Localized Surface Plasmon Resonance of 'Normal' and 'Inverted' Core-Shell Nanostructures

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Abstract

The bimetallic core-shell nanoparticles are of greater interest than the monometallic ones from both technological and scientific points of view and this can be well-attributed to the fact that in such bimetallic nanoparticles, one of the metals (the shell) determines the surface properties while the specific functional properties (optical, catalytic, magnetic, etc.) of the system may be characterized by the other metal (the core). These physical and chemical properties of core-shell nanoparticles strongly depend on the structure of the core, the shell and the interface. The properties can also be modified by changing the constituent materials or the core-to-shell ratio. Such core-shell particles have a varied number of applications, such as, in drug-delivery, providing chemical stability to colloids, enhancing luminescence properties.

In this work, we have focused on the synthesis of 'normal' and 'inverted' gold-silver core-shell nanostructures following the method of Pal group. The 'normal' and 'inverted' core-shell so formed was characterized using transmission electron microscopy and UV-visible spectroscopic techniques. Then, we have simulated the electric field generated using finite element method (FEM) and discrete dipole approximation (DDA) method and validated the experimental results with theoretical calculations.

Figures used in the abstract

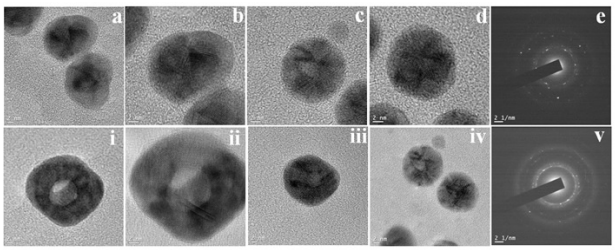

Figure 1: TEM image of core-shell of different shell thickness.

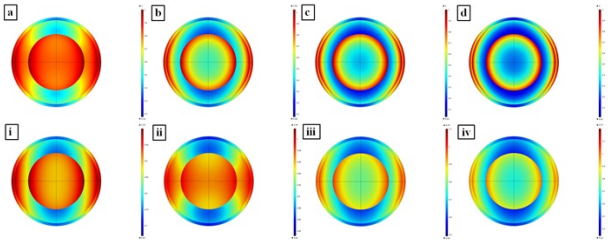

Figure 2. FEM simulation of core-shell of different shell thickness

Figure 1