

Supporting Information

for

The effect of pH and transition metal ions on cysteine-assisted gold aggregation for a distinct colorimetric detection

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Instrumental Analysis

AuNPs were characterized for the shape, size, structure, and the optical properties. Scanning electron microscopy (SEM; Hitachi S-4700 FE-SEM; Japan) was used to measure the surface morphology of the samples. Electrophoretic light scattering (Photal Otsuka Electronics, ELS 8000) were used to characterize the particle size distribution and zeta potential. X-ray diffraction (XRD; Rigaku Rint 2200 Series, Rigaku, Tokyo, Japan) using Cu K α 1 radiation of wavelength $\lambda = 1.5406 \text{ \AA}$, at 40 kV voltage and 30 mA current with the continuous-scanning 2θ mode was used to identify the crystalline structure of the samples. The absorption spectra of the sample solution with and without Cys were analyzed using UV-Visible spectrophotometer (Shimadzu, Model-UV-3600).

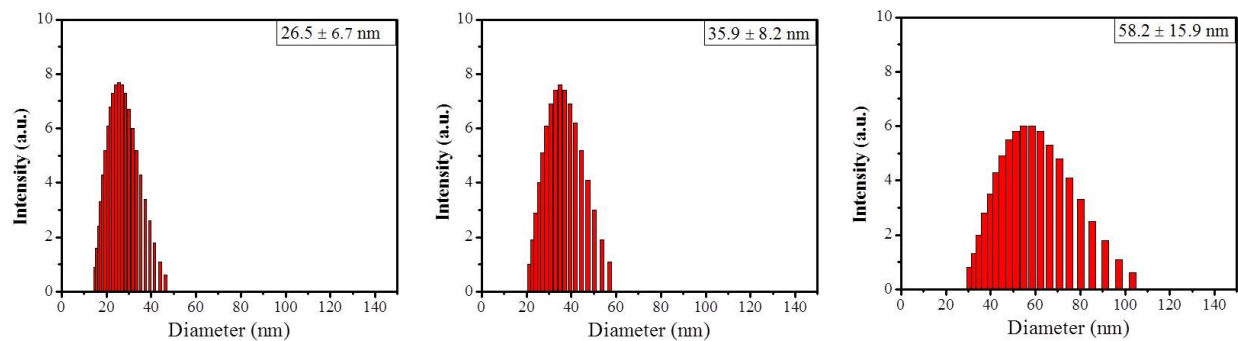


Fig. S1. Particle size distribution of AuNPs prepared at the different molar ratios of citrate/Au³⁺ according to DLS method: (a) citrate/Au³⁺ = 5:1, (b) citrate/Au³⁺ = 3:1, (c) citrate/Au³⁺ = 0.5:1.

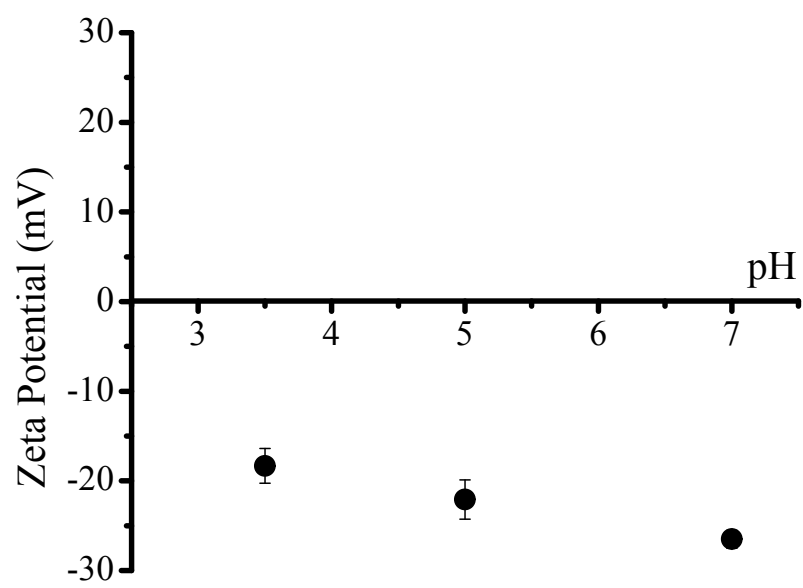


Fig. S2. Zeta potential of AuNPs (26.5 nm) at different pHs.

