Electronic Supplementary Information

Two-Photon Ratiometric Sensing of Hg^{2+} by Using Cysteine Functionalized Ag Nanoparticles

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1. Interaction of the citrate capped Ag nanoparticles with Hg^{2+}

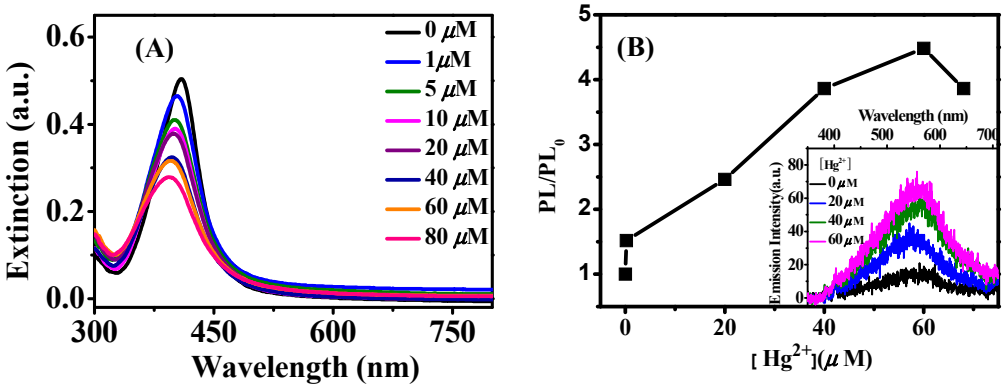

Figure S1. (A) UV-Vis extinction spectra of citrate capped Ag NPs in presence of Hg^{2+} with different concentrations; (B) Plot of TPE enhancement of citrate-Ag versus $[Hg^{2+}]$. The inset is TPE emission spectra (λ_{ex}= 800 nm) of citrate capped Ag NPs in the absence and presence of Hg^{2+}.

2. The interactions between cysteine functionalized Ag NPs and Hg^{2+} under different concentration of cysteine

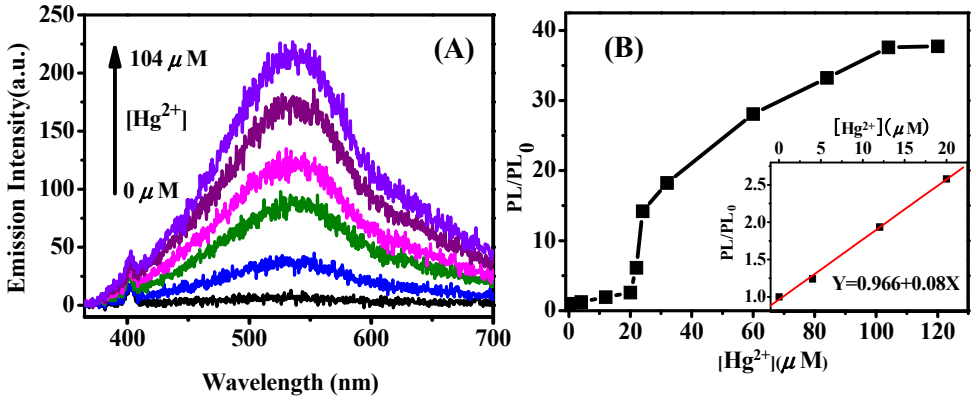

Figure S2. (A) Two photon excitation emission spectra (λ_{ex}= 800 nm) of cys-Ag in the absence and presence of Hg^{2+}, $[Hg^{2+}]$: 0, 20, 22, 24, 52, 104 μM; (B) Plot of TPE

enhancement versus concentration of Hg^{2+}. The inset is the linear dependence in the low Hg^{2+} concentration regime ([cysteine] = 175 μM)

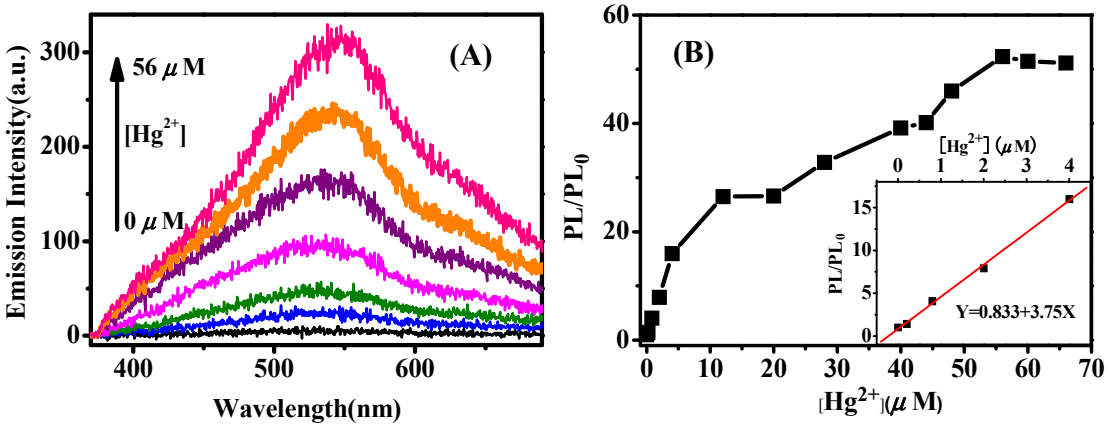

Figure S3. (A) Two photon excitation emission spectra (λ_{ex}= 800 nm) of cys-Ag in the absence and presence of Hg^{2+}, [Hg^{2+}]: 0, 0.8, 2, 4, 8, 40, 56 μM; (B) Plot of TPE enhancement versus concentration of Hg^{2+} . The inset is the linear dependence in the low Hg^{2+} concentration regime ([cysteine] = 7 μM).

