Supporting Information

Synthesis of gold nanocrystals with chiral morphology, chiral ligand and more exposed high-index facet as electrocatalyst for oxidation of glucose enantiomers with high enantioselectivity and catalytic activity

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1. Experimental

1.1. Materials and reagents

Rhodamine 6G, chloroauric acid ($HAuCl_4$), L-ascorbic acid (L-AA), hexadecyltrimethylammonium chloride (CTAC), D-glucose (D-Glu), L-glucose (L-Glu), D-cysteine (D-Cys) and L-cysteine (L-Cys) were purchased from Sigma-Aldrich. Other materials and reagents used were purchased from Sinopharm Chemical reagent Co., Ltd. The deionized (DI) water was produced using a Millipore Milli-Q grade with a resistivity of 18.2 MΩ cm.

1.2. Electrode modification

The D-Cys-Au (or L-Cys-Au) stock solution of 0.5 mL was dispersed in 0.5 mL of 5 wt. % chitosan aqueous solution by ultrasound. Its 20μL was dropped on the surface of the pre-treated glassy carbon electrode (GCE, 1 mm in diameter) and dried at 4°C dried with N_2 current. The obtained D-Cys-Au/GCE (or L-Cys-Au/GCE) was stored at 4°C before use.

1.3. Material characterization

Scanning electron microscope (SEM) was carried out in HITACHI S4800 field emission scanning electron microscope. Transmission electron microscope (TEM) were conducted on a JEOL 2010 transmission electron microscope at 200 keV. X-ray diffraction (XRD) patterns were measured on X-ray D8 Advance Instrument operated at 40 kV and 20 mA and using Cu Kα radiation source with λ=0.15406 nm. Raman measurements were carried out using InVia laser micro-Raman spectrometer. Circular dichroism (CD) spectra were measured on Chirascan V100. To check the Lorentz reciprocity, a

solutions of nanoparticles and particles attached on the substrate. The CD spectrum of each sample condition was measured in the forwards and backwards directions by changing the direction of the sample relative to incident light.

1.4. Preparation of SERE substrate

The SERS substrates were made via depositing D-Cys-Au, L-Cys-Au or gold seed onto the surface of silicon wafer.[1] In a typical procedure, silicon wafers were cleaned by immersion in a mixture of containing 30% H_2O_2 and concentrated H_2SO_4 with a volume ratio of 3:7 heat to 80°C for 2 h. After cooling down to room temperature, the silicon wafers were washed with ultrapure water and then dried under nitrogen. The silicon wafers were immersed in a APTES ethanol solution with the volume ratio of 1% for 12 h at room temperature. Followed by being rinsed in ethanol with sonication 3 times and dried with nitrogen. After centrifugation, a 1.0 mL of 5.0 mM PVP was added in 5 mL of D-Cys-Au, L-Cys-Au or gold seed solution under vigorous stirring for 30 min. Then, the above silicon wafers were soaked into the mixture for 48 h. The gold films used as SERS substrates formed after the D-Cys-Au, L-Cys-Au or gold seed self-assembling uniformly onto the surface of the silicon.