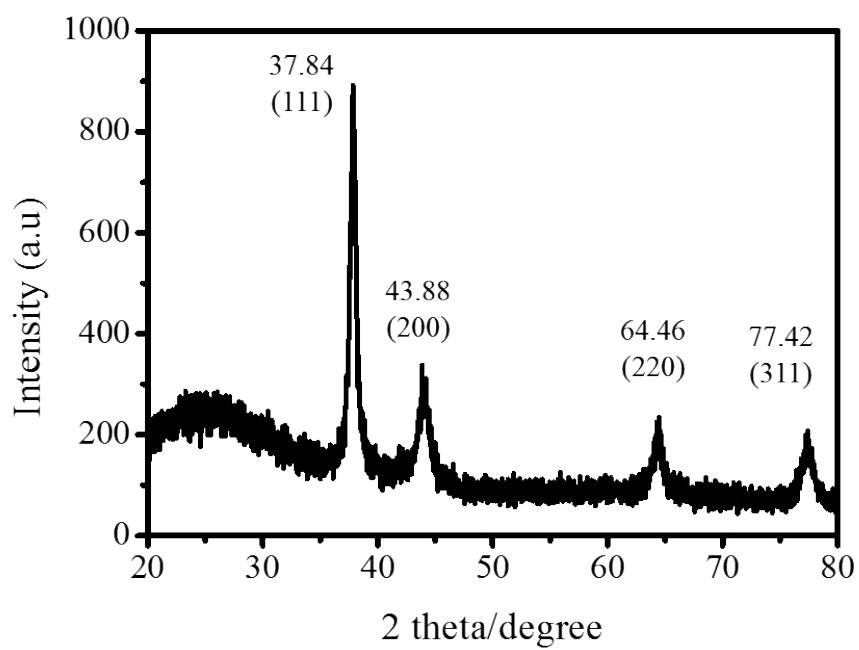


Fig. S3. XRD patterns of AuNPs (26.5 nm).

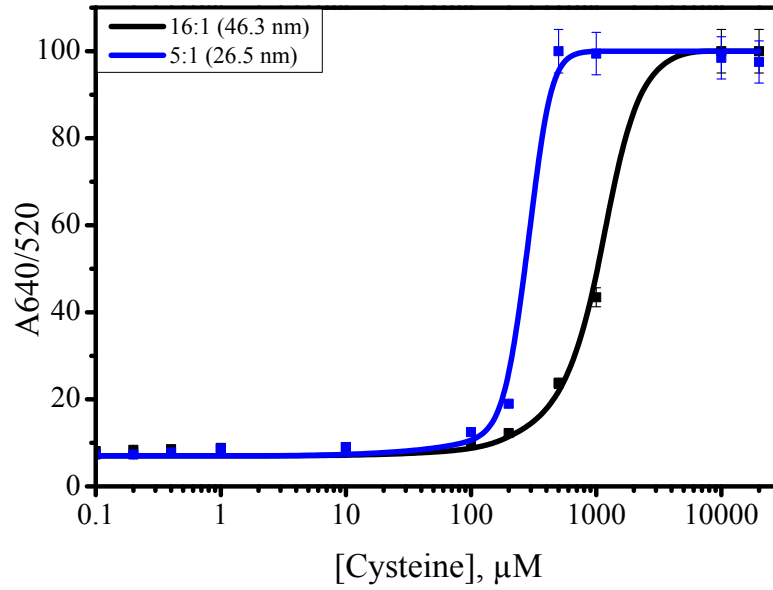


Fig. S4. Effect of Cys concentration on the absorbance ratio at 640/520 (nm/nm) for the same surface area of AuNPs prepared with 5:1 and 16:1 citrate-to-gold ratios that are corresponding to $\sim 10^{11}/\text{mL}$ and $2.809 \times 10^{10}/\text{mL}$, respectively.

