**Supporting Information**

# Carbon dot based fluorescent "on-off-on" assays for the determination of Au(III) ions and biothiols

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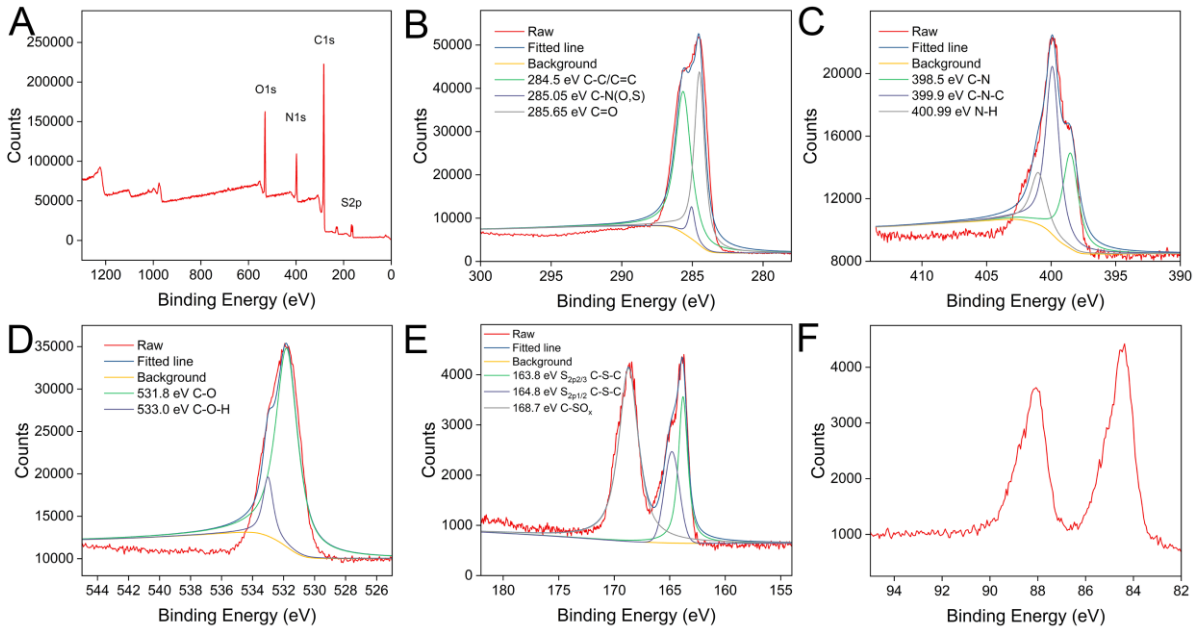


**Figure S1.** (A) XPS scanning spectra of freshly prepared CD. (B-E) XPS high-resolution survey scans. (F) XPS high-resolution survey scan of Au element in CD/$Au^{3+}$ system.

