Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary material

Highly sensitive and selective fluorescent detection of Hg^{2+} based on turn-on aptamer DNA silver nanoclusters

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Table S1 Names and sequences of the oligonucleotides.

Oligonucleotides	Sequences (5′- 3′)
Hg^{2+}-Aptamer-1	TTCTTTCTTCCCCTTGTTTGTT
Hg^{2+}-Aptamer-2	TTTTTTTTTTTTTTTTT
C-Hg^{2+}-Aptamer-1	**CCCTTAATCCCC** *TTCTTTCTTCCCCTTGTTTGTT* **CCCTTAATCCCC**
C- Hg^{2+}-Aptamer-2	**CCCTTAATCCCC** *TTTTTTTTTTTTTTTTT* **CCCTTAATCCCC**

Table S2 The lifetimes of C-Hg-Aptamer-1-AgNCs in the absence and presence of different concentration of Hg^{2+}.

Samples	[Hg^{2+}] (nM)	τ_1 (ns)	τ_2 (ns)	τ_3 (ns)	τ_{avg} (ns)	χ^2
Hg Aptamer - AgNCs	0	0.2024 (23.62%)	2.7054 (66.82%)	6.7688 (9.56%)	2.5027	1.042
Hg Aptamer - AgNCs + Hg^{2+}	5	0.1751 (29.04%)	2.6842 (59.94%)	8.1248 (11.02%)	2.5552	1.177
	10	0.1692 (26.42%)	2.7768 (64.28%)	7.9960 (9.30%)	2.5733	1.008
	15	0.2507 (25.76%)	2.8119 (66.76%)	8.6620 (7.47%)	2.5889	1.205

Table S3 Comparison of optical sensors for the detection of Hg^{2+}.

Detection methods	Materials	LOD (nM)	Linear range (nM)	References
Colorimetry	Gold nanoparticles	35	0–9000	42
Colorimetry	Gold nanorods	60	500–25000	43
Fluorescence	PI/PC-AgNCs	3	500–1000	44
		9	500–10000	
Fluorescence	DNA-AgNCs	5	5–100	31
Fluorescence	DNA-AgNCs	4.5	0–150	32
Fluorescence	TOTO-3	3	10–200	45
Electrochemistry	Graphene oxide	1	1–300	46
Fluorescence	DNA-AgNCs	0.25	2–18	This work

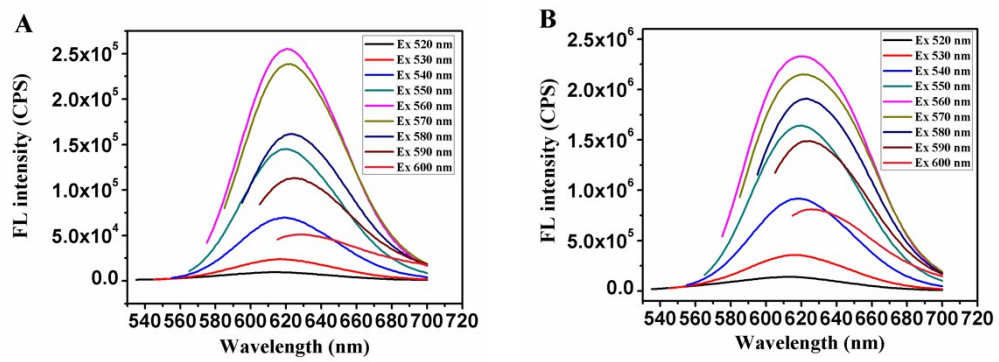

Fig. S1 Fluorescence emission spectra of C-Hg^{2+}-Aptamer-1-Ag NCs in the absence (A) and presence (B) of 10 nM Hg^{2+} under different excitation wavelengths.

