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金纳米颗粒在不同包裹介质中的超快等离子体动力学

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Effect of Surrounding Media on Ultrafast Plasmon Dynamics of Gold Nanoparticles

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Sample preparation

Synthesis of Au nanoparticles (NPs) Au NPs were synthesized through a seed-mediated growth. First, a mixture solution of 7.5 mL 0.1 M CTAB and 250 μL 10 mM $HAuCl_4$ was diluted to be 9.4 mL by adding water. Then, 0.6 mL ice-cold 10 mM $NaBH_4$ was added into the mixture solution under continuously stirring for 3 min. The seed solution was kept undisturbed at room temperature for 2 h prior to use. The growth solution was prepared by mixing 100 mL 0.1 M CTAB, 2 mL 0.024 M $HAuCl_4$, 2 mL 0.5 M H_2SO_4, 0.1 mL 10 mM $AgNO_3$, and 550μL AA (0.1 M). Then, 2.4 mL seed solution was added to the above growth solution to initiate the growth of the Au NS for 12 h. Next, 0.25 mL 0.1 M AA was added. After 2 h, the Au NPs were purified by centrifugation.

Synthesis of Au/PSS core/shell nanocomposites In a 30 °C water bath, 10 mL Au NPs, which synthesized through a way of a seed-mediated growth, was added into the mixture solution of 0.5 mL 2 mg/mL PSS and 60 mM NaCl for at least 3 h. Then the solution were purified by centrifugation for several times and re-dispersed in 200 μL water for further use.

Synthesis of Au/SiO_2 core/shell nanocomposites[S1] A certain amount of Au NPs, which synthesized through a way of a seed-mediated growth, was added into 20 mL 2-propanol. Then 0.5 mL NH_3•H_2O was added into the solution working as a catalyst. At last, a requirement amount of TEOs is mixed with the mixture for 1 h at room temperature under continuous stirring. Then the solution were purified by centrifugation for several times and re-dispersed in a certain amount of water for further use.

Synthesis of Au/TiO_2 core/shell nanocomposites 1.1 mL 1 M $NaHCO_3$ was added into the mixture solution of 6.0 mL H_2O, 200 μL $TiCl_3$ (17.1 wt%, containing 20%–30% HCl). Then 200 μL Au/PSS core/shell NPs was added into the mixture solution and kept for 30 min at room temperature to get Au/TiO_2 core/shell nanocomposites. Then the solution were purified by centrifugation for several times and re-dispersed in 5 mL water for further use.

Synthesis of Au/Cu_2O core/shell nanocomposites[S2] Au NPs were prepared by citrate reduction. In a 100 °C oil bath, 7.5 mL 0.1 M sodium citrate solution was mixed with 150 mL 0.25 mM $HAuCl_4$ under continuously stirring for 30 minutes. After finishing the reaction, the solution was natural cooling to room temperature. The Au NPs were purified by centrifugation for several times before use. Then, 0.5 g PVP was mixed with 50 mL 0.005 M $Cu(NO_3)_2$ under constant stirring until the PVP was completely dissolved at room temperature. Next, a required amount of Au NPs was added into the mixture solution and ~13 μL 35 wt% N_2H_4•H_2O was added into the mixture immediately. After 2 min, the solution were purified by centrifugation immediately and re-dispersed in a certain amount of ethanol for further use.

References

[S1] Lu Y.; Yin Y.; Li Z.; Xia Y. *Nano Lett.* **2002**, *2*, 785.

[S2] Zhang, L.; Blom, D. A.; Wang, H. *Chem. Mater.* **2011**, *23*, 4587.

Additional figures

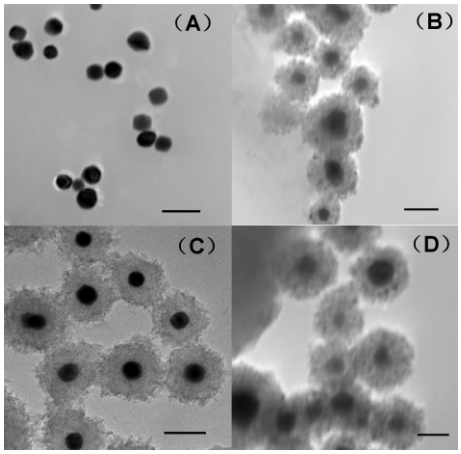

Fig.S1 TEM images of Au/PSS (A), Au/SiO_2 (B), Au/TiO_2 (C), and Au/Cu_2O (D) core/shell nanocomposites. The scale bar is 100 nm.