Electronic Supplementary Material (ESI) for Analytical Methods.

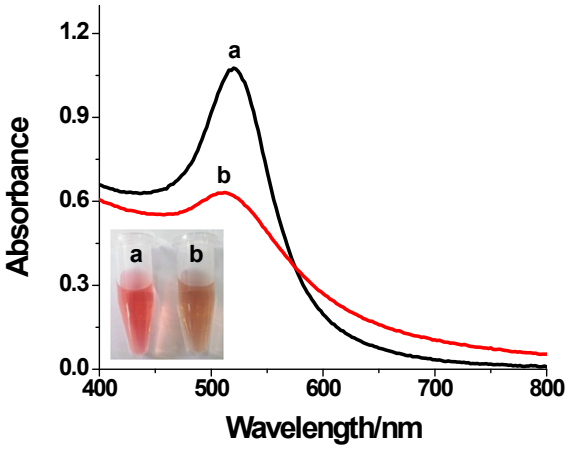


Fig. S1 UV-vis absorption spectra of (a) Au NPs and (b) Au@Pt NPs.

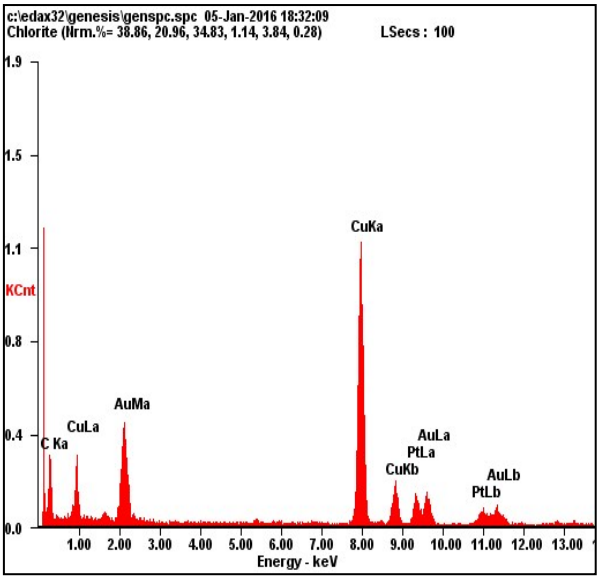
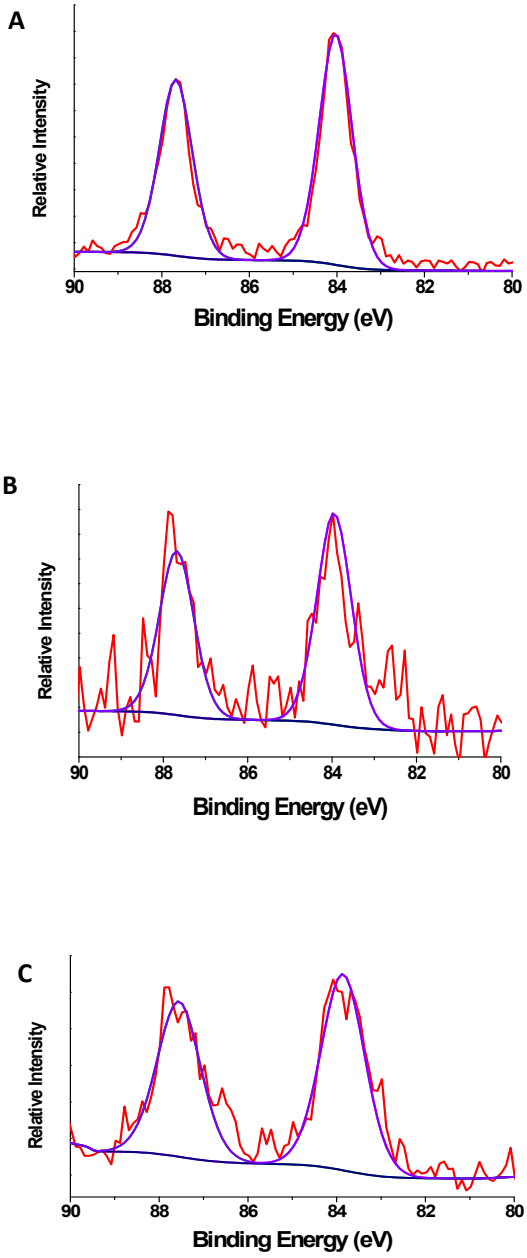


Fig. S2 EDX spectrum of Au@Pt NPs.