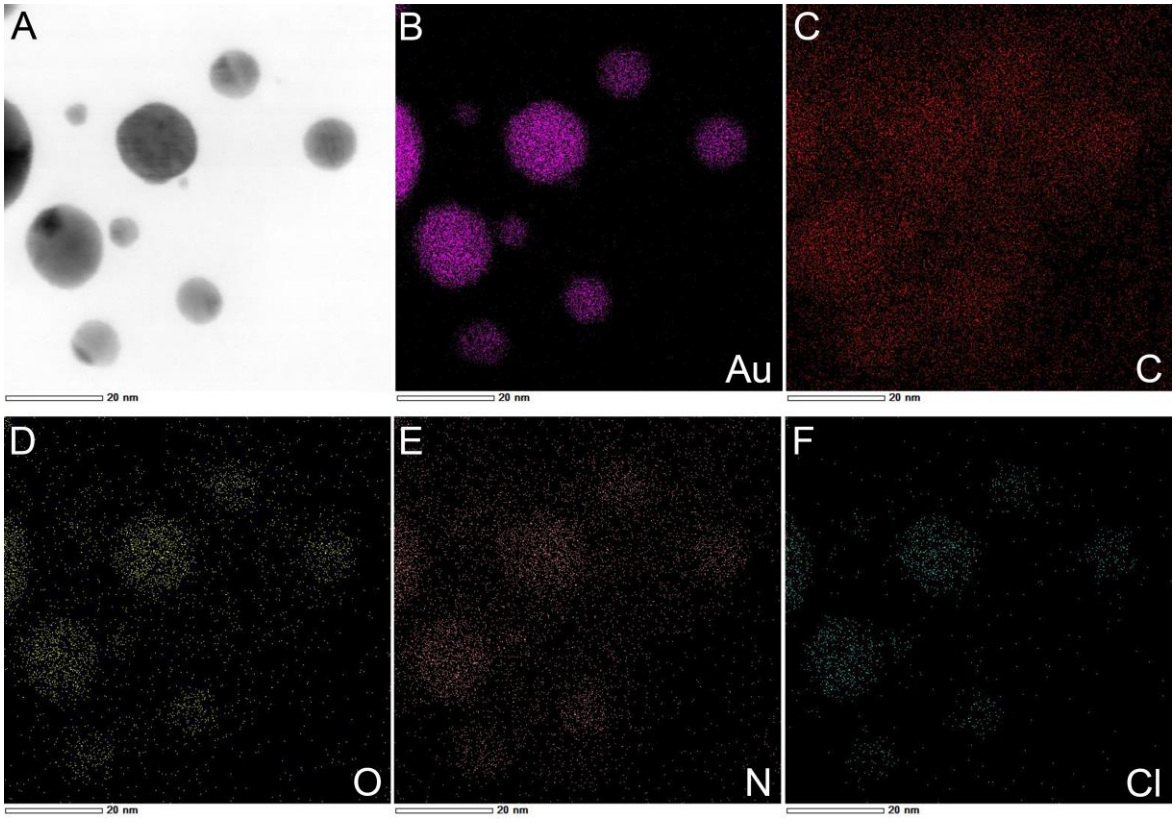


**Figure S2.** (A) TEM image of CD/$Au^{3+}$ system. (B-F) TEM-mapping illustrating Au, C, O, N and Cl.

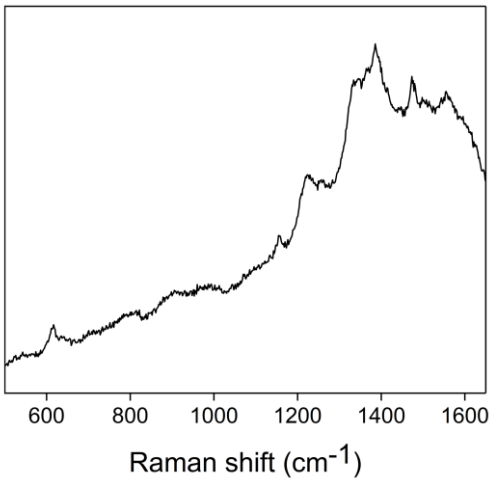


**Figure S3.** Raman spectrum of the prepared CD.

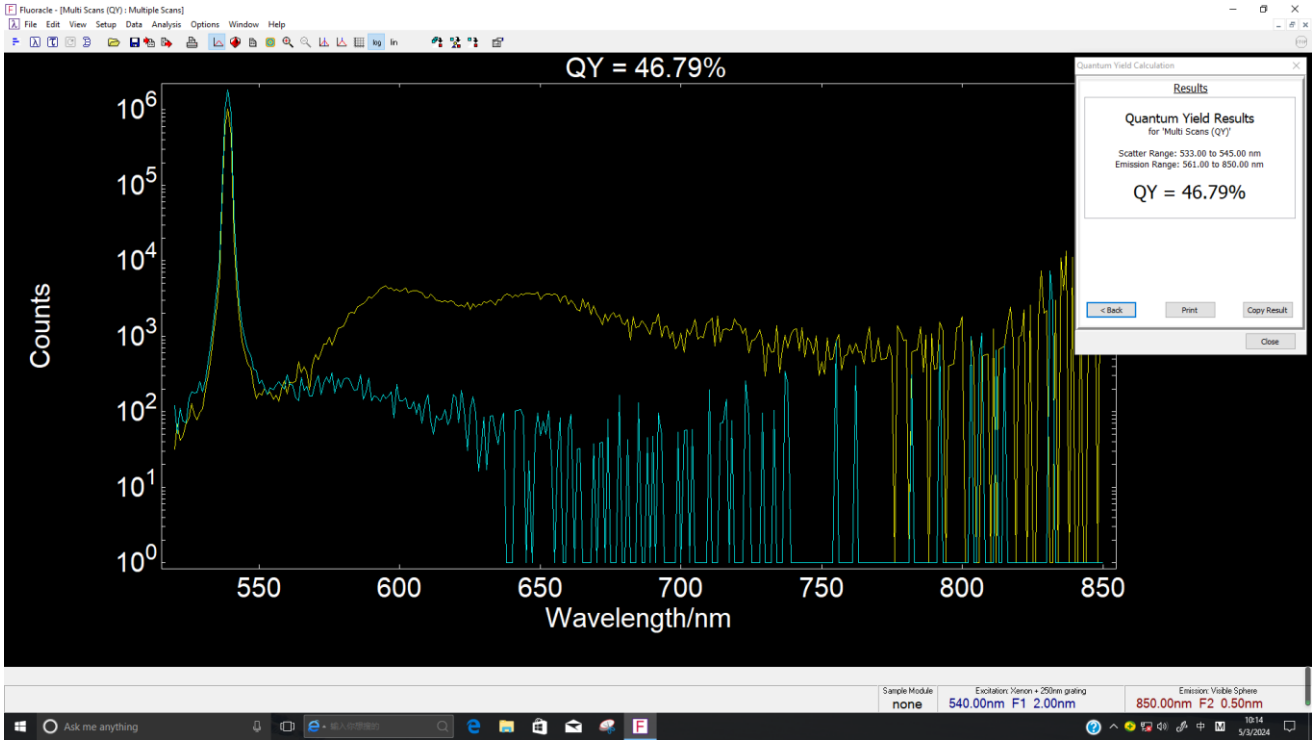


**Figure S4.** Fluorescence emission spectra of CD and reference water with the Y-axis of logarithmic photon counts.

