

## Supporting information

### **Tuning chiral morphology of gold nanoparticles with reversed chiral signals via adjusting reaction temperature of seed-mediated growth process**

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#### **Chemicals**

Andcetyltrimethylammonium chloride (CTAC), chlorauric acid ( $\text{HAuCl}_4$ ), sodium borohydride ( $\text{NaBH}_4$ ), potassium iodide (KI), ascorbic acid (AA), L-glutathione (L-GSH) was purchased from Aladdin Chemistry Sigma-Aldrich Co. Ltd. (Shanghai, China). D-glutathione (D-GSH) was purchased from GL Biochem Co. Ltd. (Shanghai, China). All chemicals were used as received without further purification. Ultrapure water was treated by Millipore Milli-Q equipment (Millipore, CA).

#### **Instruments**

Circular dichroic spectrometer was produced by Applied Photophysics (Chirascan, Britain). Scanning electron microscopy (SEM) was carried out with SU8220 electron microscopy (HITACHI, Japan). Transmission electron microscopy (TEM) experiments was performed on a JEM-2800 high resolution field-emission transmission electron microscope (JEOL,

Japan) with an accelerating voltage of 200 kV.

### **Synthesis of octahedral Au seed**

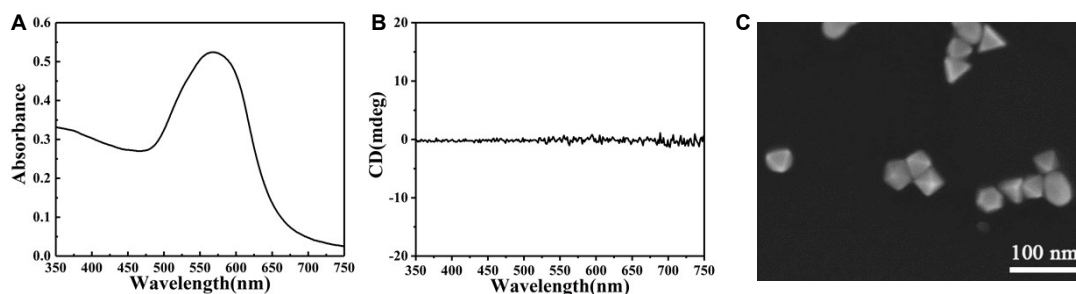
Add 1 mL CTAC (1 M), 1 mL HAuCl<sub>4</sub> (0.1 %) and 8 mL H<sub>2</sub>O into a clean sample bottle, inject 450 μL NaBH<sub>4</sub> (20 mM), stirring for 2 min, and then put it in a water bath at 30 °C for 1 h to obtain light brown seed liquid waiting for use. Two other sample bottles were added with 0.32 g of CTAC and 9480 μL H<sub>2</sub>O. After ultrasonic dissolution, 250 μL HAuCl<sub>4</sub> (10 mM), 50 μL KI (1 mM) and 220 μL AA (40 mM) were added and mixed evenly to obtain two bottles of colorless growth solution. Add 100 μL of brown seed solution to one bottle of growth solution, shake well until dark pink (about 5–6 s), immediately transfer 100 μL of dark pink solution to another growth solution, mix well and put it in a water bath at 30 °C for 15 min to obtain purple octahedral seed solution, centrifuge and concentrate it and store it in a refrigerator at 4 °C.

### **Synthesis of chiral gold nanoparticles**

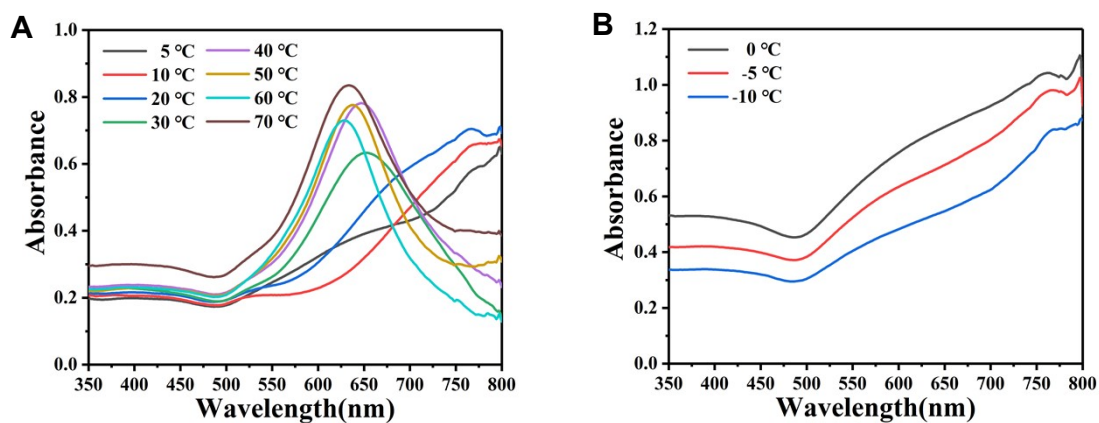
All glasswares and magnetic stirrer bars were cleaned with aqua regia (HCl:HNO<sub>3</sub> = 3 : 1 v/v) and rinsed thoroughly with ultrapure water prior to use, and then oven-dried prior to use, to avoid unwanted nucleation during the synthesis, as well as aggregation of gold colloid solution.

