

Nanoparticle-Based System of Gold Nanoshells and Silver Sulfide Quantum Dots for Enhancing Optical Response

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We aimed to develop a hybrid nanostructure with unconventional optical properties. Hence, we chose gold nanoshells as a base due to their intriguing optical characteristics, particularly their band extinction position in the near-infrared (NIR) range, and their dual contribution to absorption and scattering in the extinction spectrum. In our experiment, we utilized gold nanoshells fabricated onto a silica sphere with a diameter of 120 nm. These nanoshells were meticulously coated with a few nanometers-thick layer of gold. However, to prevent direct adsorption of the fluorescent label onto the metallic surface, it's advisable to incorporate a spacer layer. This may involve a layer of PEG-SH [1] or silica [2]. We opted for the latter due to its relatively easy thickness control, durability, and potential for subsequent surface modifications. In the subsequent step, silver sulfide quantum dots [3] were attached to this structure (Fig.1). This hybrid system exhibits strong mutual interactions, thereby enhancing both linear and nonlinear optical responses.

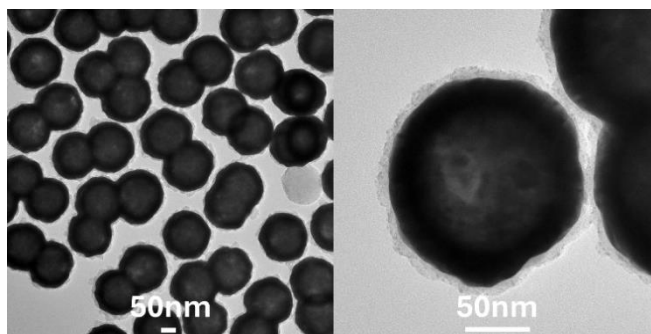


Fig.1 TEM images of gold nanoshells with a silica layer and attached silver sulfide quantum dots.

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