Electronic Supplementary Information For

A simple colorimetric approach for measuring mercuric ion with ultra-high selectivity using label-free gold nanoparticles and thiourea

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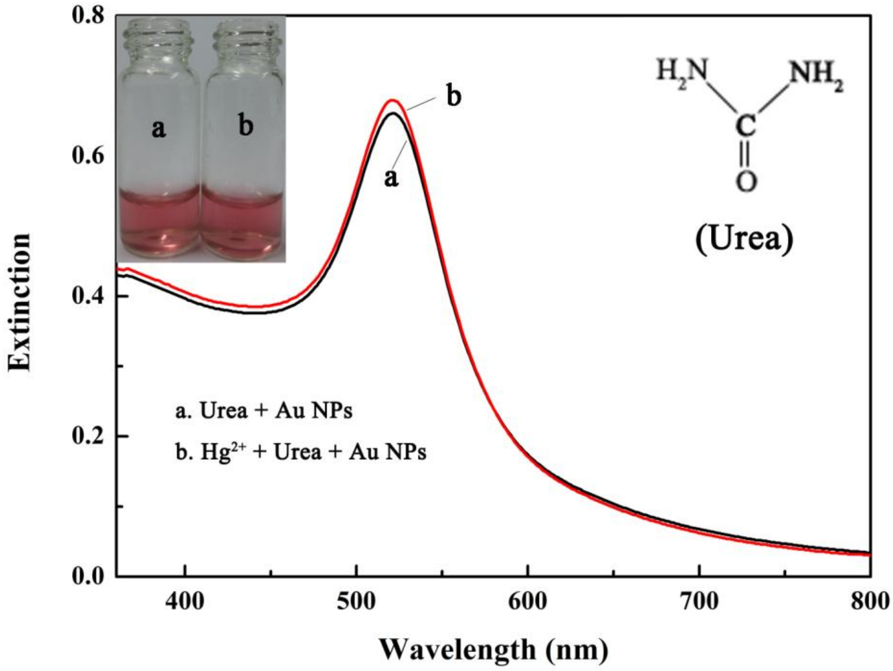

Fig. S1 Photograph and UV-vis spectra of the Au NPs (a) in the presence of 2.6 μM urea. (b) in the presence of 2.5 μM Hg^{2+} and 2.6 μM urea, inset image is the structure of urea.

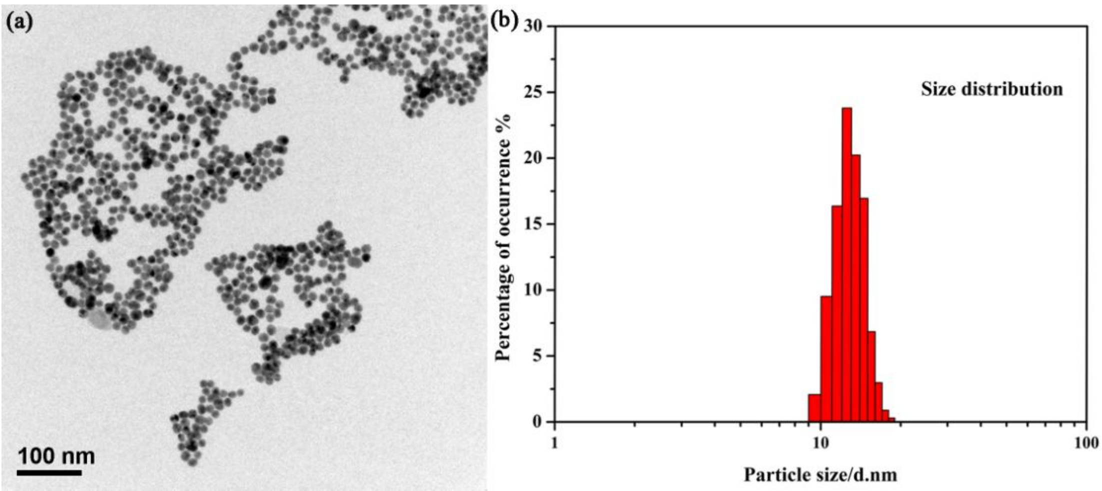

Fig. S2 (a) TEM image and (b) DLS analysis results of the 13-nm Au NPs.

