A General Strategy for the Production of Complex Hollow Gold Nanocrystals

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Hollow gold nanocrystals have received great interest due to their unique properties and applications in sensor devices [1], plasmonics [2], catalysis [1], and surface enhanced Raman spectroscopy (SERS) among others. Herein we report a rapid and general method for the production of partially hollowed multi-domain Au/Ag nanotubes, Au nanotubes, hollow Au nanorods, single and double walled Au nanoboxes, and heterodimer hollow Au/CeO₂ (see Figure 1) via simple galvanic replacement reaction at room temperature of the respective Ag template. The precise control of the final morphology of the nanostructure was achieved by adjusting the reactivity of the noble metal salts, using different capping or complexing agents such as cetyltrimethylammonium bromide (CTAB), cetyltrimethylammonium bromide (CTAC) or polyvinylpyrrolidone (PVP) and ascorbic acid as co-reducing agent [3]. Obtained structures were characterized by the combination of transmission electron microscopy (TEM), scanning electron microscopy (SEM), scanning transmission electron microscopy (STEM), energy dispersive x-ray spectroscopy (EDS). This technique is facile, rapid and versatile, and most importantly, allows to engineer highly sophisticated hollow nanomaterials with accessible surfaces.

Figure 1. Electron microscope images of different hollow gold nanocrystals.

References

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