Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information

Facile synthesis of spinous-like Au nanostructures for unique localized surface plasmon resonance and surface-enhanced raman scattering

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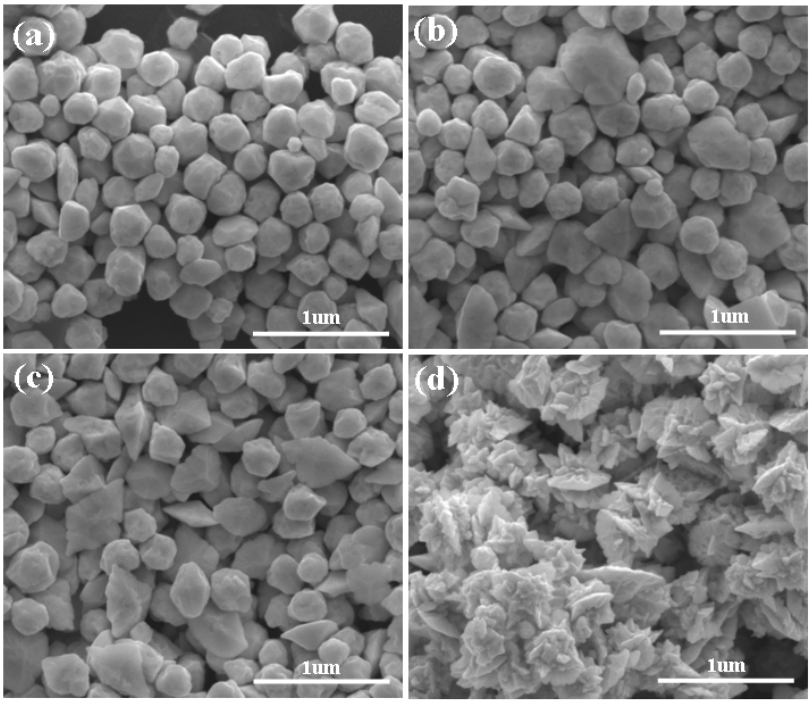


Figure S1. SEM of Au nanostructures in the presence of HCl (1.0M, 200ul) and $AgNO_3$ (0.01M, 1ul) by different ratios of CTAC to CTAB: (a) 1:4; (b)2:3; (c) 3:2; (d) 4:1.

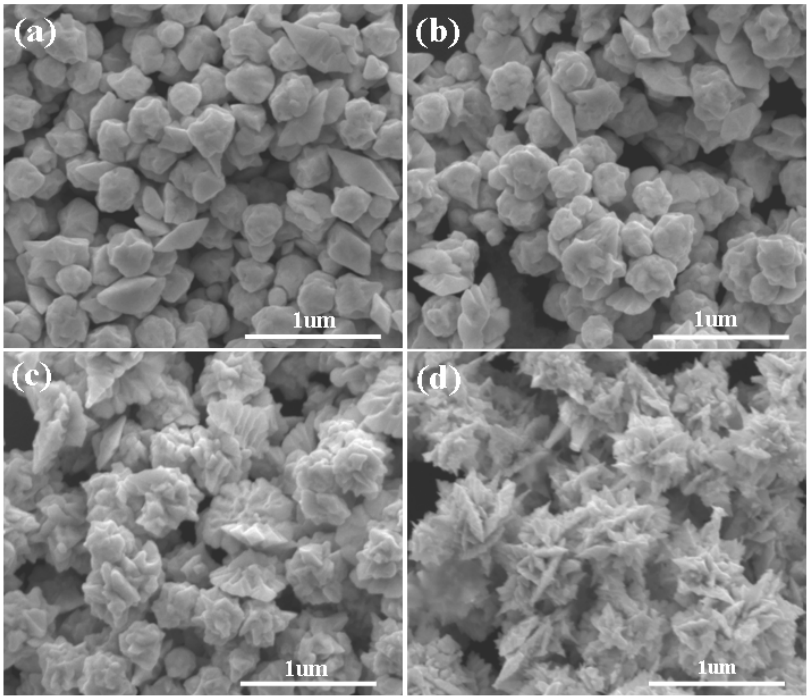


Figure S2. SEM of Au nanostructures in the presence of HCl (1.0M, 200ul) and $AgNO_3$ (0.01M, 10ul) by different ratios of CTAC to CTAB: (a) 1:4; (b)2:3; (c) 3:2; (d) 4:1.

