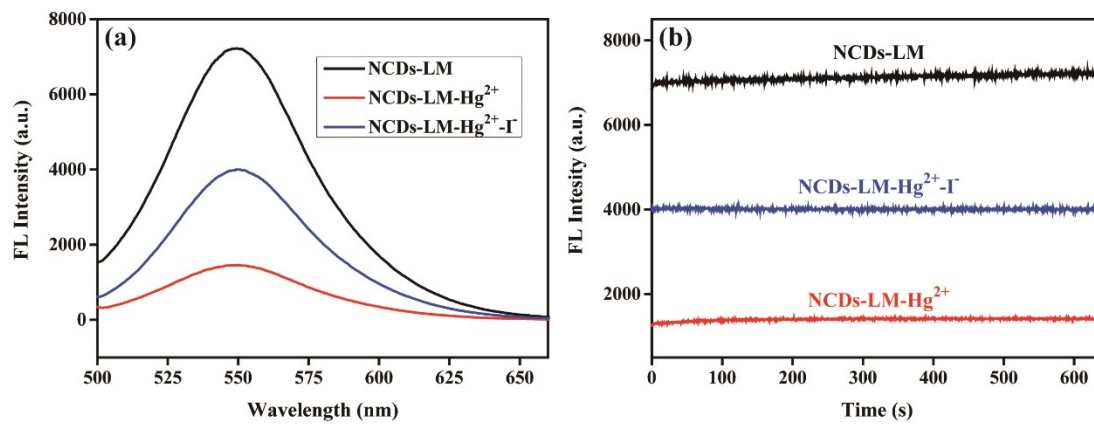


Fig.S2.

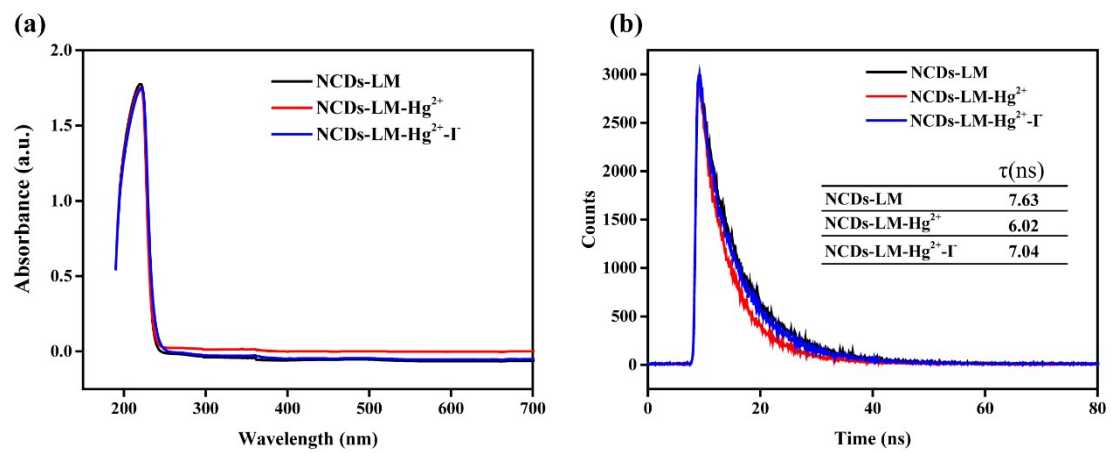


Table S1 Comparison of the LOD with the reported methods of I⁻ determination.

Detection methods	Strategy/Materials	Linear range	LOD	Reference
HPLC-DAD	Phosphatidylcholine column	0.5-10.0 mg /L	22.84 ng/mL	4
HPLC-MS/MS	Ultrasonic extraction followed by HPLC-ESI-MS/MS	0.5- 200 ng/mL	0.15 ng/mL	5
Cathodic stripping voltammetry	Chitosan coating screen-printed carbon electrode	0.15-500 μ mol/L	10 nmol/L	6
Capillary electrophoresis	UV detection	0.20-4.0 μ mol/L	60 nmol/L	7
Chemiluminescence	KMnO ₄ -carbon dots	3.0-100 μ mol/L	350 nmol/L	8
Fluorescence	Carbon dots	0.5-20 μ mol/L	430 nmol/L	9
Fluorescence	Nitrogen-doped carbon dots	0.3-15 μ mol/L	69.4 nmol/L	10
Fluorescence	Nitrogen-doped carbon dots	0-2.0 mmol/L	10 μ mol/L	11
Colorimetry and fluorescence	Histidine-mediated synthesis of gold nanoclusters	0.8-60 μ mol/L, 1.2-50 μ mol/L	118 nmol/L, 215 nmol/L	12
Colorimetry and ratiometric fluorescence	Catalase-like reaction of iodide ions and nitrogen-doped carbon dots	0.09-50 μ mol/L	60 nmol/L	13
Fluorescence	<i>Listeria monocytogenes</i> -derived nitrogen-doped carbon dots (NCDs-LM)	0.5-10 μ mol/L, 10-1000 μ mol/L	20 nmol/L	This work

Table S2 The fluorescence lifetimes of NCDs-LM ($\lambda_{\text{ex}} = 490 \text{ nm}$, $\lambda_{\text{em}} = 550 \text{ nm}$) at different pH.

pH	τ_1 (ns)	τ_2 (ns)	$\tau_{\text{avg.}}$ (ns)
1.81	2.97(49%)	7.16(51%)	5.10
2.21	3.44(47%)	7.10(53%)	5.37
3.29	3.35(18%)	7.33(82%)	6.59
4.10	3.41(16%)	7.63(84%)	6.93
5.32	3.52(13%)	7.74(87%)	7.18
6.37	3.93(18%)	7.95(82%)	7.24
7.24	4.29 (27%)	8.58(73%)	7.43
8.36	3.48(13%)	8.08(87%)	7.48
9.15	4.81(31%)	8.70(69%)	7.51
10.38	4.27(19%)	8.47(81%)	7.66
11.20	4.73(25%)	8.69(75%)	7.68

Table S3 Comparison of the pH range with the reported methods of pH determination.

Detection methods	Materials	pH range	Reference
Fluorescence and colorimetry	Microsystem-assisted synthesis of carbon dots	3.5-10.2	14
Fluorescence lifetime	CdTeSe/ZnS quantum dots (QDs)-NIR carbocyanine dye conjugates	2.0-8.0	15
Fluorescence	<i>p</i> -aminothiophenol-coated CdSe/ZnS QDs	3.2-6	16
Luminescent dimetallic Eu(III)-based Probe	Dimetallic Eu(III)-containing complex	4-8	17
Fluorescence lifetime imaging microscopy	Mercaptopropionic acid-capped QDs	5.3-9.0	18
pH-sensitive release system	Basic cobalt carbonate nanovalves	2-7.4	19
pH electrode	Tungsten needle modified with polyaniline film	2-12	20
Fluorescent chemosensors	Catechol Derivatives	8-24	21
Fluorescence	Polyamines bearing anthracene and benzophenone units at the respective ends	1-13	22
Micromechanical technique	Modified silicon and silicon nitride microcantilevers	2-8	23
Fluorescence	NCDs-LM	1.81-11.82	This work

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