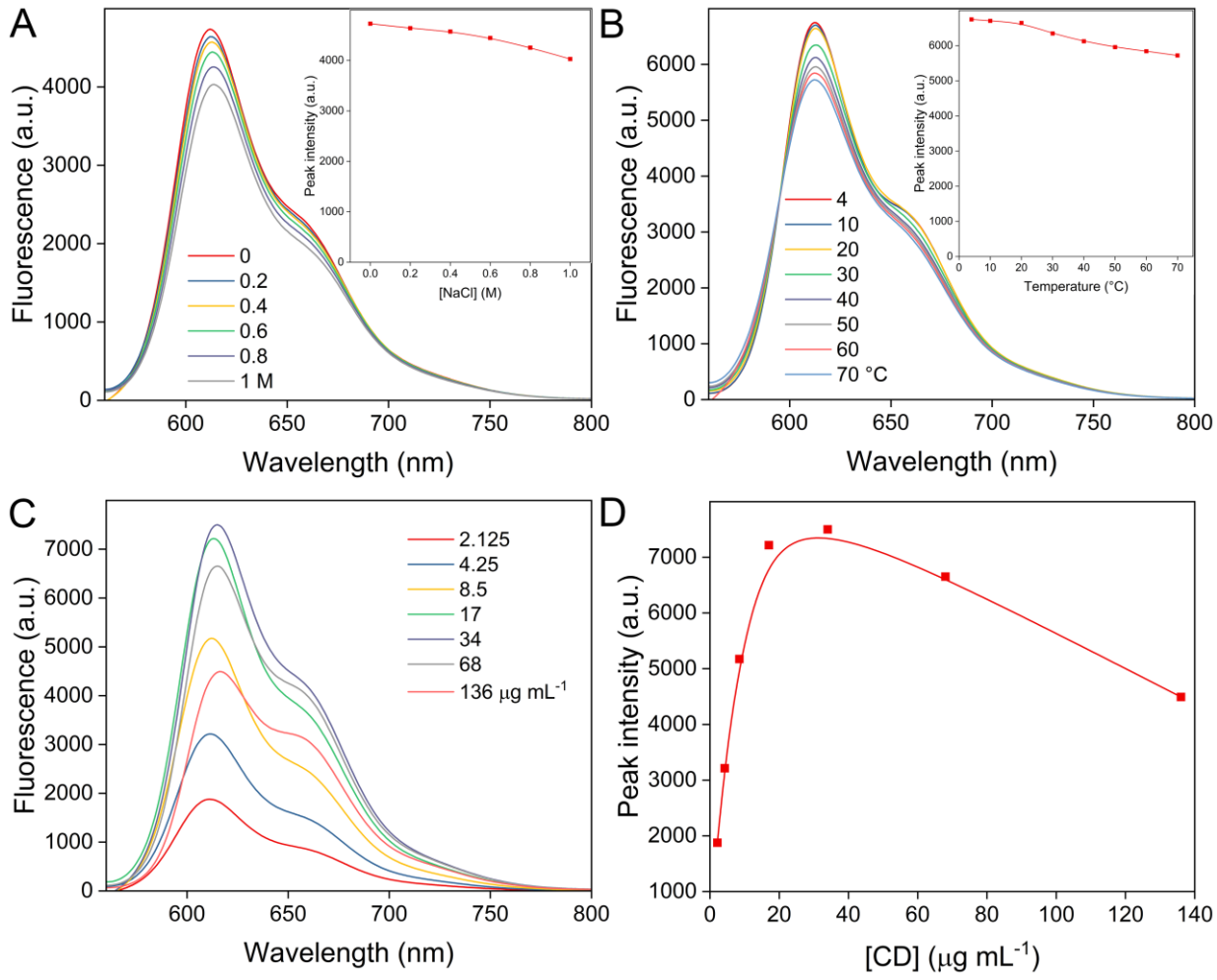


**Figure S5.** (A) Fluorescence emission spectra of CD in the presence of salt with a series of concentrations. Inset shows the relationship between the peak intensity and the concentration. (B) Fluorescence emission spectra of CD incubated at various temperatures. Inset shows the relationship between