Electronic Supplementary Information (ESI)

for

Light-Up Carbon Dots for Copper (II) Detection by Aggregation-Induced Enhanced Strategy

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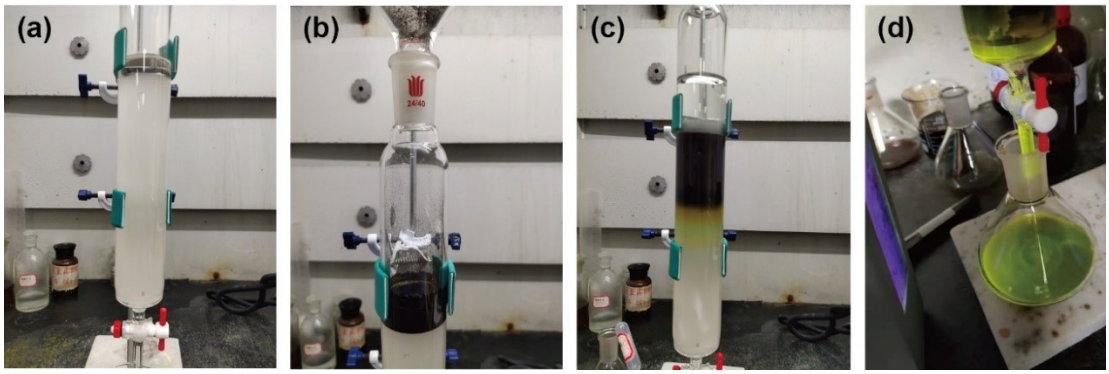

Figure S1. (a) Wet column loading. (b) Dry loading. (c) Gradient elution. (d) Collecting yellow components under the indication of 365 nm UV lamp (O-CDs appear yellow in the eluent, in yellow-orange appears in the aqueous solution).

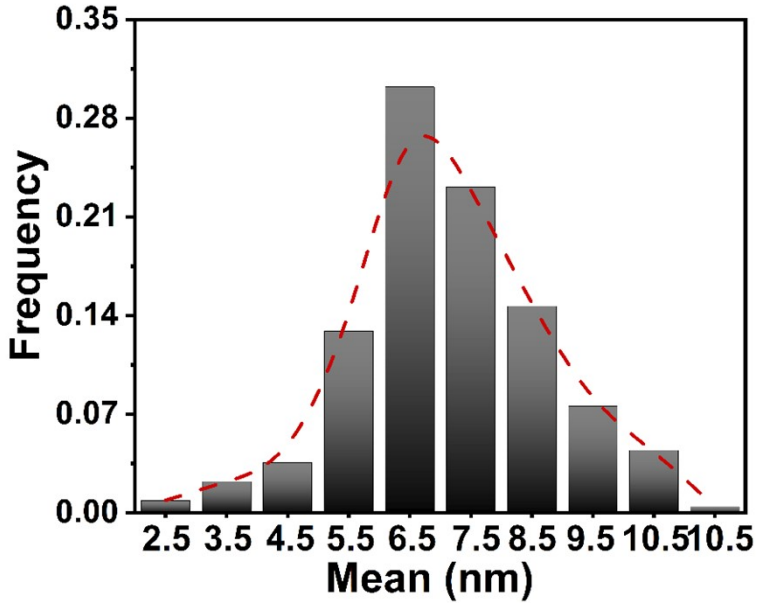

Figure S2. Histogram of the particle size distribution of O-CDs (The results of 225 O-CDs were tallied).

