Supporting Information

Differentiation of biothiols from other sulfur-containing biomolecules using iodide-capped gold nanoparticles

Lvlv Ji,[a] Jianying Wang,[a] Lei Zhu,[a] Yanbing Zu,[b] Jianfei Kong[c*] and Zuofeng Chen[a*]

[a]*Shanghai Key Lab of Chemical Assessment and Sustainability, Department of Chemistry, Tongji University, Shanghai 200092, China;* [b]*Institute of Bioengineering and Nanotechnology, 31 Biopolis Way, Singapore 138669;* [c]*College of Material Science and Engineering, Liaoning Technical University, Fuxin, Liaoning, 123000, China.*

Calculation of the concentration of the GNPs (*c*):

The total mass of GNPs in the colloidal solution = The total mass of Au in added $HAuCl_4$.

$(4/3\pi r^3) \times \rho \times (6.02 \times 10^{23}) \times c \times V = m_{HAuCl4} \times (M_{Au}/M_{HAuCl4})$

$[(4/3 \times 3.14 \times (20 \times 10^{-7}\ cm)^3)] \times 19.30\ g/cm^3 \times (6.02 \times 10^{23}) \times c\ mol/cm^3 \times 60\ cm^3$

$= (60\ g \times 0.01\%) \times (197/340)$

$c = 1.48 \times 10^{-13}\ mol/cm^3 = 1.48 \times 10^{-4}\ nmol/cm^3 = 0.148\ nmol/l$

Where r (= 20 nm) is the radius of GNPs, ρ (= 19.30 g/cm^3) is the density of bulk gold, V (= 60 cm^3) is the volume of the colloidal solution, m_{HAuCl4} (=60 g × 0.01%) is the mass of added $HAuCl_4$, M_{Au} is the atomic weight of Au, and M_{HAuCl4} is the molecular weight of $HAuCl_4$.

* Corresponding author.

E-mail address: lntukjf@163.com (J.-F. Kong), zfchen@tongji.edu.cn (Z.-F. Chen).

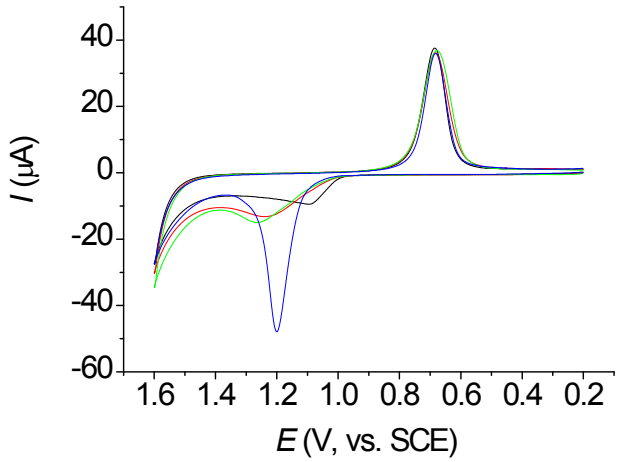
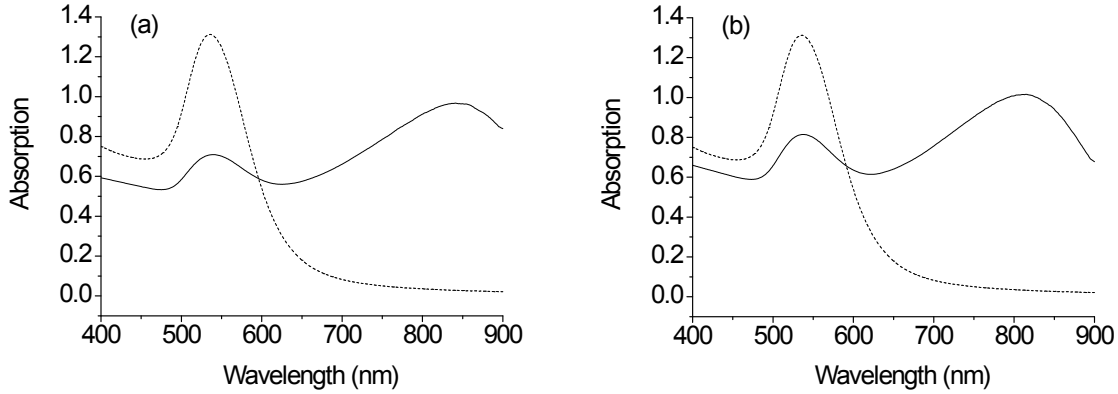