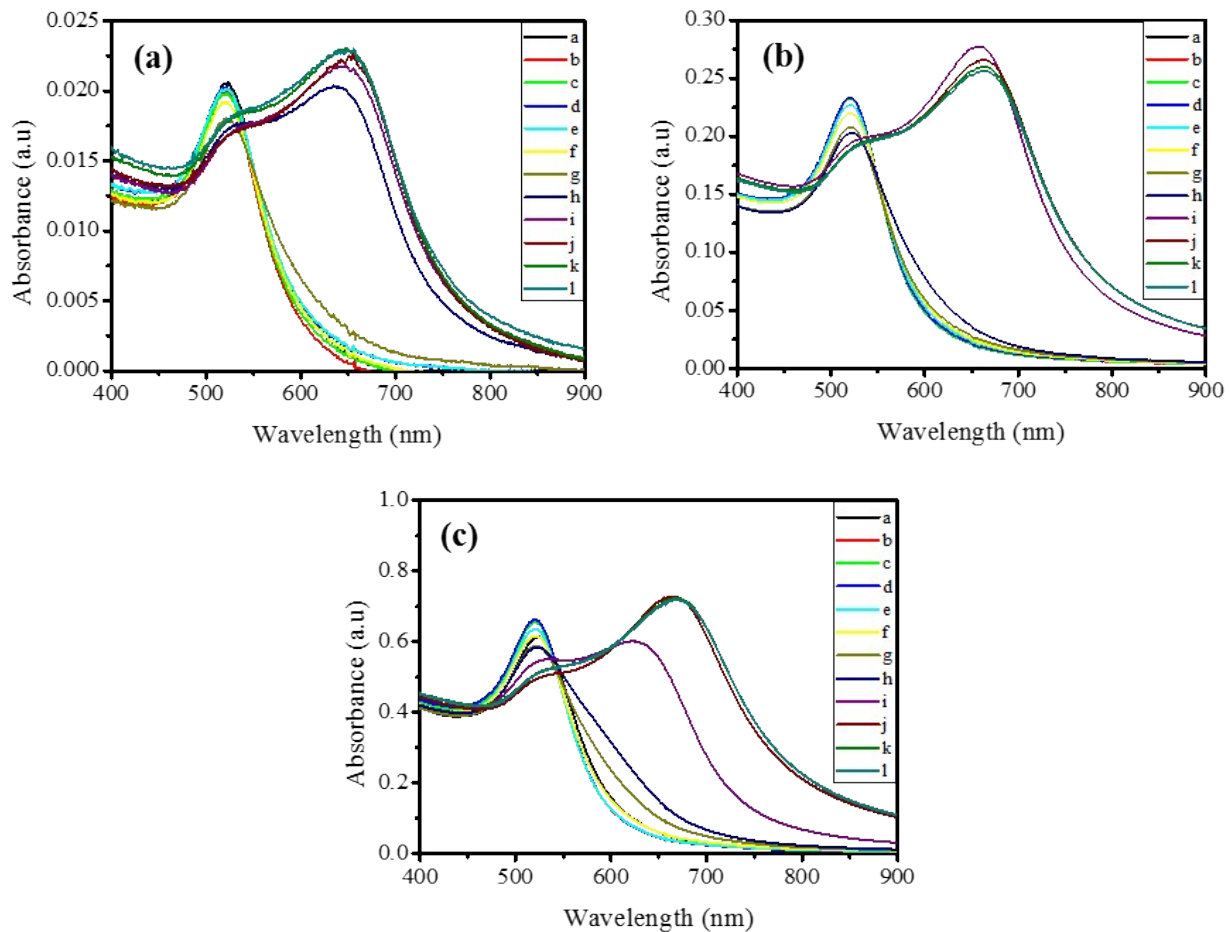


Fig. S5. UV-vis spectra of 26.5 nm AuNPs prepared with 5:1 citrate/Au³⁺ molar ratio in response to different concentrations of Cys (0 μM , 0.1 μM , 0.2 μM , 0.4 μM , 1 μM , 10 μM , 100 μM , 200 μM , 500 μM , 1000 μM , 10000 μM , 20000 μM) from a to l: (a) 10^{10} particles/mL (b) 10^{11} particles/mL (c) 3×10^{11} particles/mL.

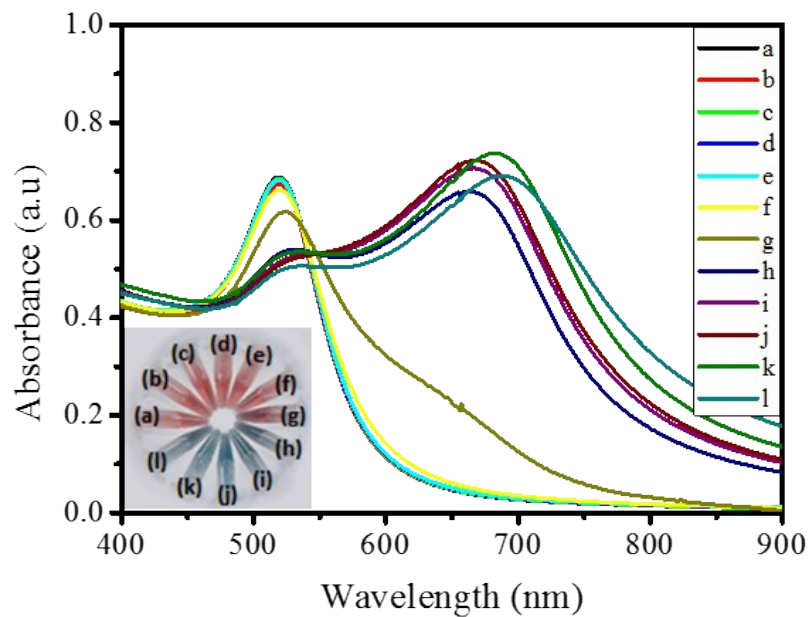


Fig. S6. UV-vis spectra of the 26.5 nm AuNPs prepared with 5:1 citrate/Au³⁺ molar ratio in response to different concentrations of cysteine (0 μM, 0.1 μM, 0.2 μM, 0.4 μM, 1 μM, 10 μM, 100 μM, 200 μM, 500 μM, 1000 μM, 10000 μM, 20000 μM) from a to l in the presence of 0.1 mM Cu²⁺. The inset shows the photograph of these AuNPs.