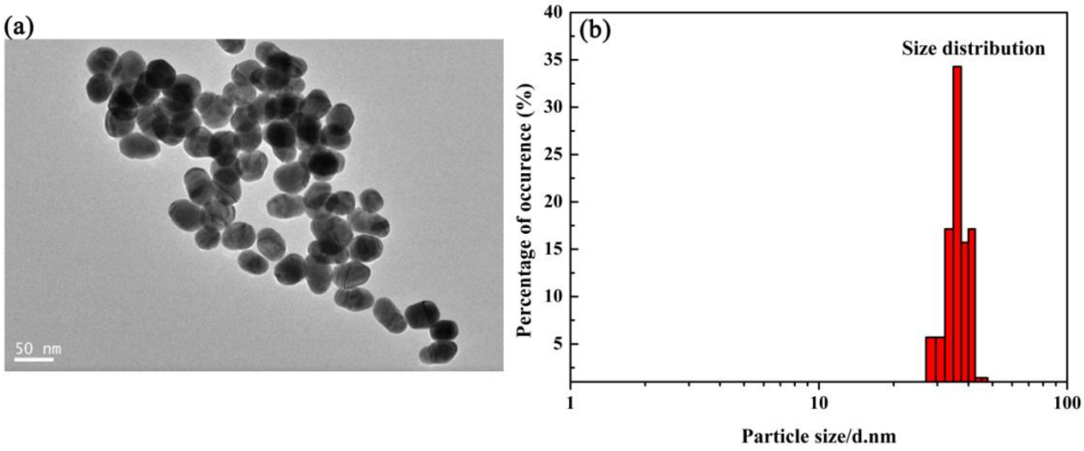

Fig. S3 (a) TEM image and (b) DLS analysis results of the 37-nm Au NPs.

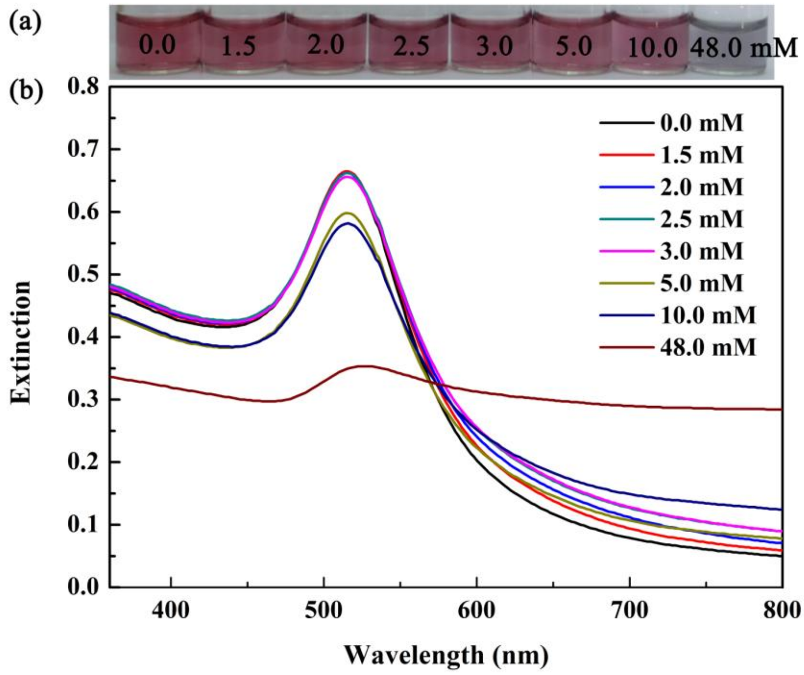

Fig. S4 Photographic image (a) and UV-vis spectra (b) of the Au NPs-TU detection system (containing 2.4 nM Au NPs and 2.6 μM of TU) for detecting Hg^{2+} (2 μM) in the presence of different concentrations of sodium chloride (0-48.0 mM)

