

Electronic Supplementary Material (ESI)

Stepwise Evolution of Au Micro/Nanocrystals from Octahedron into Truncated Ditetragonal Prism

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1. Materials and methods

$\text{HAuCl}_4 \cdot \text{XH}_2\text{O}$ ($M_w=339.79$) was purchased from macklin. Silver nitrate (AgNO_3 , $\geq 99\%$), Hydrochloric acid (HCl, AR) Polyquaternium - 11 (20 wt. % in H_2O molecular weight 110.54), ethylene glycol (EG, $\geq 99\%$) was purchased from Aladdin. All chemicals were used as received. The solutions were prepared from super pure water ($18 \text{ M}\Omega \text{ cm}$) purified through a Milli-Q Lab system (Nihon Millipore Ltd.).

For a typical synthesis of uniform gold crystals, a 1.0 mL polyquaternium - 11 was added to 20 mL EG solution in a 50 ml glass flask. $100 \mu\text{l}$ (0.5 M) $\text{HAuCl}_4 \cdot \text{XH}_2\text{O}$ solution and $15 \mu\text{l}$ (0.1 M) AgNO_3 solution was add to 1 mL EG. First use the oscillator to oscillate 1min, then ultrasonic 1min to make the solution evenly. The solution was added to 20 ml of a solution containing 1 ml of polyquaternium - 11 and stirred vigorously for 2 min. Place the solution in a 195°C degree-oil bath and react with intense agitation. All glassware used in the experiments was cleaned in a bath of freshly prepared aqua regia (HCl : $\text{HNO}_3 = 3 : 1$) and rinsed thoroughly in deionized water and ethanol. When the reaction is stopped, the flask is placed in an ice bath and quenched. The resulting product was first centrifuged at 12500 r / min for 10 min to remove the supernatant and the products were washed twice with ethanol and water, respectively.

The prepared Au crystals were characterized by SEM, TEM and SAED. The morphologies and structures of samples were studied using scanning electron microscopy (SEM, 3.0kV, SU70, Hitachi, Japan)

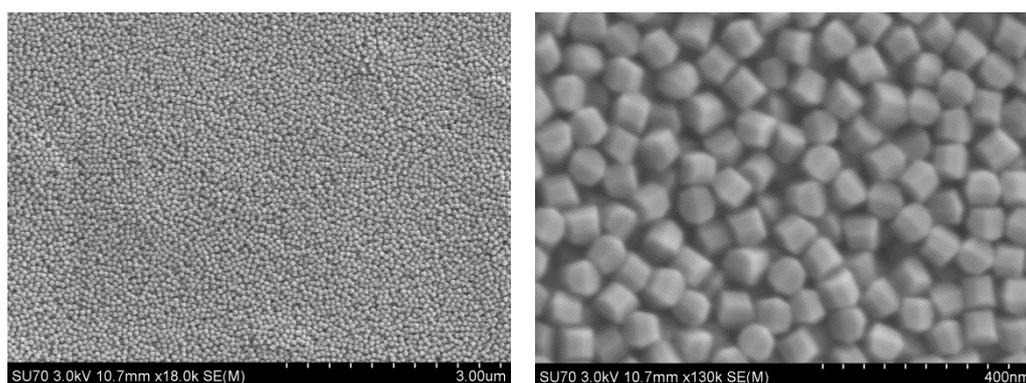


Fig. S1 (a) Low- and (b) high-magnification SEM images of TDP Au NCs prepared by $100 \mu\text{l}$ (0.5 M) $\text{HAuCl}_4 \cdot \text{XH}_2\text{O}$ solution, $15 \mu\text{l}$ (0.1 M) AgNO_3 , 1 ml of polyquaternium - 11 and 20 ml EG. The average edge length of the TDP Au NCs is about 57 nm.

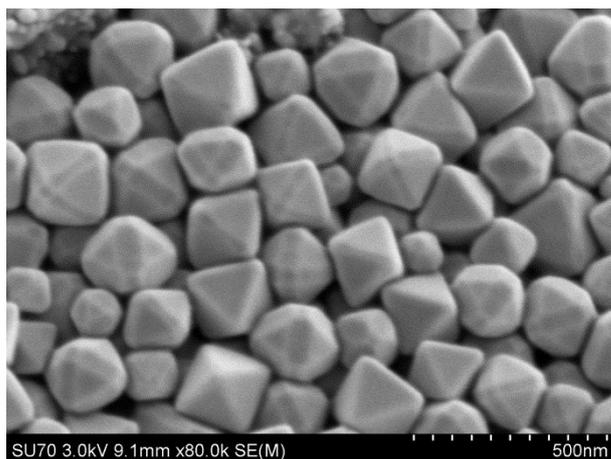


Fig. S2 SEM images of octahedron Au NCs prepared by 40 μ l (0.5 M) $\text{HAuCl}_4 \cdot \text{XH}_2\text{O}$ solution, 15 μ l (0.1 M) AgNO_3 , 1 ml of polyquaterrium – 11, 10 μ l HCl and 20 ml EG.

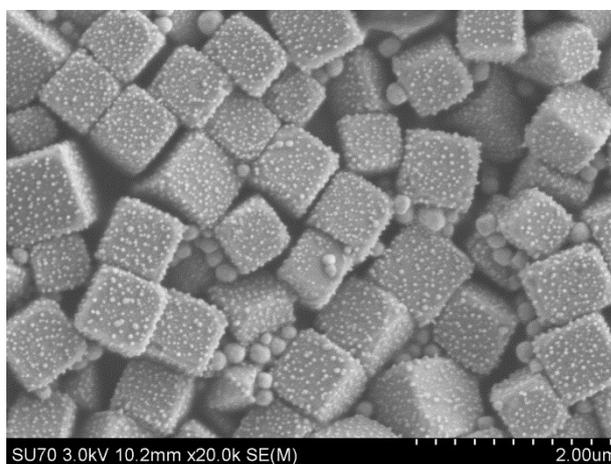


Fig. S3 SEM images of Ag@Au crystals prepared by 100 μ l (0.5 M) $\text{HAuCl}_4 \cdot \text{XH}_2\text{O}$ solution, 15 μ l (0.1 M) AgNO_3 , 1 ml of polyquaterrium – 11, 10 μ l HCl and 20 ml EG.