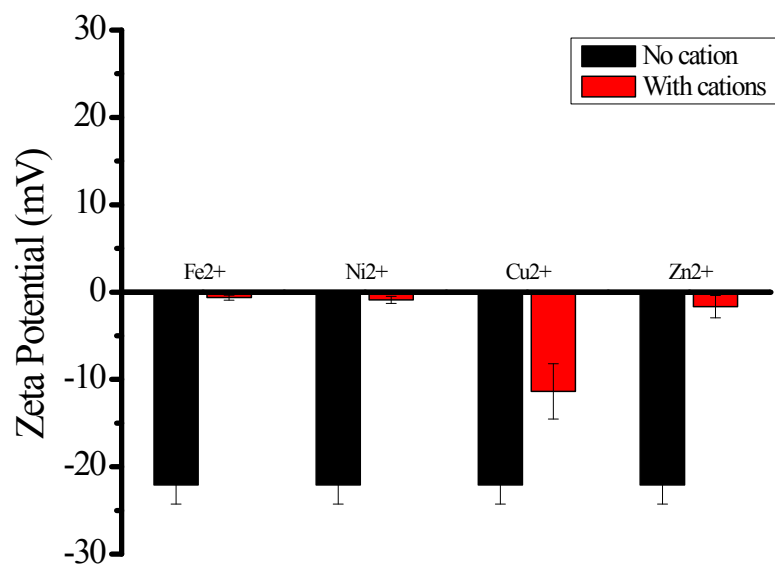


Fig. S7. Zeta potential of AuNPs in the presence of various metal cations at 1.0 mM in acidic condition (pH 5): No cation, Fe²⁺, Ni²⁺, Cu²⁺, and Zn²⁺.

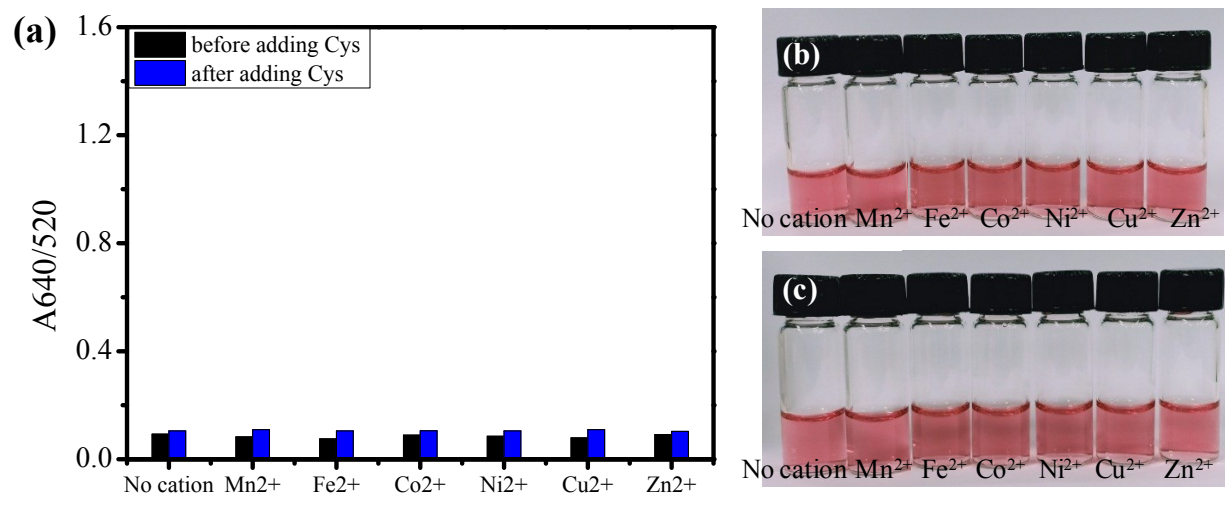


Fig. S8. The absorbance ratio of A640/520 in the presence of transition metal ions at 0.1 mM before and after adding 1.5 μ M Cys at pH 5 (a). The photograph of AuNPs solution before (b) and after adding Cys (c) with various cations (0.1 mM): No cation, Mn²⁺, Fe²⁺, Co²⁺, Ni²⁺, Cu²⁺, and Zn²⁺.