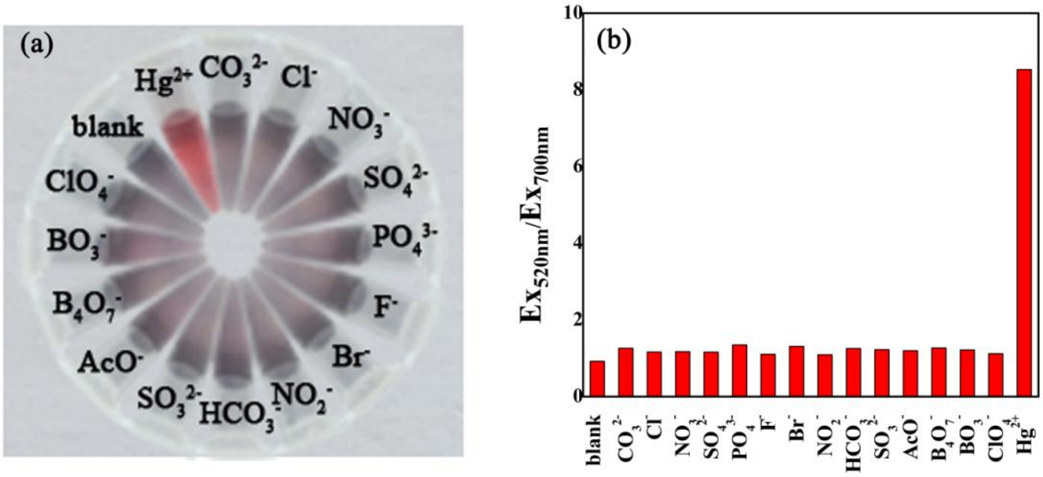

Fig. S5 Selectivity of the Au NPs-TU detection system (containing 2.4 nM Au NPs and 2.6 μM of TU) for Hg^{2+} compared with other anions. Photograph (a) and the value of $Ex_{520\ nm}/Ex_{700\ nm}$ (b) of the detection systems incubated with Hg^{2+} (2.0 μM) and other anions (20 μM).

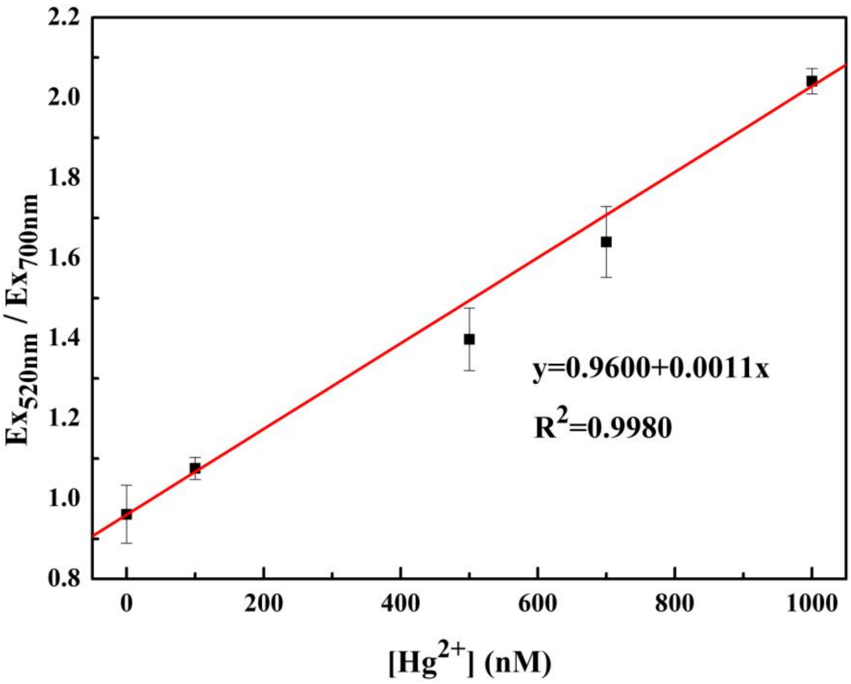

Fig. S6 A plot of $Ex_{520\ nm}/Ex_{700\ nm}$ of AuNPs-TU mixture versus the concentrations of Hg^{2+} ranging from 0 to 1 μM in drinking water samples.