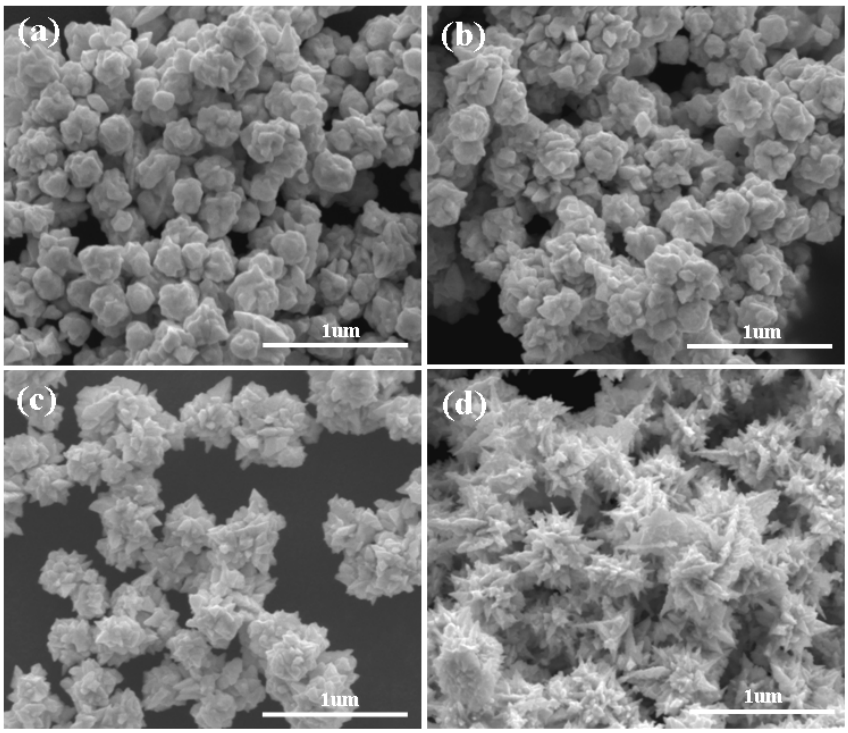


Figure S3. SEM of Au nanostructures in the presence of HCl (1.0M, 200ul) and $AgNO_3$ (0.01M, 40ul) by different ratios of CTAC to CTAB: (a) 1:4; (b)2:3; (c) 3:2; (d) 4:1.

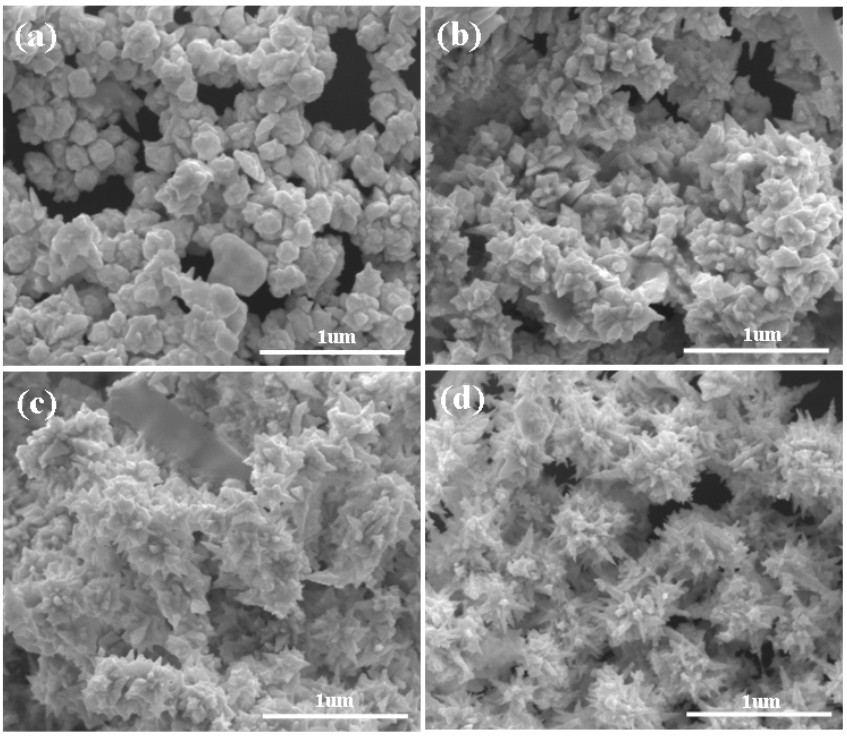


Figure S4. SEM of Au nanostructures in the presence of HCl (1.0M, 200ul) and $AgNO_3$ (0.01M, 100ul) by different ratios of CTAC to CTAB: (a) 1:4; (b)2:3; (c) 3:2; (d) 4:1.