the peak intensity and the temperature. (C) Fluorescence emission spectra of CD with a series of concentrations. (D) shows the relationshop between the peak intensity and the concentration.

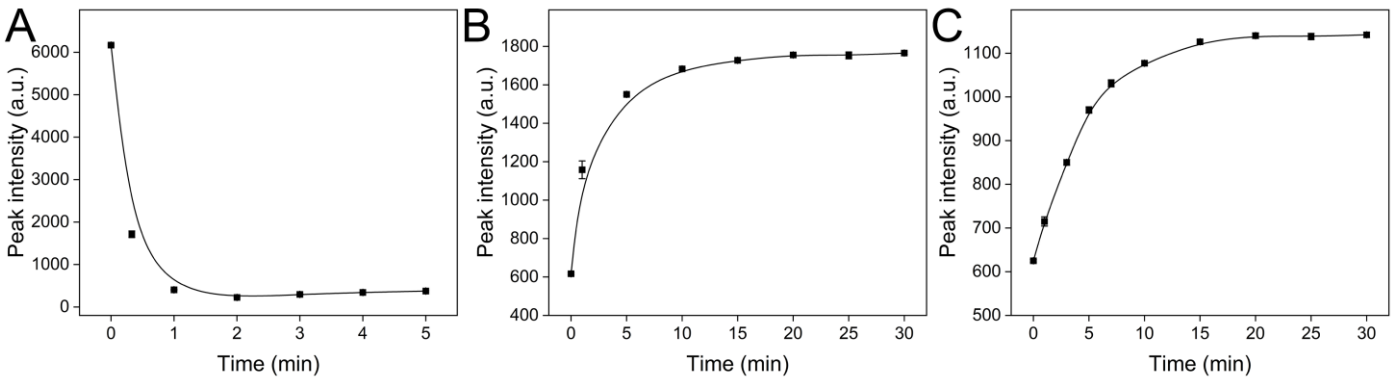


**Figure S6.** Optimizations of (A) the reaction time with $Au^{3+}$, (B) the reaction time with Cys and (C) the reaction time with GSH.

