

A Versatile Synthesis Route for Metal@SiO₂ Core-Shell Nanoparticles Using 11-mercaptoundecanoic Acid as Primer

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Supplementary information

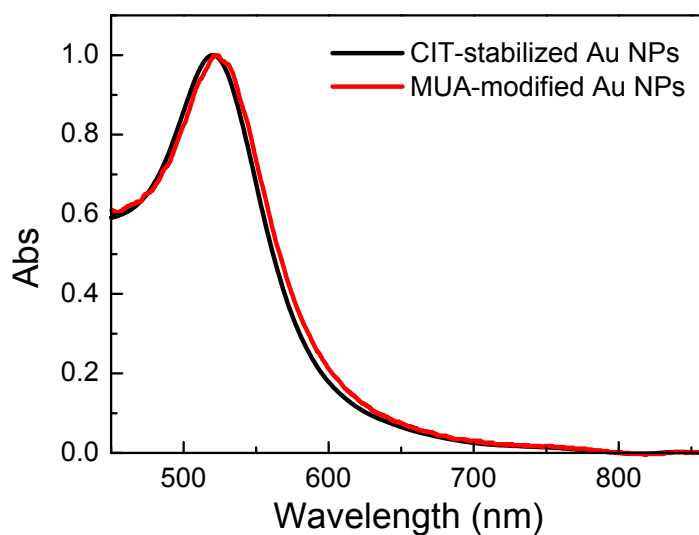


Figure S1. UV-vis spectra of citrate-stabilized Au NP and MUA modified Au NPs.

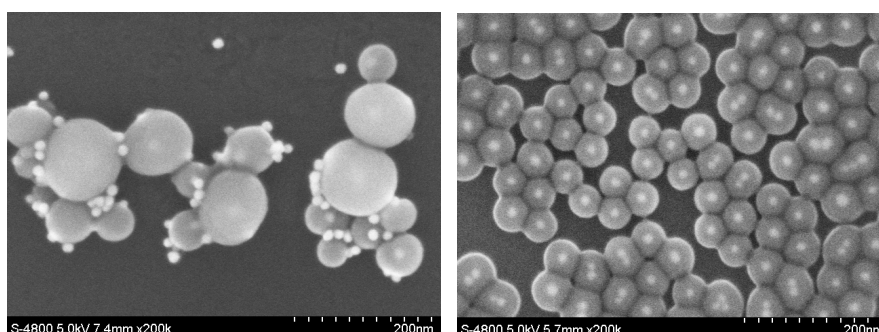


Figure S2. FE-SEM images for the SiO₂-coated thiol-modified Au NPs: a. MPA-modified Au NPs, b. MHA-modified Au NPs

To demonstrate whether MPA (SH-(CH₂)₂-COOH) or MHA (SH-(CH₂)₁₅-COOH) could also be used as linker molecules, therefore, the same method was used to modify the citrate-stabilized Au nanoparticles by using 3-mercaptopropionic acid (MPA) or 16-mercaptohexadecanoic acid (MHA) to replace the MUA. Figure S2 shows FE-SEM images for the SiO₂-coated thiol-modified Au NPs produced by this approach. In the case of the Au NPs modified with SH-(CH₂)_n-COOH (n=2), the Au NPs form inhomogeneous silica shell and free-gold Au NPs (see Figure S2A). However, for the Au NPs stabilized with SH-(CH₂)_n-COOH (n=15), mostly single gold colloids coated with a silica shell were dominated (see Figure S2B).

As is well known, the concentration of ammonium hydroxide and the ethanol to water ratio played important roles in controlling the deposition of silica on the Au NPs. In the work, we examined the effects of the concentrations of ammonium hydroxide and the ethanol to water ratio on the encapsulation of silica. It turned out that homogeneous homogeneous silica-coated Au NPs could not be obtained in this way. Apparently, these results indicated that the affinity of carboxyl to silica for SH-(CH₂)_n-COOH (n=2, 10 or 15) ligand was also related with 'n'. The above results obtained for the different thiol compounds showed that the silica was directly growing onto the chemical-adsorbed thiol compounds (-COOH).