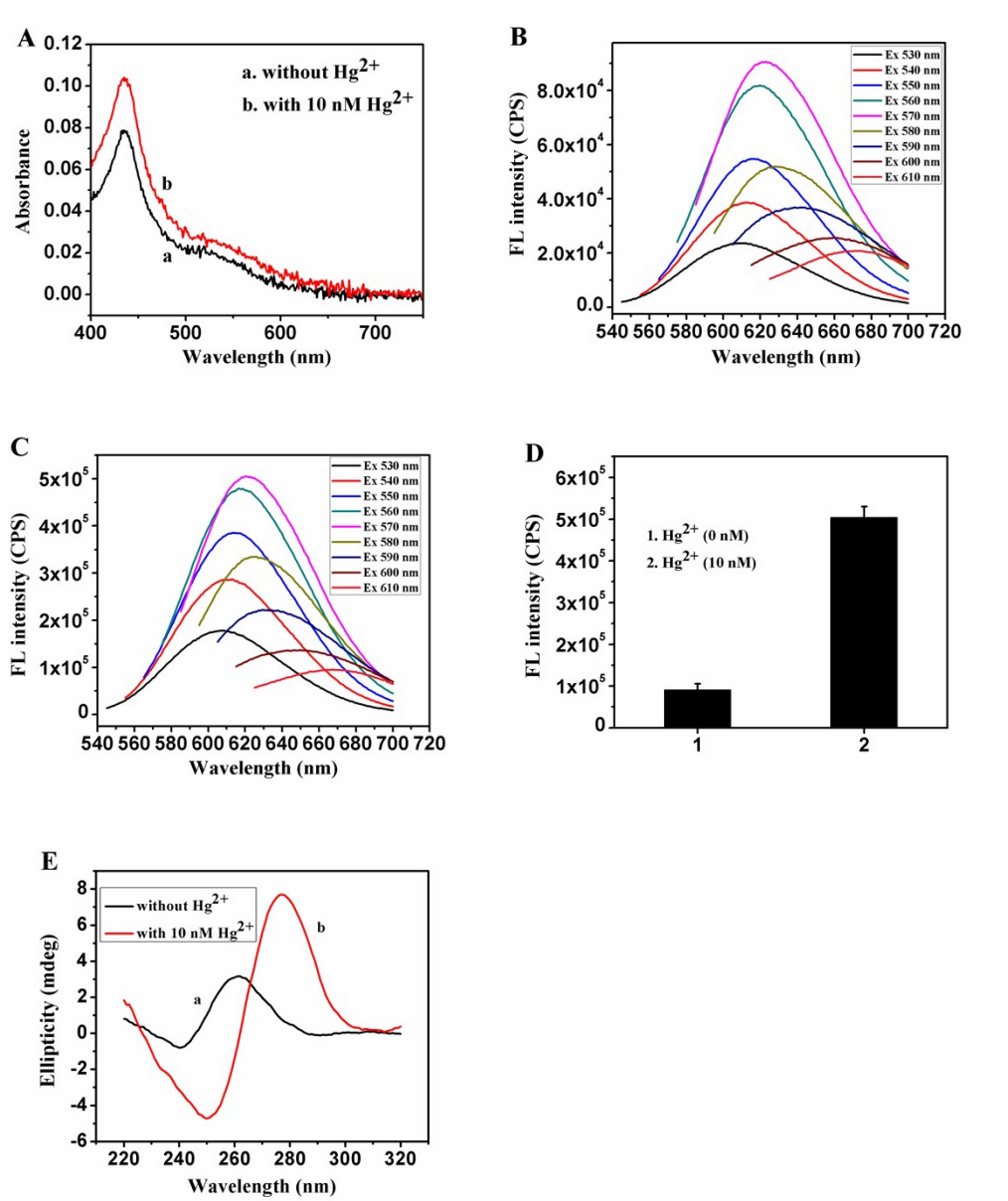

Fig. S2 (A) UV-Vis spectra of C-Hg^{2+}-Aptamer-2-AgNCs in the absence (a) and presence of 10 nM Hg^{2+} (b). Fluorescence emission spectra of C-Hg^{2+}-Aptamer-2-AgNCs (B) in the absence and (C) presence of 10 nM Hg^{2+} under different excitation wavelengths. (D) The fluorescence intensity of C-Hg^{2+}-Aptamer-2-AgNCs in the absence (1) and presence of 10 nM Hg^{2+} (2). (E) CD spectra of C-Hg^{2+}-Aptamer-2-AgNCs without (a) and with (b) 20 nM Hg^{2+}. All measurements were performed in 20 mM PBS buffer (pH 6.3).