Figure S1. Cyclic voltammograms of bare Au (black line), Cl^--Au (red line), Br^--Au (green line) and I-Au (blue line) electrodes in 0.15 M PBS (pH 3.0). Scan rate, 100 mV/s.

Prior to the experiments, a bare polycrystalline gold electrode of 2 mm diameter was wet polished with 0.05 μm Al_2O_3 powders to obtain a mirror surface followed by sonication in distilled water for 10 s, and was subjected to repeated scanning in a wide potential range in 0.1 M H_2SO_4 solution until reproducible voltammograms were obtained. The halide-modified Au electrodes (Cl^--Au, Br^--Au or I-Au) were prepared by dipping the pretreated Au electrode into 0.1 M aqueous solutions of different halide salts for 20 min followed by a thoroughly rinsing with distilled water.



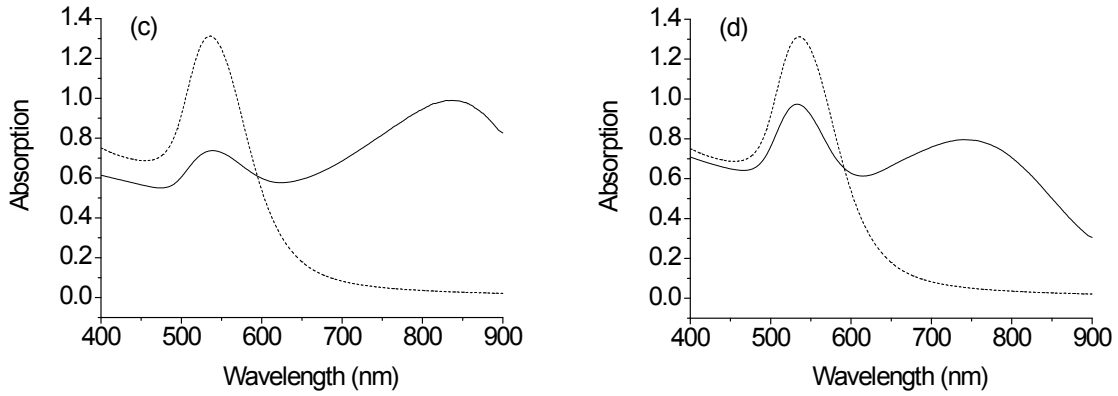


Figure S2. UV-vis spectra of 40 nm iodide-capped GNPs in the presence of 5 μM cysteamine (a), 2-mercaptoethanol (b), 2-mercaptoethylamine (c), and 6-mercapto-1-hexanol (d). The corresponding dashed lines represent the UV-vis spectra of GNPs before adding analytes. All the spectra were acquired at 10 min after the addition of analytes.