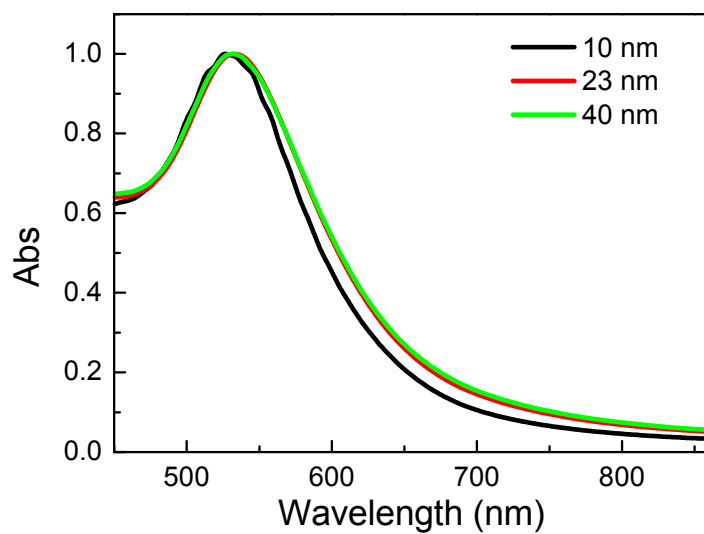


Figure S3. Influence of silica shell thickness on UV-vis spectra of Au NPs encapsulated in silica shell.

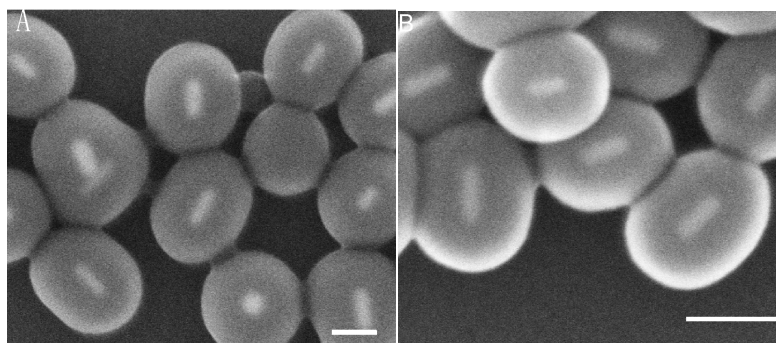


Figure S4. SEM of silica-coated Au NRs produced by varying the amounts of the TEOS for A-B. The shell thicknesses were 50 nm (A) and 30 nm (B). The scale bar was 60 nm.

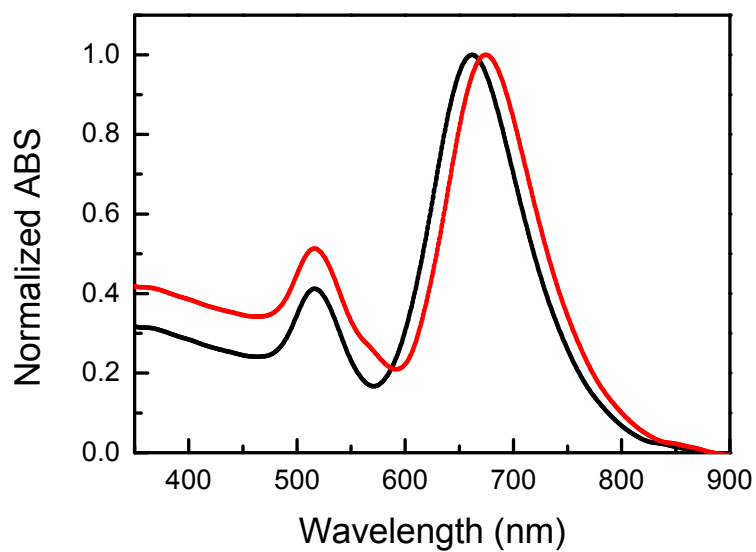


Figure S5. UV-visible spectra of Au NRs colloids before (black) and after silica coating (red). The spectra were normalized at the longitudinal band maximum