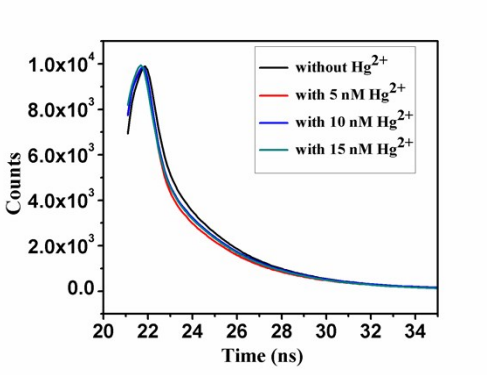

Fig. S3 The fluorescence lifetimes of C-Hg^{2+}-Aptamer-1-Ag NCs (excitation at 405 nm and emission at 620 nm) incubating without and with the different concentration of Hg^{2+}.

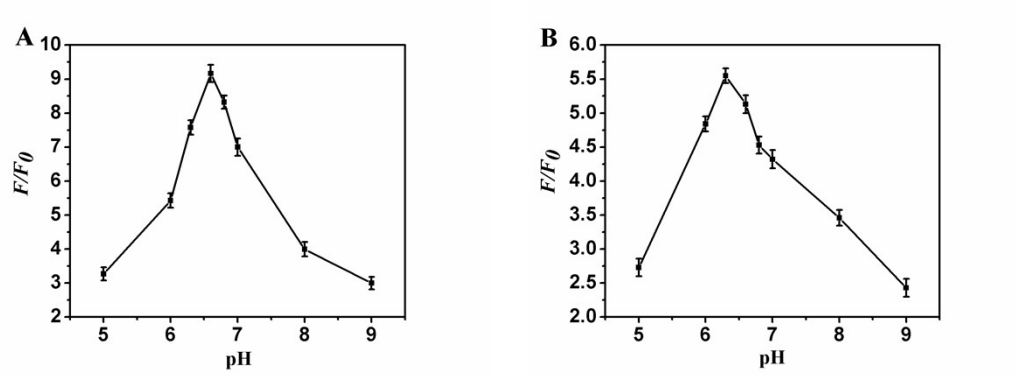

Fig. S4 The F/F_0 of (A) C-Hg^{2+}-Aptamer-1-Ag NCs and (B) C-Hg^{2+}-Aptamer-2-Ag NCs at different pH values. F_0 and F were the maximum emission intensity of the DNA-Ag NCs incubating without and with 10 nM Hg^{2+}, respectively.