3. The selectivity of the UV-vis extinction methods

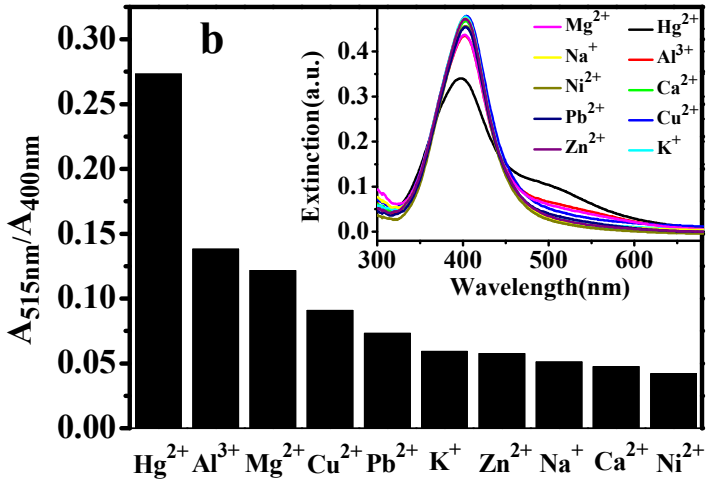

Figure S4. The extinction ratios (A_{515}/A_{400}) of cys-Ag NPs after addition of various metal ions of the same concentration. The inset is the corresponding UV-Vis extinction spectra. [metal ions] = 3 μM, under which the best selectivity was achieved for the UV extinction method in our experiments.

4. Preparation of cysteine functionalized Au NPs

Gold nanoparticles were prepared by the citrate reduction of $HAuCl_4$. 10 mL of 38.8mM sodium citrate solution was quickly injected into 100 mL of 1mM boiling

$HAuCl_4$ in a 250mL round-bottomed flask under vigorous stirring. The solution quickly changed color from pale yellow to dark red. The solution was continuously heated at ~100 °C for 10 min and was then kept stirring for another 15 min while cooling. The obtained Au nanoparticles have an average particle size of 13 nm with extinction band maximum at 518 nm. The cysteine capping process is similar to that of Ag NPs.

5. **Interaction between the cysteine functionalized Au NPs with Hg^{2+}**

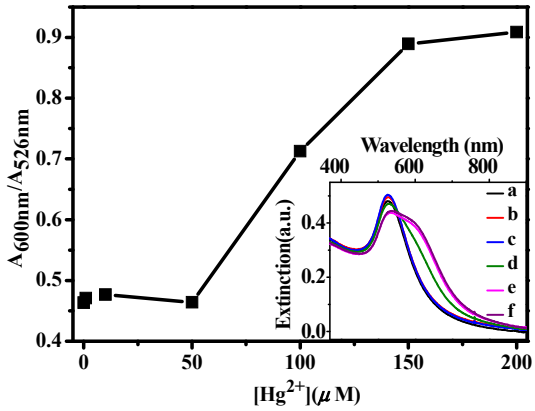

Figure S5. Plot of extinction ratio A600nm/A526 nm versus [Hg^{2+}] using cys-Au NPs. The inset is UV-Vis extinction spectra of Cys- Au NPs in absence and presence of Hg^{2+} of different concentrations (0, 10, 50, 100, 150, 200 μM).

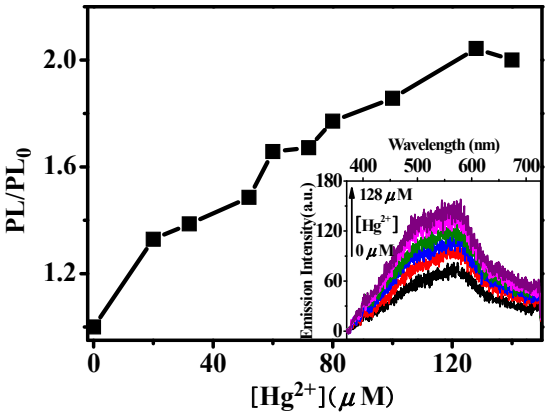

Figure S6. Plot of TPE enhancement of cys-Au NPs versus concentration of Hg^{2+}. The inset is TPE emission spectra (λ_{ex}= 800 nm) of Au in the absence and presence of Hg^{2+} with different concentrations: 0, 20, 52, 72, 100, 128 μM.