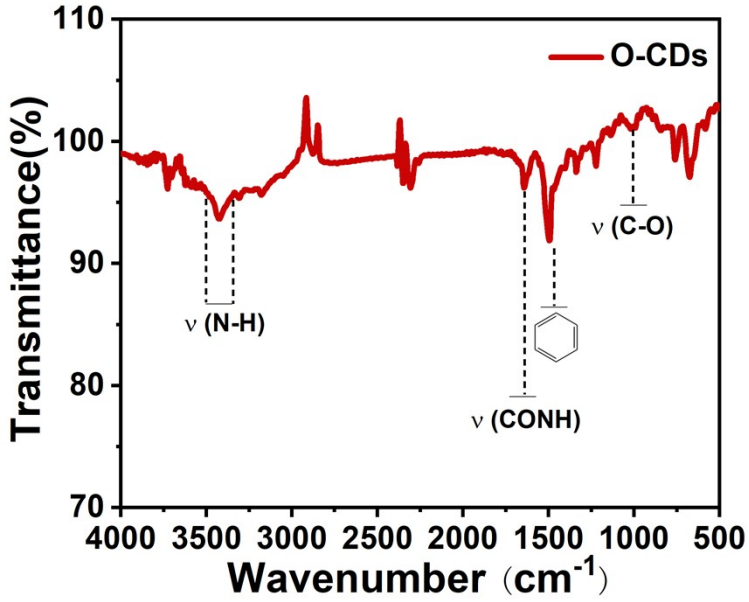

Figure S3. Fourier infrared spectroscopy of O-CDs.

The precursors iron phthalocyanine and O-phenylenediamine were put separately into two Teflon-lined autoclaves under the same condition as the O-CDs preparation. Then, we also used the same column chromatography method to purify product 1 (FePc-CDs) from iron phthalocyanine and product 2 (OPD-CDs) from O-phenylenediamine by column chromatography. Their optical properties were firstly compared.

As shown in Figure S2a, b the maximum emission wavelengths of FePc-CDs, OPD-CDs and O-CDs are 422 nm, 565 nm and 572 nm, respectively. We can see that the solution of FePc-CDs was blue, OPD-CDs were yellow and O-CDs were yellow-orange under 365 nm ultraviolet light. Based on this, we can conclude that the doping of iron phthalocyanine can make the wavelength of the carbon dots prepared from O-phenylenediamine red-shifted. O-CDs with longer wavelength emission and higher quantum yield are more conducive to imaging and colorimetry in subsequent analysis and detection.

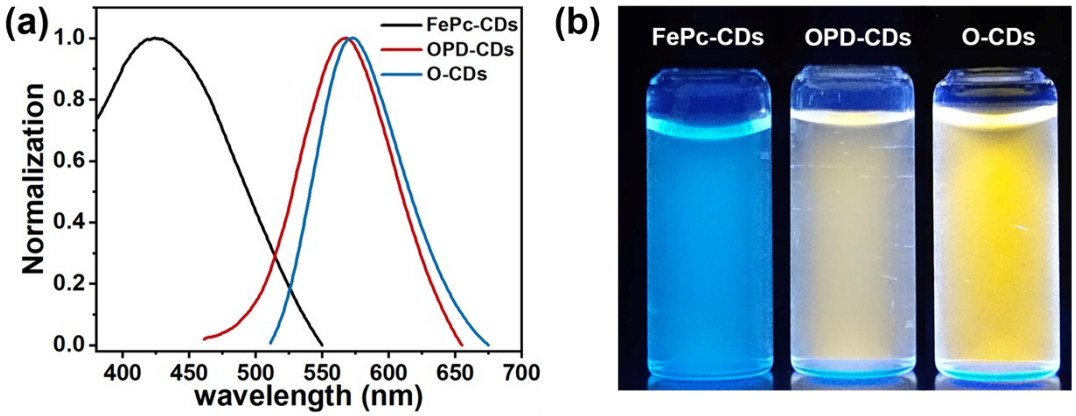

Figure S4. (a) Fluorescence spectra and (b) pictures under 365nm UV lamp of FePc-CDs, OPD-CDs and O-CDs.