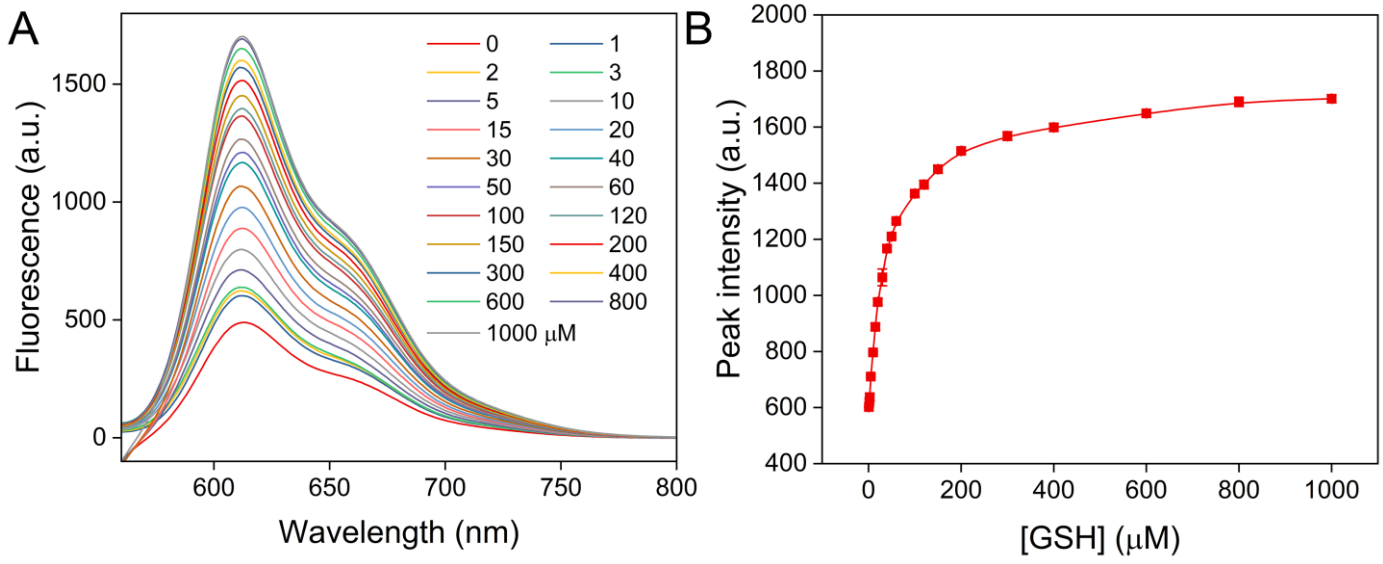


**Figure S7.** (A) Fluorescence emission spectra for the detection of GSH with a series of concentrations. (B) The relationshop between the peak intensity and GSH concentration.

**Table S1.** Comparison of the analytical performances of recent $Au^{3+}$ assays.

| Technique | Strategy | Detection range (M) | LOD (M) | Ref |
|---|---|---|---|---|
| fluorescence | bis-pyrene-containing fluorescent receptor | $0 – 6\times10^{-6}$ | $7.5\times10^{-7}$ | 1 |
| colorimetry | plasmonic $H_{0.3}MoO_3$ nanoparticles | $5\times10^{-7} – 7\times10^{-5}$ | $4.5\times10^{-7}$ | 2 |
| fluorescence | rhodamine based probe | $5\times10^{-7} – 3\times10^{-6}$ | $3.4\times10^{-7}$ | 3 |
| colorimetry | indolino-spironaphthooxazine probe | $2.5\times10^{-7} – 5\times10^{-7}$ | $3.35\times10^{-7}$ | 4 |
| fluorescence/ colorimetry | dual-functional probe equipped with smartphone chromaticity | $0 – 3\times10^{-7}$ | $6.8\times10^{-8}$ | 5 |
| fluorescence | red fluorescent CD | $10^{-6} – 5\times10^{-6}$ | $2.9\times10^{-8}$ | 6 |
| fluorescence | functional CD-hydrogel complex | $6.5\times10^{-9} – 2.193\times10^{-5}$ | $3.98\times10^{-9}$ | 7 |
| multichannel detection | AIEE behavior of rhodamine derivative | $0 – 4\times10^{-8}$ | $2.98\times10^{-10}$ | 8 |
| fluorescence | fluorescent CD | $10^{-7} – 7\times10^{-6}$ | $10^{-8}$ | this work |

AIEE, aggregation-induced emission enhancement.

**References**


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