With the acid additive, keep the concentration of hydrochloric acid, volume and the concentration of a solution of silver nitrate unchanged, change the volume of silver nitrate solution, the morphology of gold nanostructures were characterized by the SEM as shown in figure S1,S2,S3, and S4. With the ratios of CTAC and CTAB increased, the bumped structures, which grown out from the central core of Au nanostructure, gradually become longer and thinner. Keep the ratios of CTAC and CTAB unchanged, with the increasing of the volume of silver nitrate, the bumped structures of nanostructure were increased.

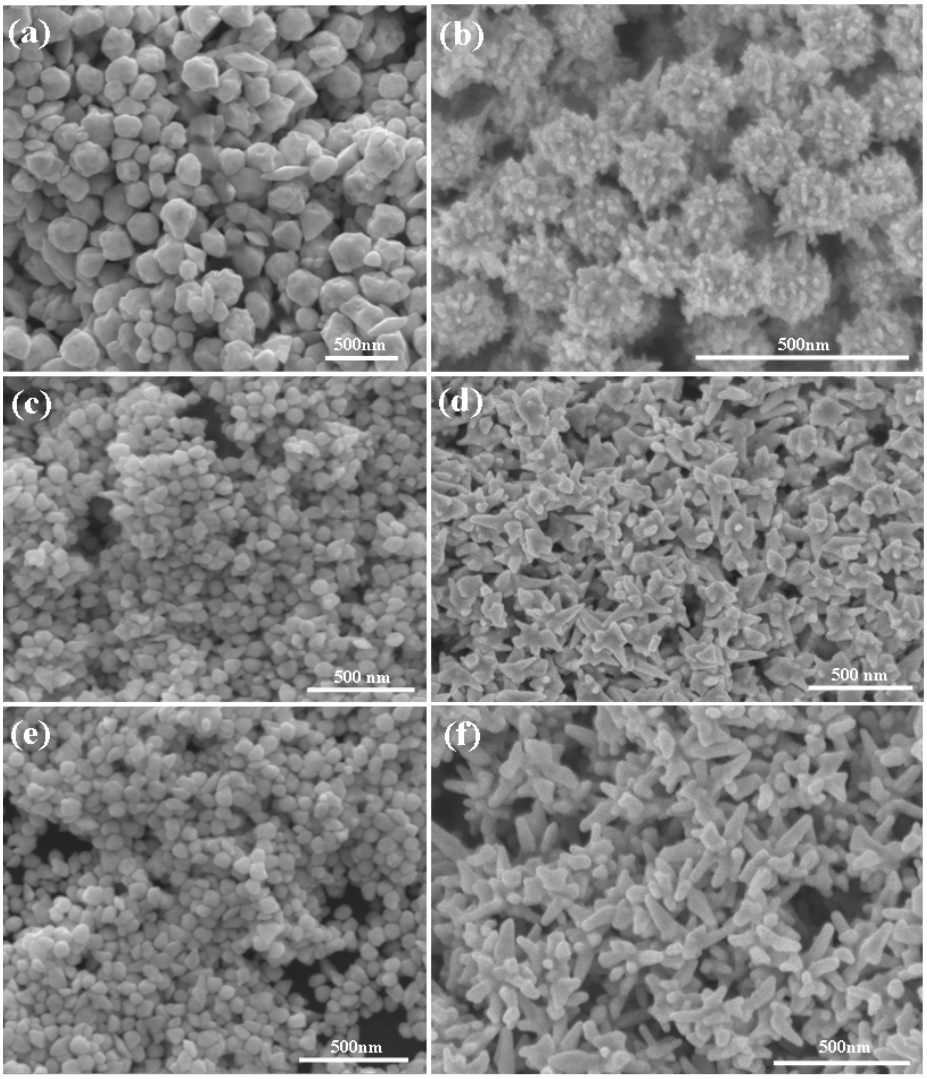


Figure S5. With CTAB as the only surfactant：（a）HCl (1.0M, 200ul), $AgNO_3$ (0.01M, 10ul), (c) NH_4OH, (e) NaBr (0.1M, 50ul); With CTAC as the only surfactant：（b）HCl (1.0M, 200ul), $AgNO_3$ (0.01M, 10ul), (d) NH_4OH, (f) NaBr(0.1M, 50ul)

With the only surfactant CTAB, keep the PH of the solution unchanged, nanostructure gold are exhibited irregular topography, because coordinate affinity of Br - CTA + to gold is very strong, small tip will be preferential etched from nanometer gold. With the only surfactant CTAC, stellate structure of gold nanoparticles were easy to obtained.