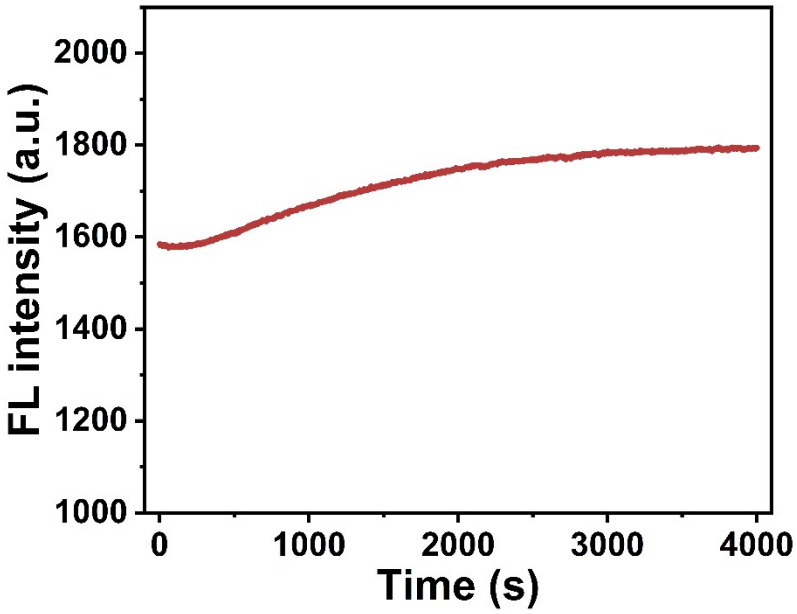

Figure S5. The fluorescence intensity of 4000 s was irradiated by carbon dots under 430 nm excitation light.

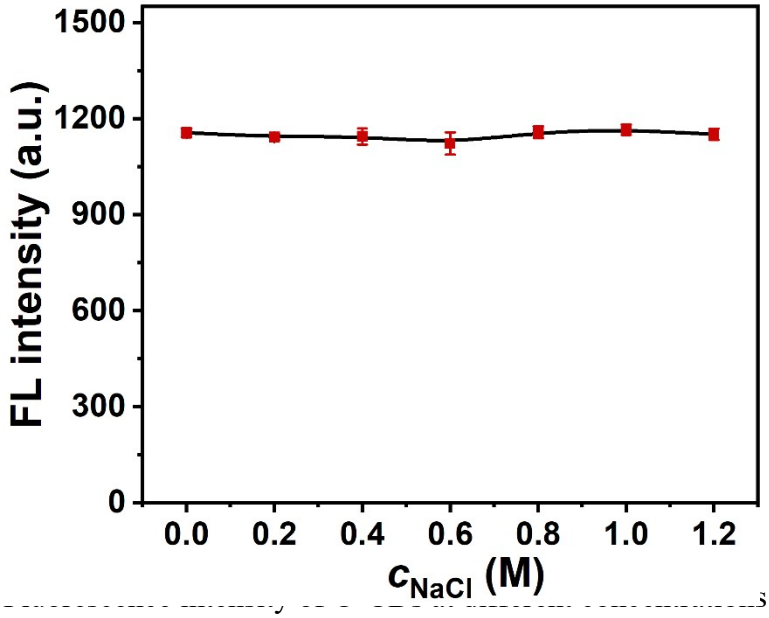

Figure S6. s of NaCl (0−1.2 M).