In Fig. S3 XPS spectra of Au 4f region of Au@Pt NPs before (A) and after incubated with Hg^{2+} (B) and Ag^{+} (C).

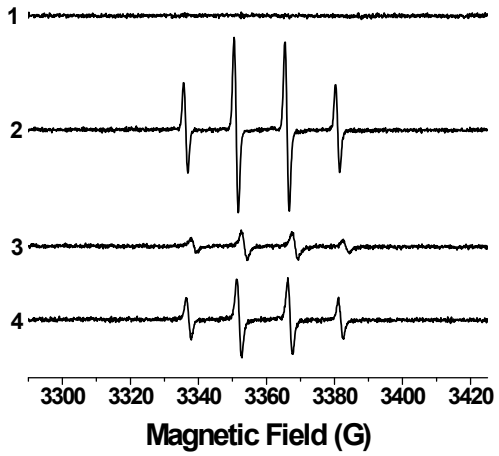


Fig. S4 EPR measurements of DMPO-•OH adduct in the absence and presence of Ag^+. (a) DMPO; (b) DMPO+0.7 M H_2O_2; (c) DMPO+0.7 M H_2O_2+1.2 nM Au@Pt NPs; (d) DMPO+0.7 M H_2O_2+1.2 nM Au@Pt NPs +5.0 μM Ag^+.

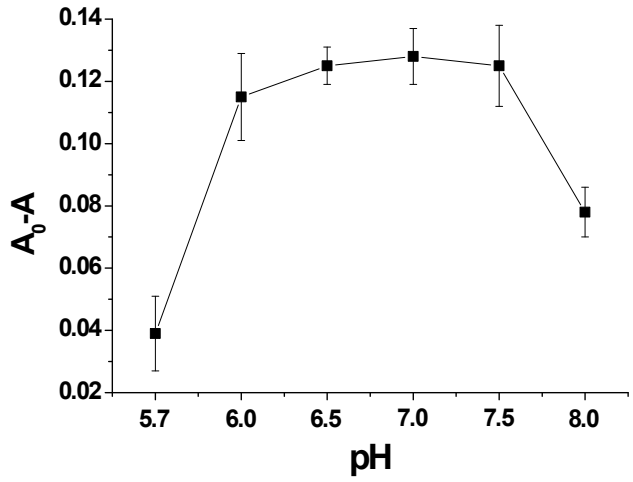


Fig. S5 Effect of pH value on the detection of Hg^{2+}.

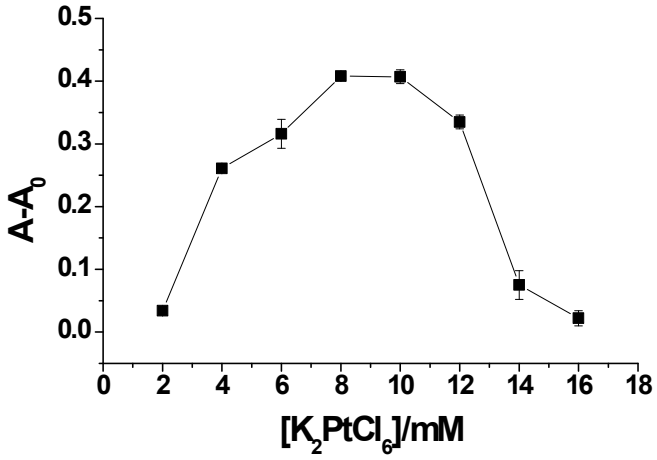


Fig. S6 Effect of K_2PtCl_6 concentration on the detection of Hg^{2+}.

