

Supporting Information

Dual-responsive fluorescence sensor for Hg²⁺ and thiols based on N-doped silicon quantum dots and its application in cell imaging

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Experimental

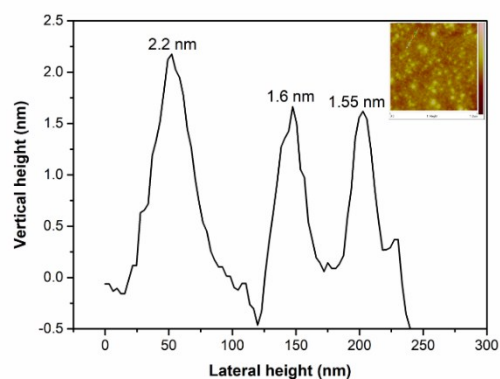


Fig. S1 AFM height profile diagram of N-SiQD (inset: AFM image).

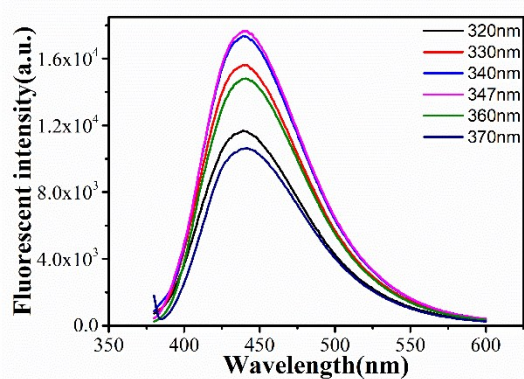


Fig. S2 N-SiQDs fluorescence emission spectrum under different excitation emissions in the range of 320 nm to 370 nm.

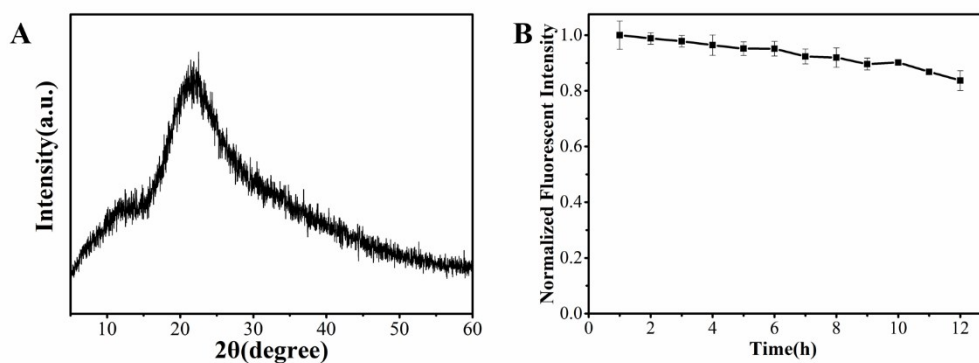


Fig. S3 (A) XRD image of N-SiQDs. (B) Photostability of N-SiQDs ($\lambda_{\text{ex}}/\lambda_{\text{em}}=347/440$ nm).

