



Supporting Information

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Plasmon-Driven Synthesis of Triangular Core-Shell Nanoprisms From Gold Seeds

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Experimental Details

Synthesis of 5 nm gold nanoparticles: An aqueous solution (20 mL) containing HAuCl_4 (0.25 mM) and trisodium citrate (0.25 mM) was prepared in a flask. Then ice-cold, freshly prepared NaBH_4 (0.6 mL, 0.1 M) solution was added to the mixture while stirring vigorously. The solution was allowed to age for 3 hours, and then used as a seed solution. While stirring, 2.5 mL of this seed solution was mixed with 7.5 mL of an aqueous solution containing HAuCl_4 (0.25 mM) and polyvinylpyrrolidone (0.1% PVP, $M_w \sim 58,000$). Then freshly prepared ascorbic acid solution (0.05 mL, 0.1 M) was added to the mixture and allowed to react for 20 min while stirring. The average diameter of the gold nanoparticles was determined by TEM (5.3 ± 0.8 nm).

Synthesis of 11 nm gold nanoparticles: An aqueous solution of HAuCl_4 (1 mM, 500 mL) was brought to a reflux while stirring, and then trisodium citrate solution (50 mL, 77.6 mM) was added quickly to the boiling mixture. The solution was refluxed for an additional 15 min, and allowed to cool to room temperature. Subsequently, the gold colloid was centrifuged at 13.2 krpm (Eppendorf, 5415D) for 30 min, and resuspended in trisodium citrate solution (0.3 mM). The average diameter of the gold nanoparticles was determined by TEM (11.2 ± 1.8 nm).

Synthesis of 25 nm gold nanoparticles: An aqueous solution of HAuCl_4 (1% w/v, 50 mL) was heated to boiling while stirring. Then trisodium citrate (0.75 mL, 1% w/v) was added quickly to the boiling mixture. The solution was refluxed for 15 min, and then allowed to cool to room temperature. Subsequently, the gold colloid was centrifuged at 13.2 krpm for 20 min and resuspended in trisodium citrate solution (0.3 mM). The average diameter of the gold nanoparticles was determined by TEM (25.1 ± 2.7 nm).

Synthesis of silver nanoparticles: A three-neck flask was filled with 95 mL of Nanopure™ water and immersed in an ice bath. This water was bubbled with nitrogen gas in the dark with vigorous stirring for 30 minutes. Aqueous solutions of AgNO_3 (0.5 mL, 20 mM) and trisodium citrate (1 mL, 30 mM) then were added to the ice-cold solution. One mL of aqueous NaBH_4 (50 mM, freshly prepared with ice-cold Nanopure™ water) was rapidly injected into the solution. Over the next 15 minutes, 5-6 drops of NaBH_4 solution were added to the solution every two minutes. Finally, 1 mL of NaBH_4 solution and 1 mL of bis(p-sulfonatophenyl) phenylphosphine (BSPP) solution (5 mM) were added to the mixture dropwise. The resulting silver nanoparticle solution was gently stirred for 5 hours in an ice bath and allowed to stand overnight in the dark at 4 °C. The average diameter of the silver nanoparticles was determined by TEM (5.0 ± 1.2 nm).

Photosynthesis of Au@Ag Core-shell nanoprisms: In a typical experiment, a 9 mL solution of silver nanoparticles was mixed with a 1 mL solution of gold nanoparticles (diluted, with optical density of 1 O.D./mL at extinction maximum). Then, the solution was irradiated with a 150 W halogen lamp coupled with an optical bandpass filter centered at either 550 ± 20 nm, 514 ± 5 nm, or 600 ± 20 nm (Intor, Inc.), to generate triangular nanoprisms with average edge lengths of 70 ± 6 nm, 48 ± 5 nm, and 80 ± 7 nm, respectively. The resulting colloids were centrifuged at 1200 rpm for 60 min, and resuspended in trisodium citrate solution (0.3 mM).