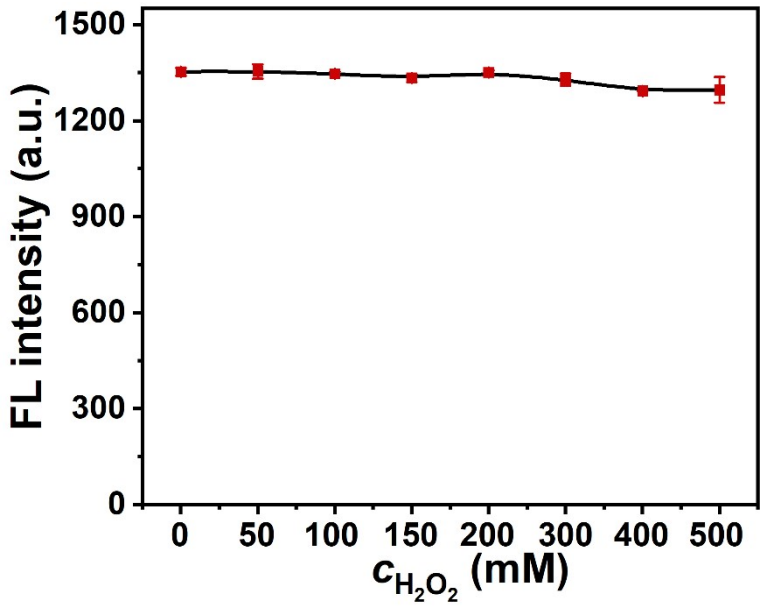

Figure S7. Fluorescence intensity of O-CDs at different concentrations of H_2O_2 (0−500 mM).

CCK-8 assay was carried out to investigate the cytotoxicity of O-CDs. MCF-7 cells were seeded in 96-well plates at a seeding density of 1.0×105 cells/well in 100 μL DEME culture medium supplemented with 2% FBS and incubated at 37℃ with 5% CO2 for 24 h. After rising with PBS, culture media containing serial concentrations of DNA-GO nano complex probes were incubated with MCF-7cells for another 24 h. After PBS washing, each well was replaced by 10 μL of Cell Counting Kit-8 (CCK-8) solution and 90 μL of FBS free DEME, followed by incubation for 30 min. The optical densities (OD) of the mixture at a wavelength of 450 nm were measured with a Microplate Reader Model. The cell viability was estimated according to the following equation:

$$V_{cell} = \frac{OD_{Treated} - OD_{PBS}}{OD_{Control} - OD_{PBS}} \times 100\%$$

Where V_{cell} represents the cell viability (%), $OD_{Treated}$ is the optical density in the presence of O-CDs, OD_{PBS} is the absorbance of PBS in the 96 well-plate and $OD_{Control}$ is the optical density in the absence of O-CDs.

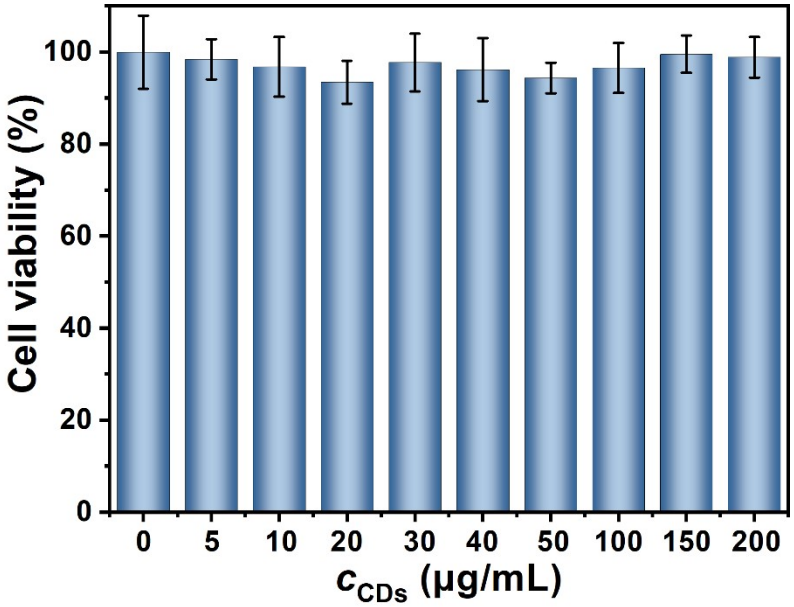

Figure S8. The relative survival rate of MCF-7 cells incubated with O-CDs for 24 h (n=3).