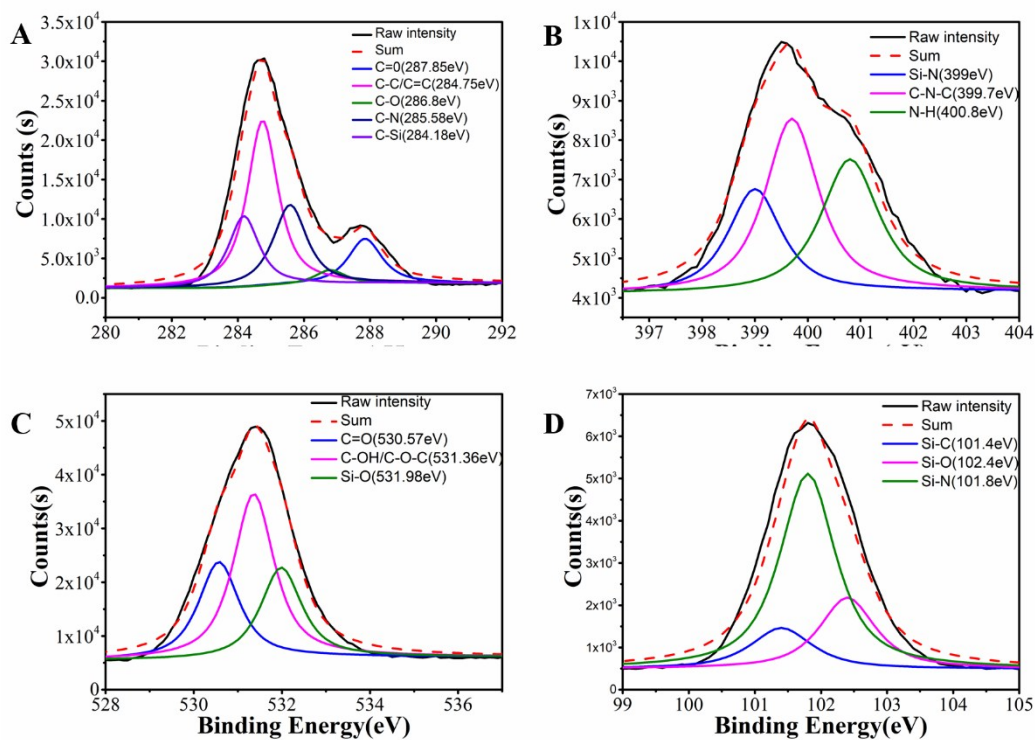


Fig. S4 (A) C 1s spectrum, (B) N 1s spectrum, (C) O 1s spectrum and (D) Si 2p spectrum of N-SiQDs.

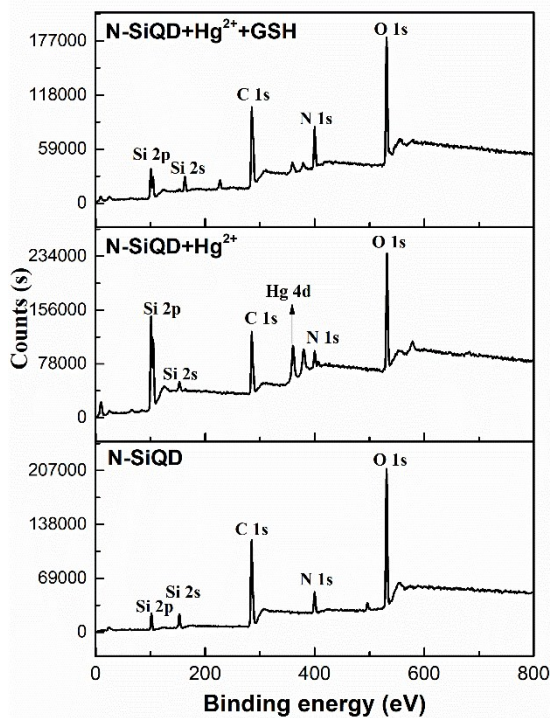


Fig. S5 Full scan XPS spectrum of N-SiQDs, N-SiQDs+Hg²⁺ and N-SiQDs+Hg²⁺+GSH.

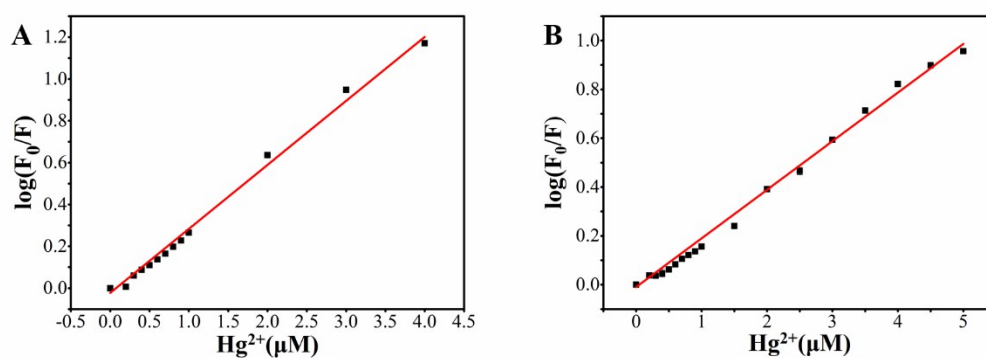


Fig. S6 (A) A line plot of Hg²⁺ detection when the concentration ratio between APTMS and urea is 1:1. (B) A line graph for detecting Hg²⁺ at a concentration ratio of 1:4.