Au nanoparticles were prepared by seed-assisted growth at different temperatures. Briefly, 1600 μL CTAC (100 mM), 200 μL HAuCl<sub>4</sub> (5 mM),

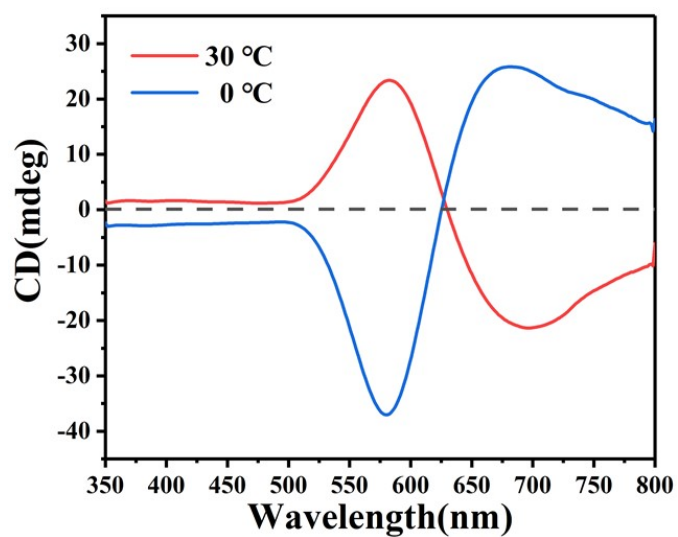
7140  $\mu\text{L}$   $\text{H}_2\text{O}$ , 950  $\mu\text{L}$  AA (50 mM) and 10  $\mu\text{L}$  L-GSH or D-GSH (2.75 mM) were mixed together for obtaining the growth solution. Then, 100  $\mu\text{L}$  seed was added into the growth solution. Finally, the mixed solution was left undisturbed for 2 h in the water bath at a given temperature ( $-10\text{ }^\circ\text{C}$ ,  $-5\text{ }^\circ\text{C}$ ,  $0\text{ }^\circ\text{C}$ ,  $5\text{ }^\circ\text{C}$ ,  $10\text{ }^\circ\text{C}$ ,  $20\text{ }^\circ\text{C}$ ,  $30\text{ }^\circ\text{C}$ ,  $40\text{ }^\circ\text{C}$ ,  $50\text{ }^\circ\text{C}$ ,  $60\text{ }^\circ\text{C}$ , or  $70\text{ }^\circ\text{C}$ ). After reaction, the products were washed with water through centrifugation. The reaction temperature was controlled by the thermostatic water bath. The sub-zero temperature was controlled by the ratio of ice water to salt and placed in the foam incubator to maintain the temperature.



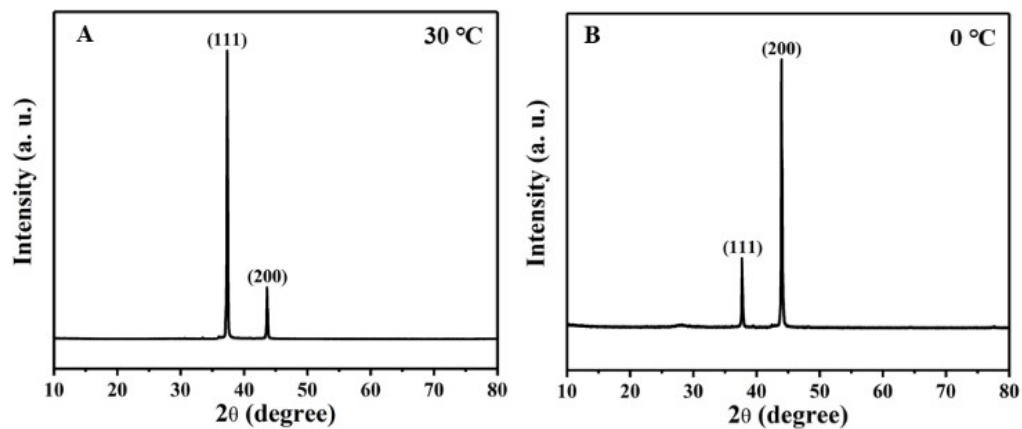
**Figure S1.** (A) The optical absorbance spectrum of the prepared Au seeds, (B) CD spectrum of the prepared Au seeds, and (C) SEM images of the prepared Au seeds.



