New Journal of Chemistry

Electronic Supplementary Information

Highly selective and sensitive detection of heparin based on competition-modulated assembly and disassembly of fluorescent gold nanoclusters

Sha Li, Pengcheng Huang, Fangying Wu*

College of Chemistry, Nanchang University, Nanchang 330031, China

*Corresponding Author: Fangying Wu, fywu@ncu.edu.cn. Tel: + 86 79183969882, Fax: + 86 7918396951.

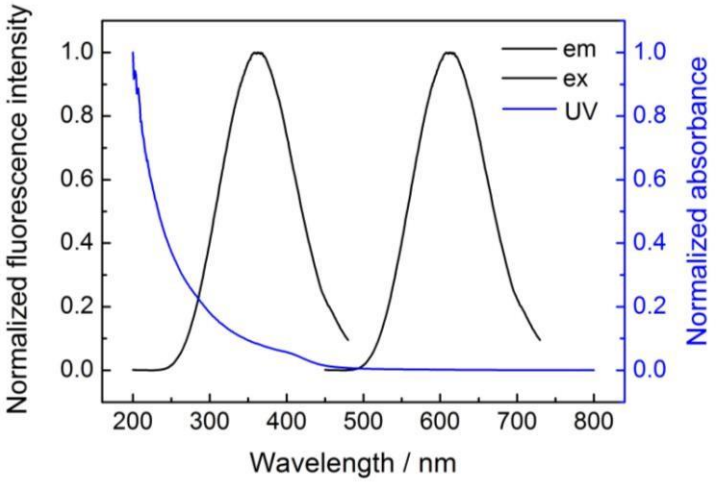

Fig. S1 UV−vis (blue), fluorescence emission, and excitation spectra (black) of GSH-Au NCs.

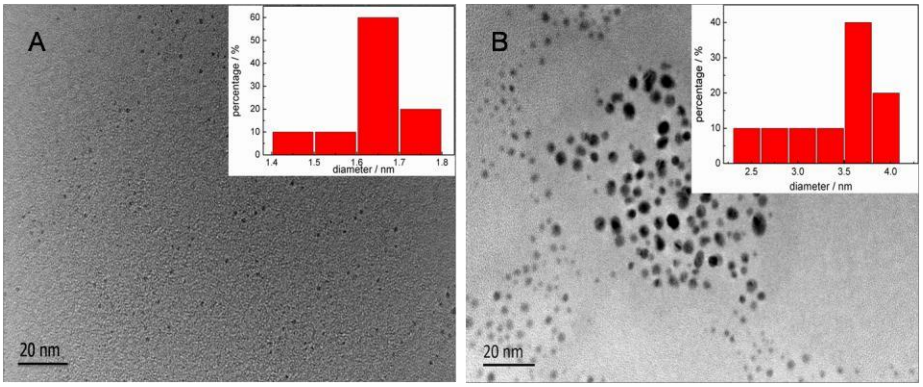

Fig. S2 TEM images of the GSH-Au NCs in the absence (A) and presence (B) of CTAB, respectively. The insets are the corresponding histograms of the size distribution of Au NCs.

Table S1 Summary of fluorescence lifetimes of GSH-Au NCs, GSH-Au NCs/CTAB, and Au NCs/CTAB/heparin (λ_{em} = 610 nm).

Sample	τ (ns)
GSH-Au NCs	2.94
GSH-Au NCs+CTAB	6.48
GSH-Au NCs+CTAB+heparin	2.36

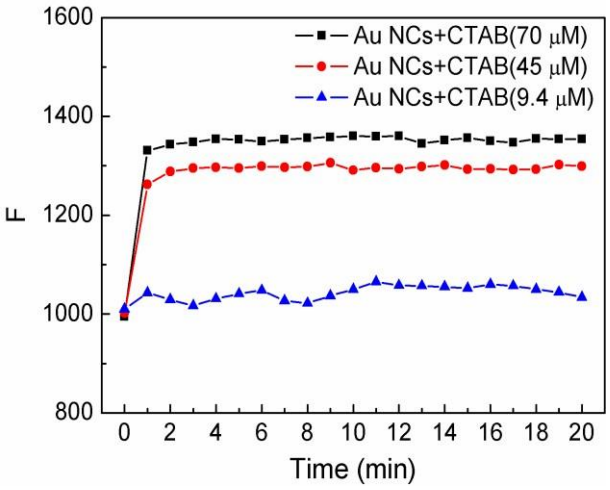

Fig. S3 Time-dependent fluorescence intensity of GSH-Au NCs at 610 nm upon addition of different concentrations of CTAB (9.4, 45, and 70 μM, respectively).