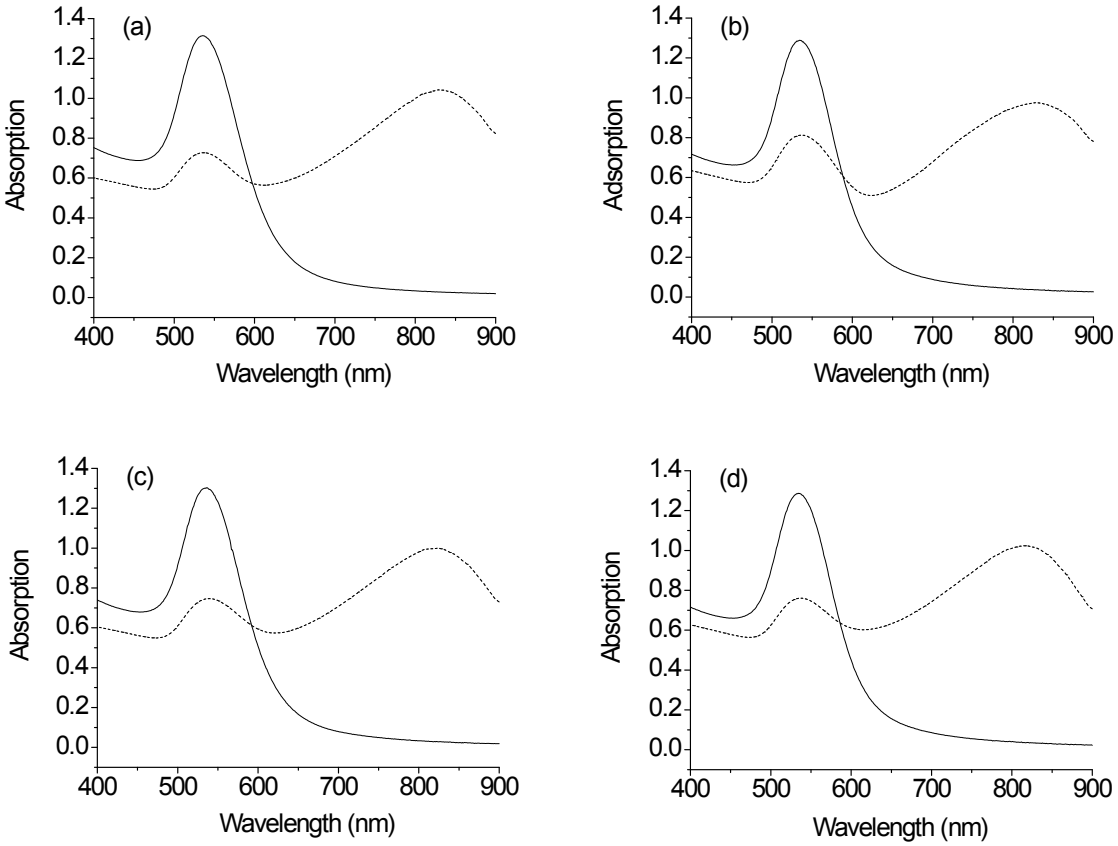


Figure S3. UV-vis spectra of 40 nm iodide-capped GNPs in the presence of 100 μM cystamine (a), 2,2′-thiodiethanol (b), thiourea (c), and thiocarbohydrazide (d). The corresponding dashed lines represent the UV-vis spectra of GNPs without any capping in the presence of 2 μM cystamine, 40 μM 2,2′-thiodiethanol, 2 μM thiourea and 2 μM thiocarbohydrazide. The spectra of solid line and dashed line were acquired at 60 min and 2 min, respectively, after the addition of the analytes.