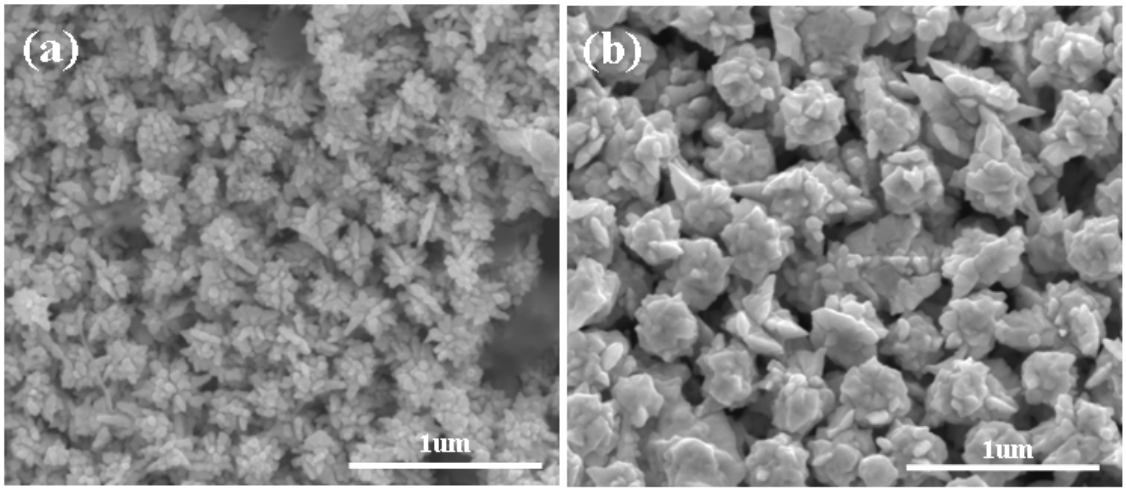
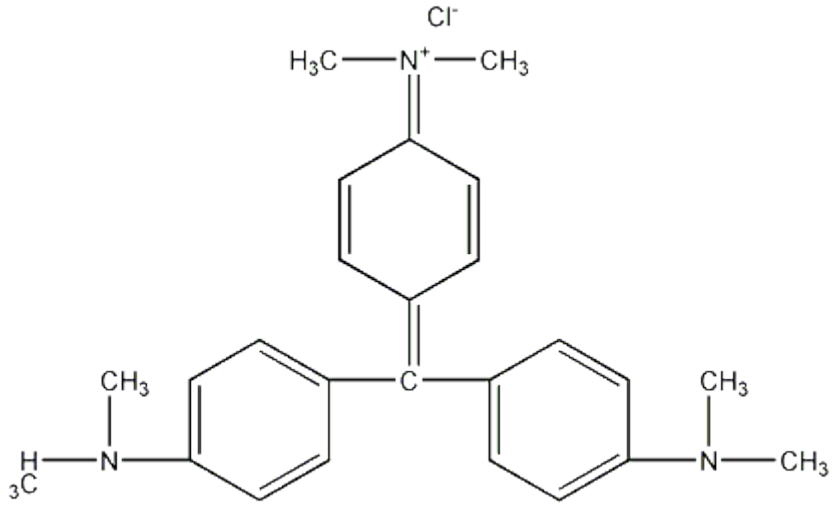


Figure S6 (a) the ratio of CTAC and CTAB was 1:1，the SEM of nanostructure；(b) the ratio of DDAB and CTAB was 1:1，the SEM of nanostructure.

Keep the ratio of the two surfactants unchanged, change CTAC to DDAB, spiny convex of gold nanoparticles were decreased. The stellate morphology was produced by using CTAC, which was according with theory research.

Some other control experiments were performed as follows: (1) With the acid additive, keep the concentration of hydrochloric acid, volume and the concentration of a solution of silver nitrate unchanged, change the volume of silver nitrate solution, the morphology of gold nanostructures were characterized by the SEM as shown in figure S1,S2,S3, and S4. (2) With CTAB or CTAC as the only surfactant, keep the PH of the solution unchanged, nanostructure gold are exhibited irregular topography as shown in figure S5. (3) Keep the ratio of the two surfactants unchanged, change CTAC to DDAB, the spinous morphology of gold nanoparticles were characterized by figure S6.

The estimate calculation of σ is represented as follows:



The structure of crystal violet molecula

According to the structure of a crystal violet molecular, we use three nitrogen atoms as three vertexs to draw an equilateral triangle. Based on the bond length of C-N and carbon-carbon bond in benzene ring are 0.147nm and 0.139nm. According to the triangle area of law, 4.35nm^2 as surface area of one CV molecule was obtained.