Table S2 Comparison of the linear range and detection limit of heparin detection by different methods.

Sensor	Method	Linear range (μg/mL)	LOD (ng/mL)	Ref.
P4Me-3TOEIM	Colorimetric	0−108	180	S1
AuNRs/GO	Colorimetric	0.02–0.28	5	S2
$[C_{12}mim][Cl]$-AuNPs	Colorimetric	0.012–6.260	10	S3
PEI-AgNCs	RLS	1.8–180	515	S4
4-MPY-AgNPs	SERS	0.0005−0.15	0. 5	S5
$Fe(CN)_6^{3-}$/Pim/MWCNT	Electrochemistry	9−180	−	16
Silole derivative	Fluorescence	14.4–57.6	431	17
Pyrene derivative	Fluorescence	90-540	2940	18
Polyfluorene derivative	Fluorescence	0.56−864	−	22
PFBTs	Fluorescence	0−648	−	23
A-based molecular beacon	Fluorescence	0.18−1.8	60	24
A_{20}-coralyne complex	Fluorescence	0.18–1.8	75	25
Phloxine B/PEI	Fluorescence	0.12−18.7	94	26
Copolymer	Fluorescence	0.56−4.12	−	27

GO/ScGFP	Fluorescence	0.05−1	−	28
SPEET/try-AuNCs	Fluorescence	0.1−4.0	50	30
SiQDs-AuNPs	Fluorescence	0.002–1.4	0. 67	31
GSH-AuNCs/CTAB	Fluorescence	0.1−1.6	75	This work

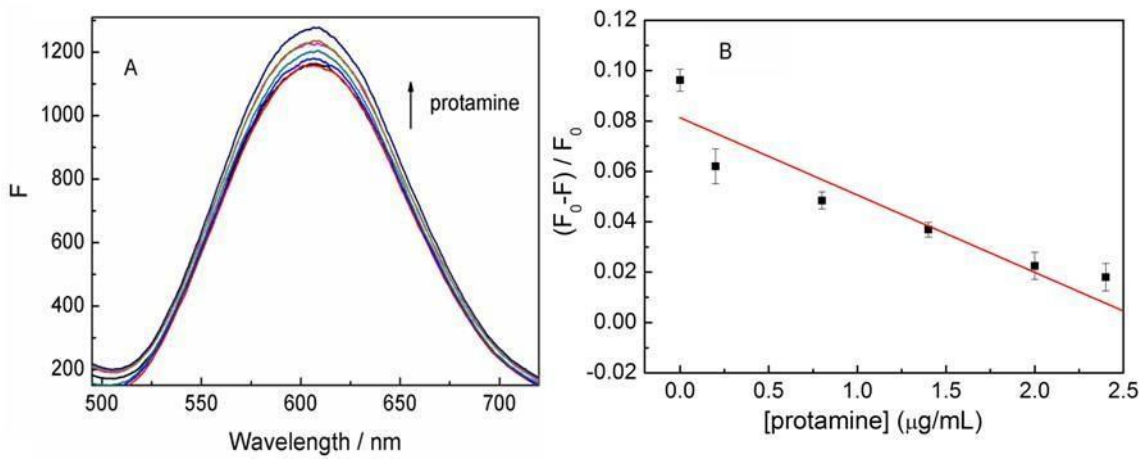

Fig. S4 (A) Fluorescent spectra of GSH-Au NCs/CTAB solution upon addition of the mixture of heparin (0.7 μg/mL) and protamine at various concentrations. The concentrations of protamine (from bottom to top) were 0, 0.2, 0.8, 1.4, 2.0, and 2.4 μg/mL, respectively. (B) The linear fitting of the relative fluorescent intensity versus concentrations of protamine. F_0 and F correspond to the fluorescence intensity of GSH-Au NCs/CTAB at 610 nm in the absence and presence of the mixture of heparin and protamine, respectively. The concentration of Au NCs used in the assay is 0.0625 mg/mL in PBS (pH 7.4, 0.01 M). The error bars represent standard deviations of three independent measurements.

References

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