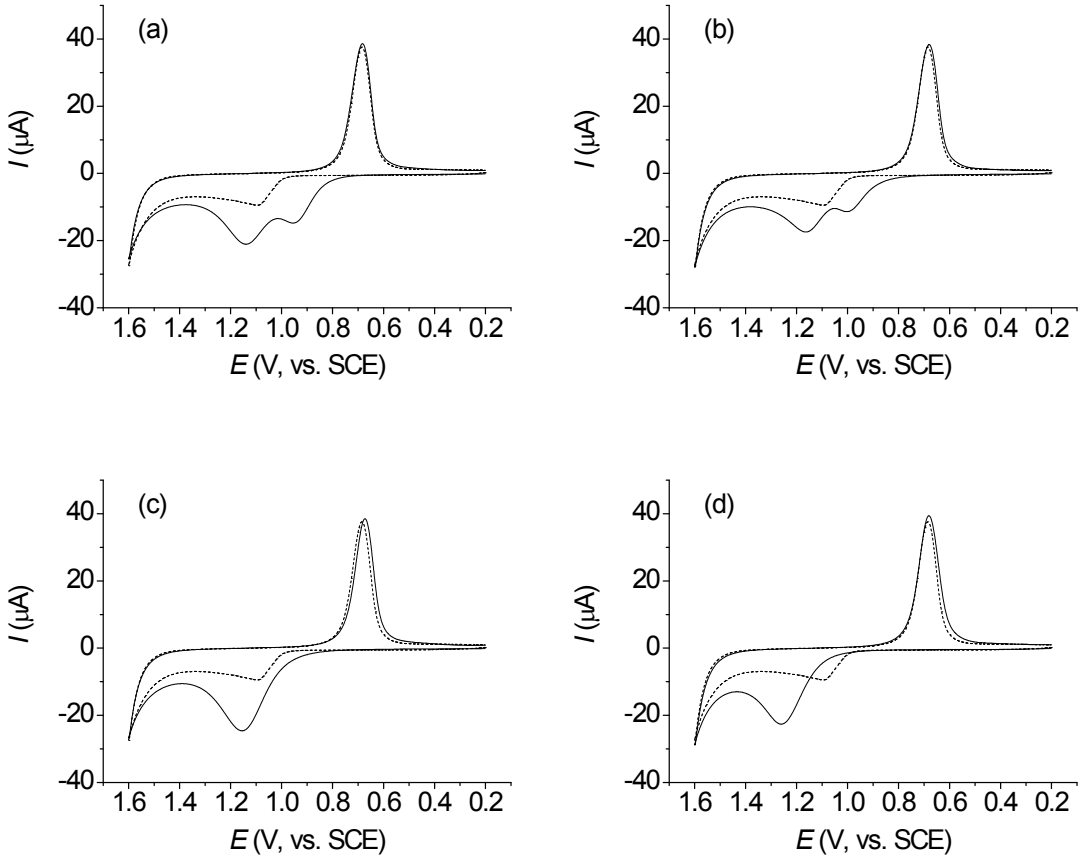


Figure S4. Cyclic voltammograms of Cys-Au (a), Hcy-Au (b), CysGly-Au (c), and Glu-Au (d) electrodes in 0.15 M PBS (pH 3.0). Scan rate, 100 mV/s. The dashed line represents the cyclic voltammogram of bare Au electrode under the same experimental condition.

The biothiols-modified Au electrodes (Cys-Au, Hcy-Au, CysGly-Au or Glu-Au) were prepared by dipping the pretreated Au electrodes into 10 mM aqueous solutions of the corresponding biothiols for 10 min followed by a thoroughly rinsing with distilled water.

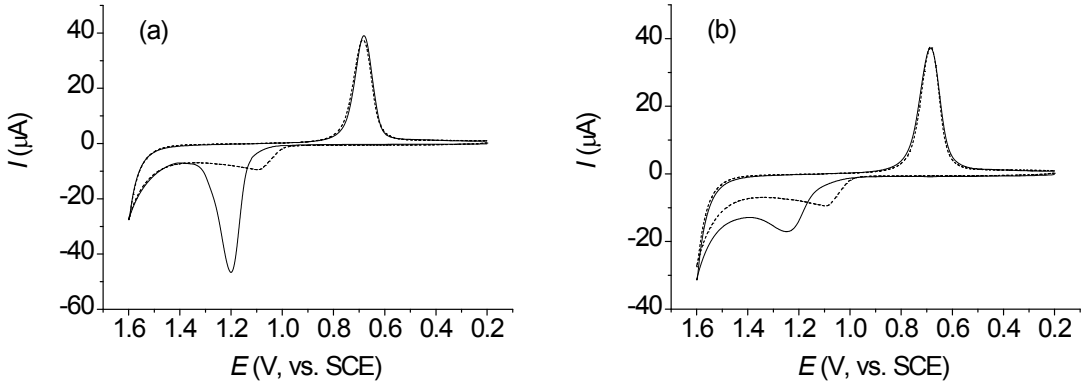


Figure S5. Cyclic voltammograms of FSN-Au (a) and Brij 35-Au (b) electrodes in 0.15 M PBS (pH 3.0). Scan rate, 100 mV/s. The dashed line represents the cyclic voltammogram of bare Au electrode under the same experimental condition.

The FSN-modified Au electrode (FSN-Au) and Brij 35-modified Au electrode (Brij 35-Au) were obtained by dipping the pretreated Au electrode into 5 wt % FSN and Brij 35 aqueous solutions for 10 min, respectively, followed by a thoroughly rinsing with distilled water.