2. Figures and Tables

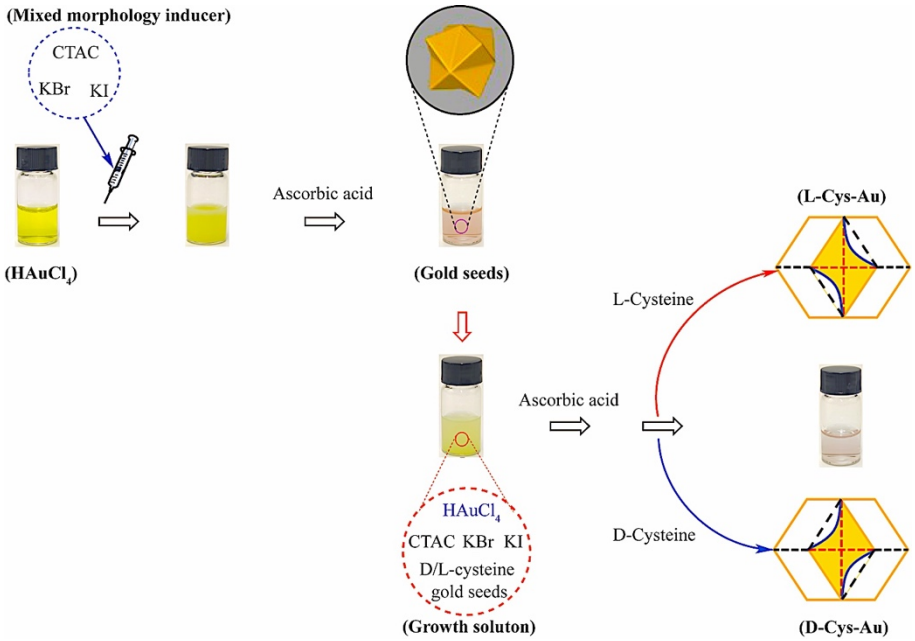

Fig. s1 Scheme for synthesis of chiral gold nanocrystals

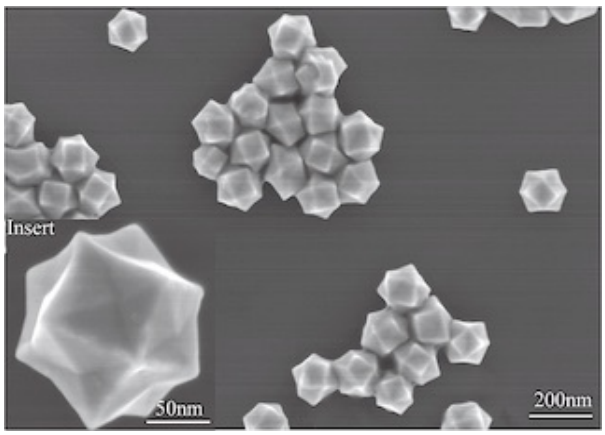

Fig. s2 SEM image and enlarged SEM image (Insert) of the as-synthesized trioctahedral gold nanocrystals

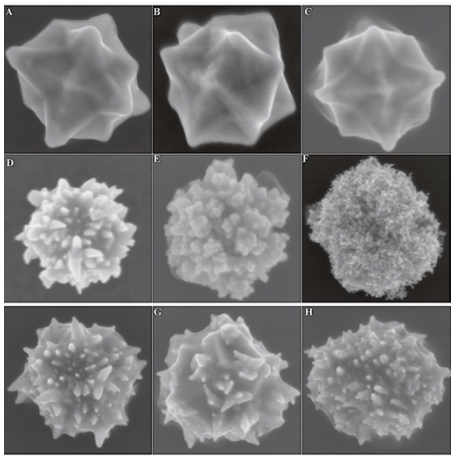

Fig. s3 SEM images of the gold nanocrystals by asymmetric structural evolution of trioctahedral gold nanocrystals by evolution time of 20 min in the mixed solution composing of 10 mM ascorbic acid, 0.01 mM L-cysteine and 0.36 mM $HAuCl_4$ (A), 10 mM ascorbic acid, 0.05 mM L-cysteine and 0.36 mM $HAuCl_4$ (B), 50 mM ascorbic acid, 0.05 mM L-cysteine and 0.36 mM $HAuCl_4$ (C), 50 mM ascorbic acid, 0.5 mM L-cysteine and 0.36 mM $HAuCl_4$ (D), 10 mM ascorbic acid, 0.01 mM L-cysteine and 0.36 mM $HAuCl_4$ (E), 10 mM ascorbic acid, 0.01 mM L-cysteine and 1.8 mM $HAuCl_4$ (F), 100 mM ascorbic acid, 0.05 mM L-cysteine and 0.36 mM $HAuCl_4$ (G), 500 mM ascorbic acid, 0.05 mM L-cysteine and 0.36 mM $HAuCl_4$ (H), and 10 mM ascorbic acid, 0.5 mM L-cysteine and 0.36 mM $HAuCl_4$ (I)