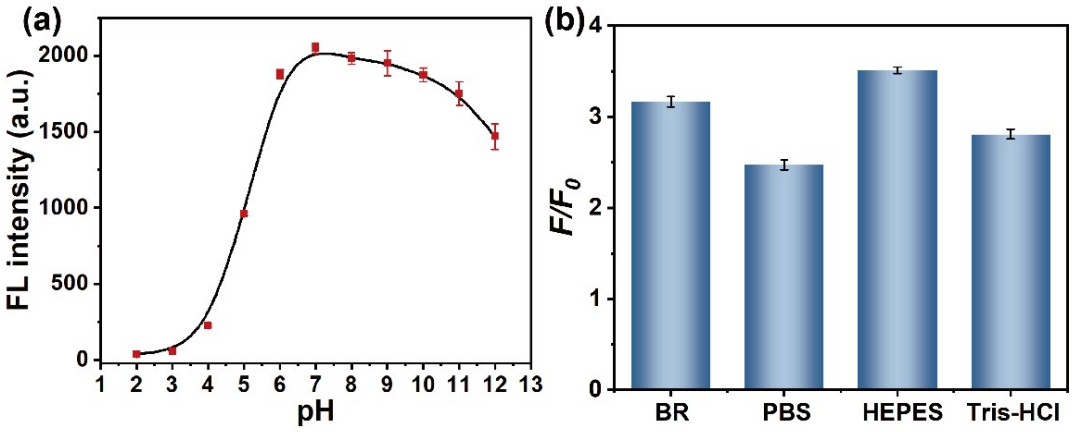

Figure S9. (a) pH stability of O-CDs. (b) Response of O-CDs in different buffer systems (pH 7.4).

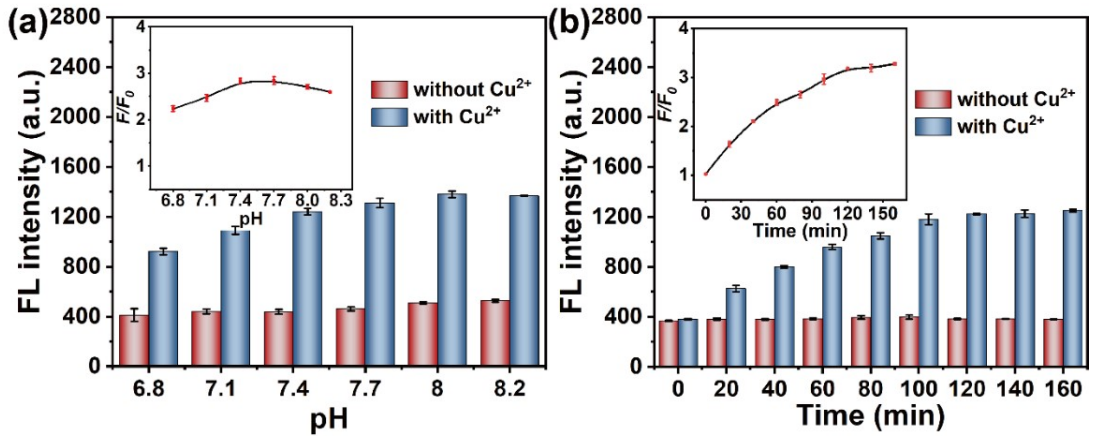

Figure S10. Optimization of detection conditions. (a) Optimization of reaction pH and (b) optimization of reaction time for the established detection method.

Table S1. Comparison of various analytical technologies for Cu^{2+}.

Materials	Test Method	Linear range	LOD	Reference
Modified AuNNP	Photoacoustic imaging	0–18 mM	57.4 μM	1
Organic molecule	Fluorescence quenching	0.0−10.0 μM	8.33 nM	2
Organic molecule	Fluorescence enhancement	0.0−10.0 μM	27.7 nM	3
MGQD	Fluorescence quenching	0.5−25 μM	0.5 μM	4
Fluorescence	Fluorescence quenching	0.05–5 μM	0.025 μM	5
O-CDs	Fluorescence enhancement	0.02−30 μM	14 nM	this work

Reference

(1) Feng, H.; Fu, Q.; Du, W.; Zhu, R.; Ge, X.; Wang, C.; Li, Q.; Su, L.; Yang, H.; Song, J. Quantitative Assessment of Copper(II) in Wilson's Disease Based on Photoacoustic Imaging and Ratiometric Surface-Enhanced Raman Scattering. *ACS Nano* 2021, **15**, 3402−3414.

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