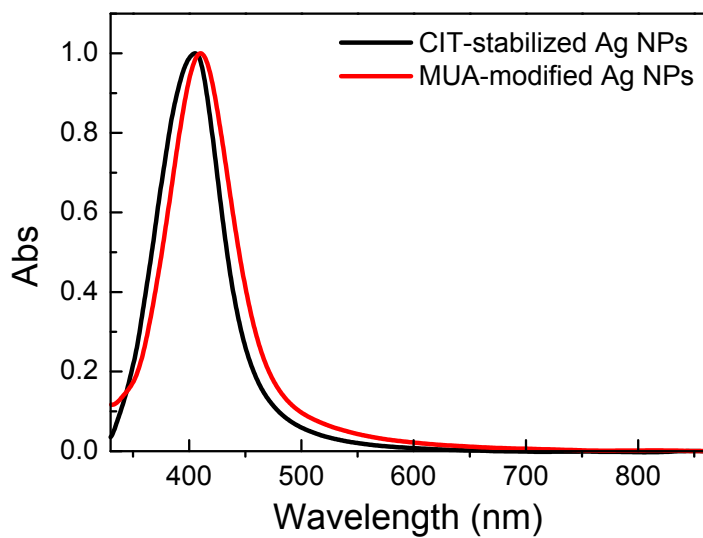


Figure S6. UV-vis spectra of citrate-stabilized Ag NP and MUA modified Ag NPs.

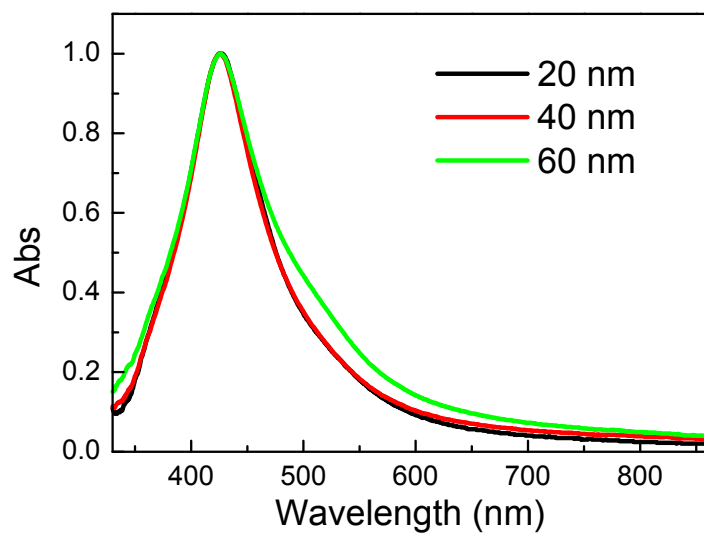


Figure S7. Influence of silica shell thickness on UV-vis spectra of Ag NPs (20 nm in diameter) encapsulated in silica shell.

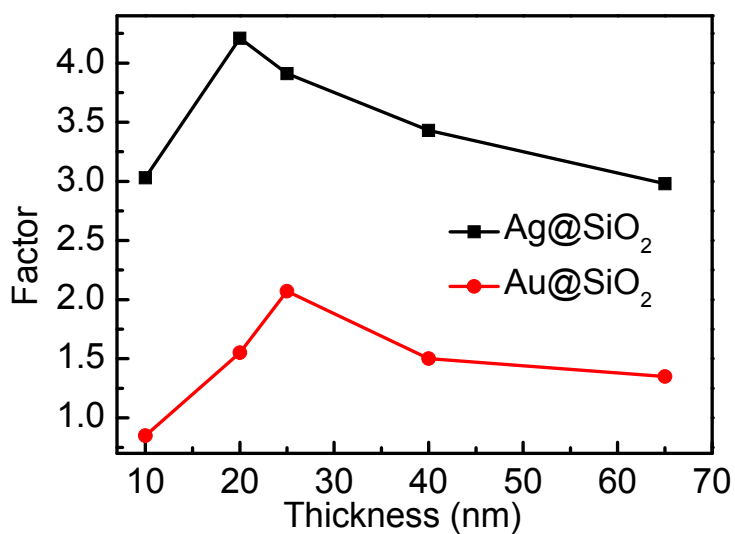


Figure S8. Distance dependent fluorescent enhancement factor of FITC by Ag and Au NPs.