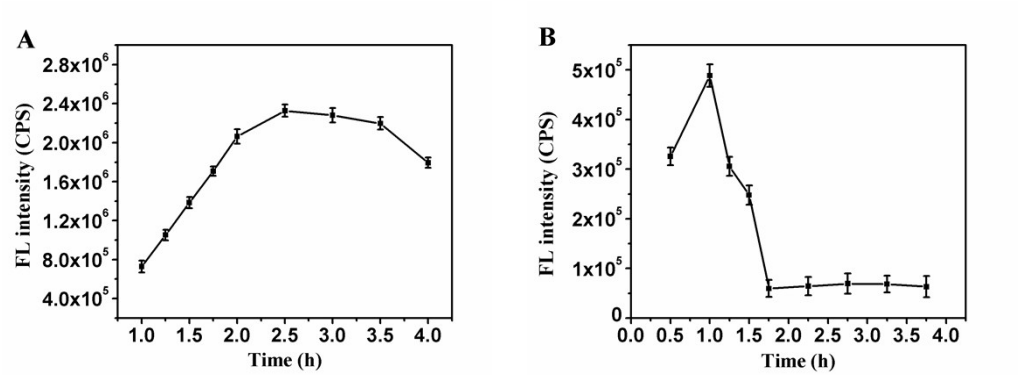

Fig. S5 The changes of the fluorescence intensity of (A) the C-Hg^{2+}-Aptamer-1-AgNCs and (B) the C-Hg^{2+}-Aptamer-2-AgNCs in the presence of 10 nM Hg^{2+} *against* the increasing reaction time with $NaBH_4$.

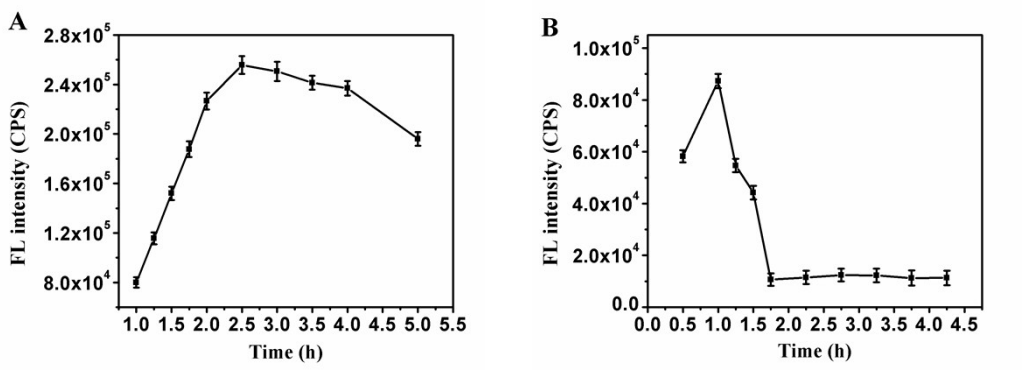

Fig. S6 The change of fluorescence intensity of (A) the C-Hg^{2+}-Aptamer-1-AgNCs and (B) the C-Hg^{2+}-Aptamer-2-AgNCs probes *against* the increasing reaction time with $NaBH_4$.

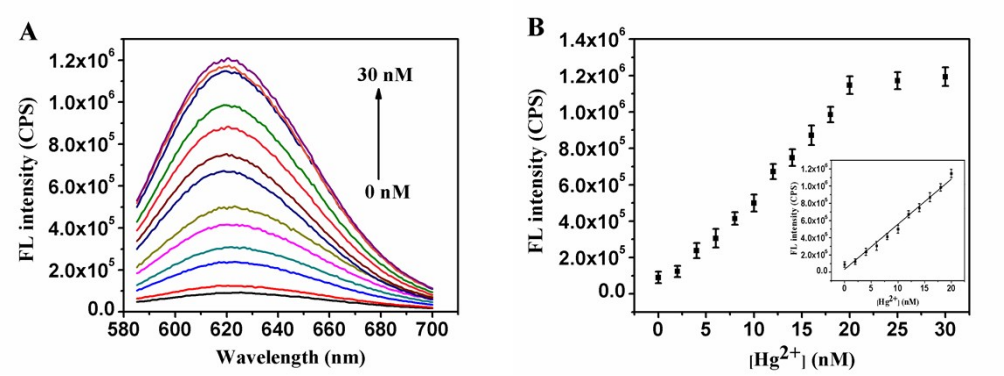

Fig. S7 (A) Fluorescence emission spectra (λ_{ex} = 570 nm) of C-Hg-Aptamer-2-DNA-Ag NCs incubating with different concentrations of Hg^{2+} for 1 h. (B) Fluorescence intensity as a function of Hg^{2+} concentration. The insert showed the linear range of 2-18 nM (R = 0.9972). The error bar represented the standard deviation of three independent measurements.