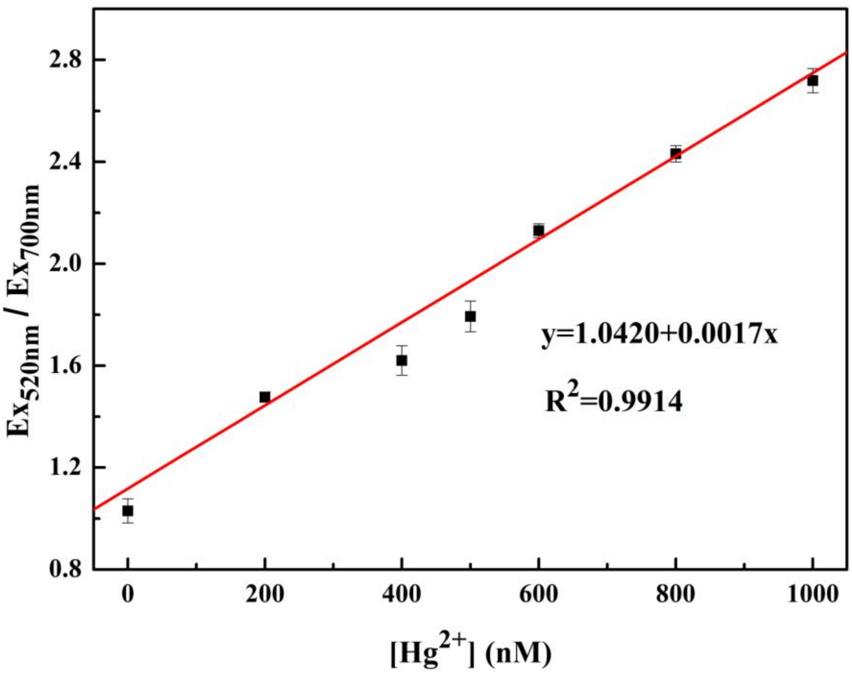

Fig. S7 A plot of $Ex_{520\ nm}/Ex_{700\ nm}$ of AuNPs-TU mixture versus the concentrations of Hg^{2+} ranging from 0 to 1 μM in lake water sample.

Table S1 Comparison of our approach with other label-free colorimetric assays based on Au NPs.

Probes	Detection limit (by UV-vis spectra or calculation)	Response time	Selectivity	Linear Range/LOD (in real sample)	Reference
Au NPs/TU	40 nM	3 min	Hg^{2+}	Drinking water 100-1000 nM Lake water 100-1000 nM	This study
Au NPs/oligopeptide	100 nM	--	Hg^{2+}	--	[13]
Au NPs/4-MB	500 nM	--	Hg^{2+}	River water 0-10 μM	[14]
Au NPs/aptamer	0.6 nM	5 min	Hg^{2+}	--	[15]
Au NPs/urine	100 nM	15 min	Hg^{2+}	Tap water 50-250 nM Lake water 50-250 nM	[16]
Au NPs/DNA	250 nM	10 min	Hg^{2+}	--	[17]
Au NPs/OPD	5 nM	20 min	Hg^{2+}	--	[18]

Au NPs/MPBA	8 nM	20 min	Hg^{2+}		[19]
Au NPs/thymine	2 nM	30 min	Hg^{2+}	--	[20]
Au NPs/4,4'-dipyridyl	15 nM	30 min	Hg^{2+}	--	[21]
Au NPs/cysteine	25 nM	--	Hg^{2+}, Cu^{2+}, Pb^{2+}	--	[22]

Table S2 Effect of potentially interfering ions

Potentially interfering ions	Tolerance ration (compared to 2 μM of Hg^{2+})
K^{+} , BO_3^{-}	15000
CO_3^{2-} , HCO_3^{-}	10000
Na^{+} , PO_4^{3-} , $B_4O_7^{-}$, AcO^{-} , F^{-}	5000
SO_3^{2-} , NO_3^{-} , NO_2^{-}	4500
SO_4^{2-} , ClO_4^{-}	2000
Ca^{2+} , Ba^{2+} , Mn^{2+}	150
Mg^{2+} , Cd^{2+} , Pb^{2+} , Fe^{3+} , Ni^{2+} , Cu^{2+} , Zn^{2+}	100
Al^{3+} , Co^{2+} , Cr^{3+}	50