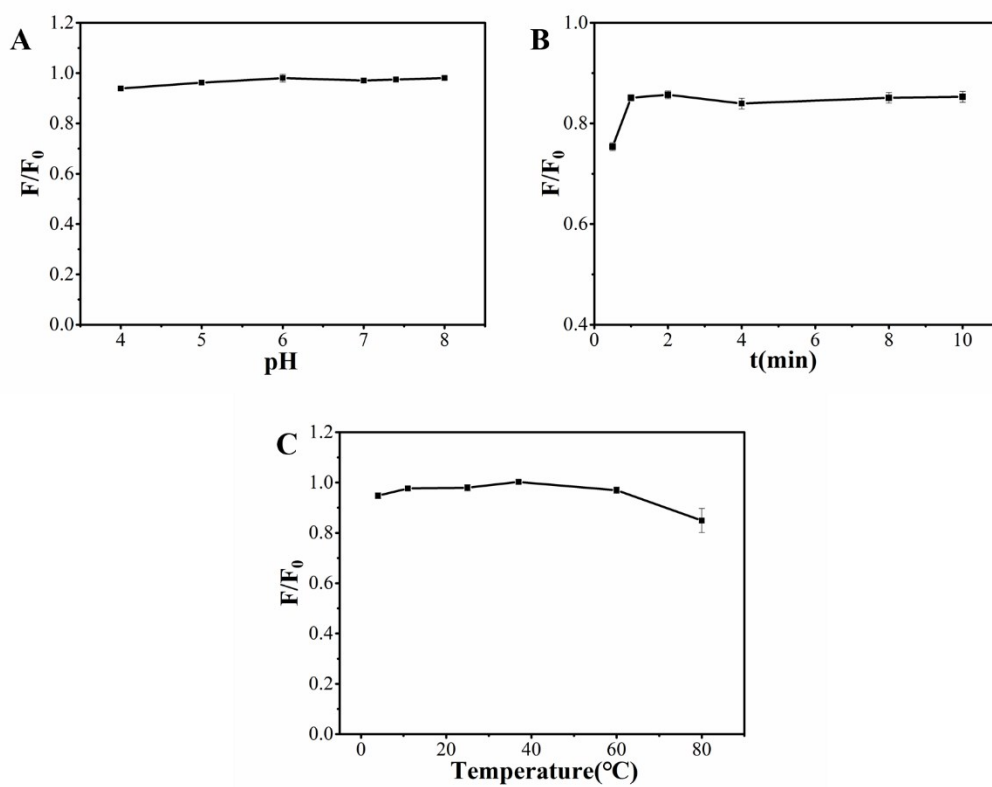


Fig. S7 Influence of (A) pH, (B) reaction time, and (C) temperature on the fluorescent intensity of Hg²⁺-N-SiQDs solution ($C_{\text{Hg}^{2+}}=5 \mu\text{M}$). F and F_0 represented the fluorescence intensity of Hg²⁺-N-SiQDs with and without GSH, respectively.

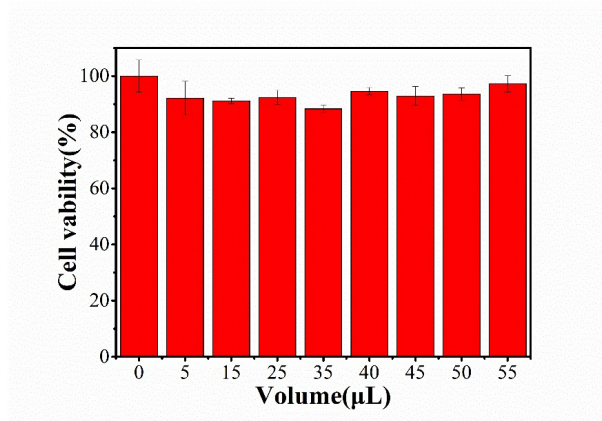


Fig. S8 Incubation of MCF-7 cells with different volumes of N-SiQDs stock solution for 24 h.

Table S1 Comparison of fluorescence quantum yield and linear range of N-SiQDs synthesized by different concentrations of APTMS and urea.

$C_{\text{APTMS}}/C_{\text{urea}}$	QY (%)	Linear range (μM)
1:1	30.6	0.2-4
1:2	28.8	0.1-5
1:4	23.9	0.2-5

Table S2 Comparison of response time of N-SiQDs for detecting Hg^{2+} with reported methods.

Fluorescent sensor	Response time	Reference
NGQDs	25 min	1
CDs	6 min	2
OI-FMs-120	2 min	3
CdTe quantum dots	5 min	4
N-CQDs	5 min	5
CDs	5 min	6
N-SiQDs	30 s	This work

Table S3 Comparison of response time of N-SiQDs for detecting GSH with reported methods.

Fluorescent sensor	Response time	Reference
UiO-67-sbdc	2 min	7
AMC	3 h	8
AuNCs	23 min	9
DP-S	120 s	10
CQDs	2 min	11
MnO ₂ -SiO ₂	5 min	12
N-SiQDs	1 min	This work

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