Control of optical properties of hollow gold nanoparticles by manipulation of their size and shell thickness

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We have synthesized hollow gold nanoparticles using galvanic replacement reaction. For the preparation of hollow gold nanoparticles, silver nanoparticles were synthesized by citrate reduction method. Then, aqueous HAuCl4 solution was added to synthesize hollow gold nanoparticles. Because the standard reduction potential of AuCl4-/Au is higher than that of Ag+/Ag, hollow gold nanoparticles can be synthesized. Shell thickness of hollow gold nanoparticles could be tuned by control of aqueous HAuCl4 solution amount. To characterize hollow gold nanoparticles, we used the UV-vis absorption spectroscopy, TEM, quasi-elastic light scattering (QELS) and zeta potential measurement. Our results indicate that increase of shell thickness of hollow gold nanoparticles induce the red-shift of absorption wavelength to near-IR region. This suggests that optical properties of hollow gold nanoparticles can be controlled by the manipulation of their shell thickness.