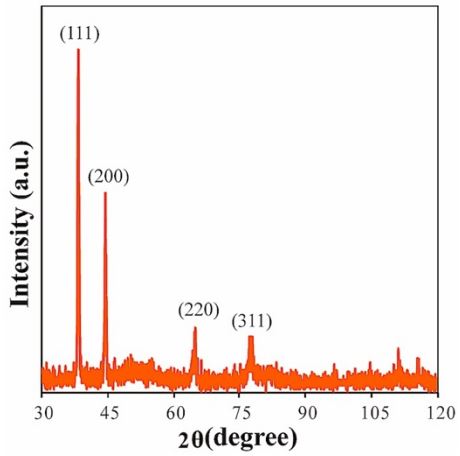

Fig. s4 XRD pattern of the as-synthesized trioctahedral gold nanocrystals

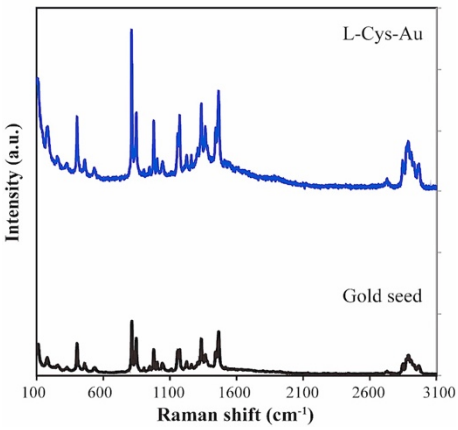

Fig. s5 SERS spectra of Rhodamine-6G on the L-Cys-Au and gold seed substrates with the excitation wavelength of 785 nm

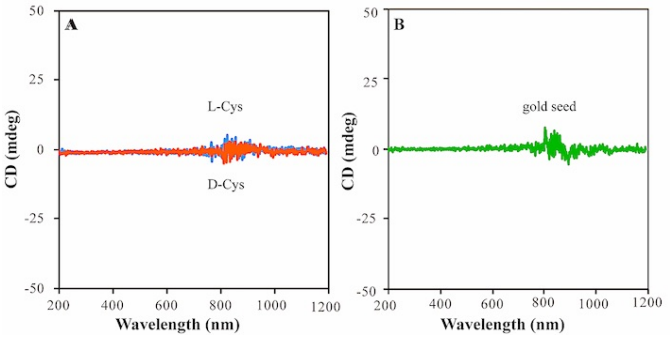

Fig. s6 The CD spectra of L-Cys and D-Cys (A) and gold seeds (B)

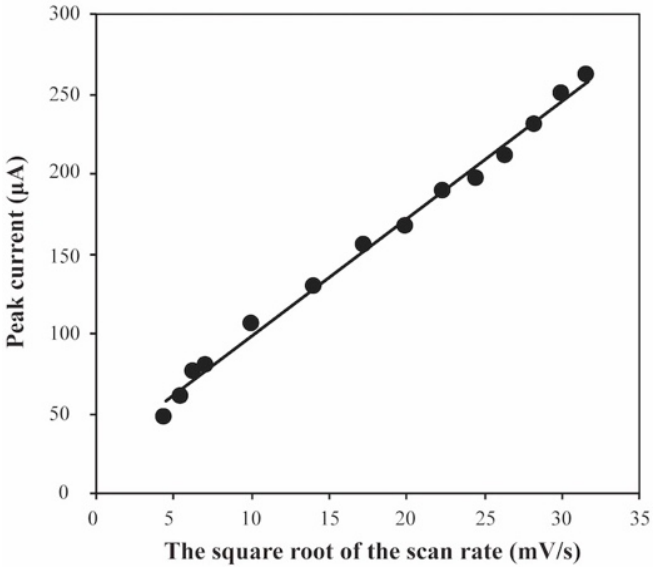

Fig. s7 The relationship curve of peak current with the square root of the scan rate

References

[1] X.Y. Zhou, R.Y. Li, Z.J. Li, J.K. Liu, Z.G. Gu, G.L. Wang, A surface-enhanced Raman scattering strategy for detection of peanut allergen Ara h 1 using a bipyramid-shaped gold nanocrystal substrate with an improved synthesis, RSC Adv. 4 (2014) 15363–15370.