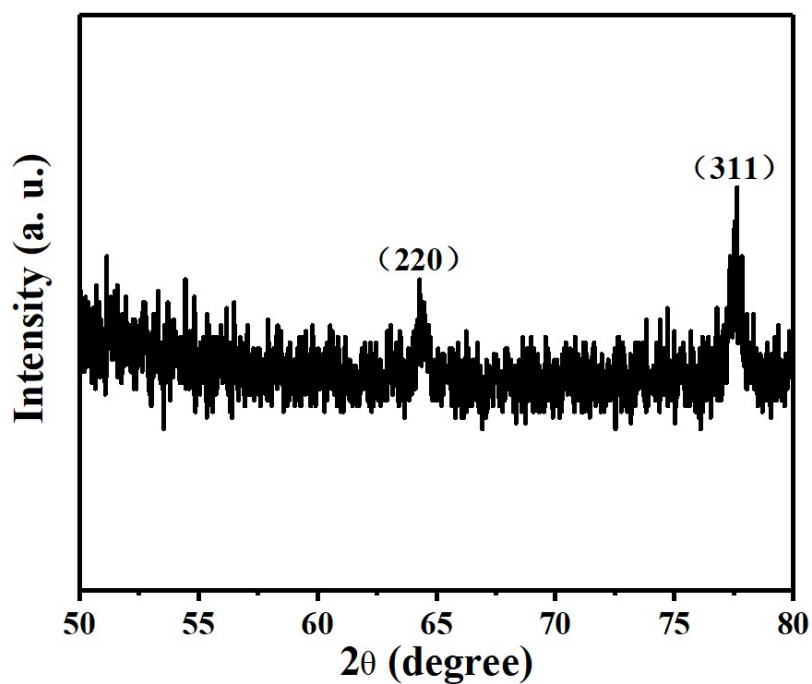
**Figure S2.** The optical absorbance spectra of the AuNPs prepared at different temperatures.



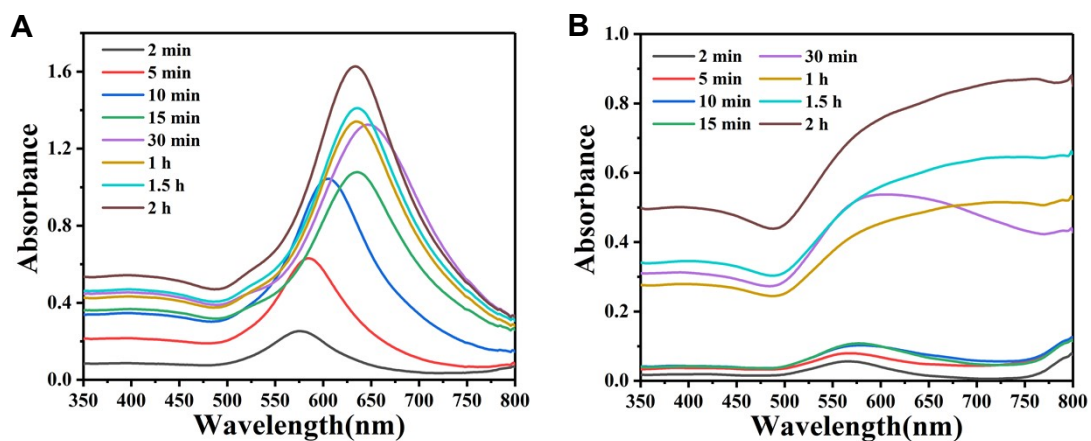
**Figure S3.** CD spectra of the AuNPs prepared at 30 °C (or 0 °C) with D-GSH as chiral inducer.



**Figure S4.** XRD patterns of AuNPs prepared at 30 °C (A) and 0 °C (B).



**Figure S5.** Enlarged XRD patterns of AuNPs prepared at 0 °C.



**Figure S6.** (A) The optical absorbance spectra of the AuNPs-30 over growth time, and (B) the optical absorbance spectra of AuNPs-0 over growth time.