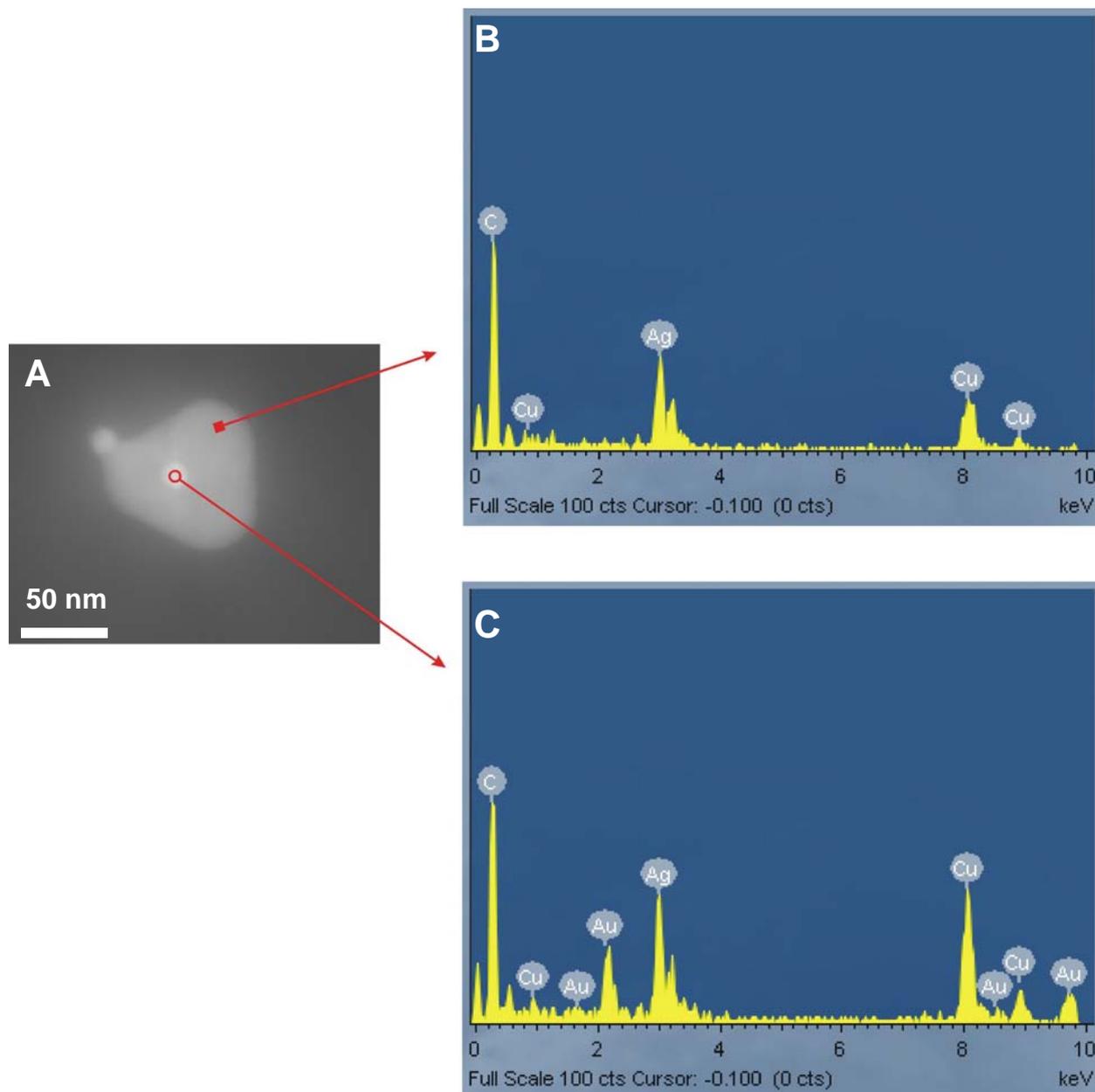


Figure 1S. STEM-EDS analysis of a Au@Ag core-shell nanoprism. (A) STEM image; (B) EDS analysis of the silver nanoprism matrix (square spot) shows only silver signal; (C) EDS analysis of the silver nanoprism matrix (circle spot) shows both gold and silver signal.

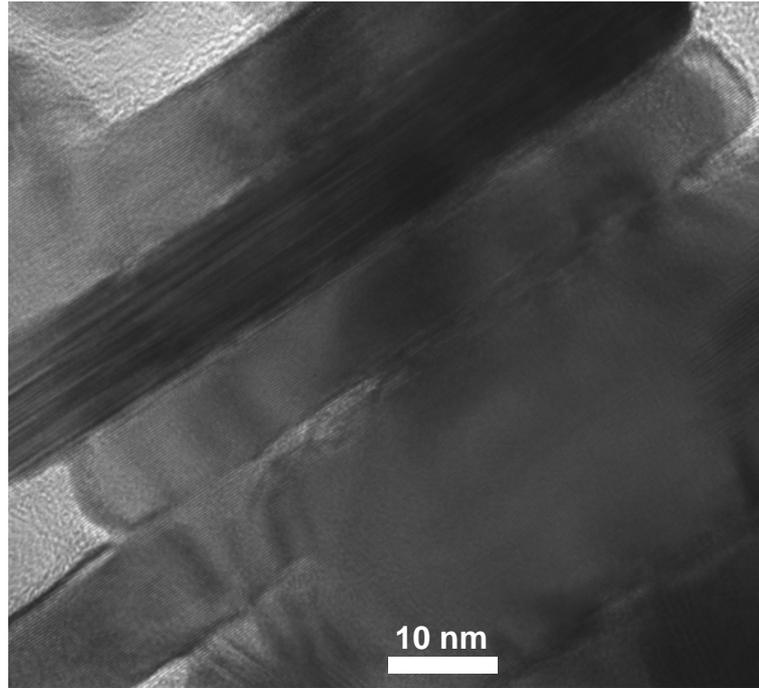


Figure 2S. A High-resolution TEM image of stacks of Au@Ag nanoprisms