Table S1 Comparison of different methods for detection of $Hg^{2+}$and Ag^{+}

Method	Linear range	LOD	Ref
Colorimetric assay based on Tween 20-Au NPs	Hg^{2+}: 200 -800 nM Ag^{+}: 400 -1000 nM	100 nM 100 nM	1
Colorimetric assay based on Tween 20-Au NPs	Hg^{2+}: 0.5 -10 μM Ag^{+}: 1.0. -8.0. μM	5.0 nM 10 nM	2
Colorimetric assay based on AgNPRs[a]	Hg^{2+}: 200 -800 nM Ag^{+}: —	5.0 nM —	3
Colorimetric assay based on Ag/Pt NCs	Hg^{2+}: 10 -200 nM Ag^{+}: —	5.0 nM —	4
Colorimetric assay based on Fu-Au NPs[b]	Ag^{+}: 20 -100 nM Hg^{2+}: —	12 nM —	5
BSA@AuNCs[c]	Ag^{+}: 0.5-10 μM Hg^{2+}: —	0.2 μM —	6
FL[d] based on ONPCRs[e]	Hg^{2+}: 2 nM - 60 μM Ag^{+} : 5 nM -80 μM	0.68 nM 1.73 nM	7
EIS [f] based on immobilized DNA	Hg^{2+}: 0.1nM-10 μM Ag^{+}: 100 -800 nM	0.1 nM 10 nM	8
FL based on cytidine - stabilized Au NCs	Hg^{2+}: 30 nM-16 μM Ag^{+}: 10 nM - 6 μM	30 nM 10 nM	9
FL based on assembly of DNA	Hg^{2+}:100 nM -2 μM Ag^{+}: 100 nM −2 μM	100 nM 100 nM	10
FL based on multi- walled carbon nanotube	Hg^{2+}: 20 -150 nM Ag^{+}: 20 -150 nM	15 nM 18 nM	11
FL based on Rhodamine B Selenolactone	Hg^{2+}: 30 nM-16 μM Ag^{+}: 10 nM- 6 μM	30 nM 10 nM	12
FL Based on WS_2 Nanosheet	Hg^{2+}: 6.0-450.0 nM Ag^{+}: 5.0-500.0 nM	3.3 nM 1.2 nM	13
Colorimetric assay based on Au@Pt NPs	Hg^{2+}: 10-200.0 nM Ag^{+}: 5.0-100.0 nM	3.5 nM 2.0 nM	This work

[a] Silver nanoprisms;

[b] AuNPs modified with furfuryl alcohol;

[c] Bovine serum albumin stabilized gold nanoclusters;

[d] Fluorescent method;

[e] Oxygen-doped, nitrogen-rich, photoluminescent polymer carbon nanoribbons;

[f] Electrochemical impedance spectroscopy.

Table S2 Recovery experiments of $Hg^{2+}$and Ag^{+} in real samples

Sample	Metal ions	Spiked amount (nM)	Found amount (nM)	Recovery (%)	RSD (n=3, %)
1	Hg^{2+}	20	21.5	107.5	3.6
	Ag^{+}	450	402.1	100.5	2.9
2	Hg^{2+}	50	49.3	98.6	4.2
	Ag^{+}	450	412.5	91.7	3.3
3	Hg^{2+}	150	144.5	96.3	2.3
	Ag^{+}	450	457.1	101.6	2.8
4	Hg^{2+}	200	201.3	100.6	2.4
	Ag^{+}	30	32.5	108.3	5.2
5	Hg^{2+}	200	186.8	93.4	2.6
	Ag^{+}	100	105.5	105.5	3.2
6	Hg^{2+}	200	183.4	91.7	4.3
	Ag^{+}	450	448.3	99.6	3.4

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