

Silver nanodecahedron based core-shell nanoparticles as surface enhanced Raman Scattering (SERS) tags for labeling biomolecules

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Here we report a core-shell plasmonic nanoparticle (NP) design based on silver nanodecahedrons (Ag NDs). We have developed a new photo-assisted synthesis process to prepared the Ag NDs and a self-assembly procedure to coat the Ag NDs with a uniform layer of silica in which Raman tags may be incorporated. This core-shell Ag nano-composite exhibits strong surface enhanced Raman scattering (SERS) because of its localized surface plasmon resonance (LSPR). A unique property offered by the Ag NDs is their widely tunable LSPR peak between 420 - 660 nm. Until now, there are very few reported cases of Ag nanoparticles that exhibit LSPR in the RED region since the natural plasmonic resonance of Ag occurs in the UV-blue region. This has led to problems with most Raman-active tags as they only produce transition-enhanced Raman signal in the RED-GREEN region. The core-shell design also ensures that the Ag nano-particles are completely protected against degradation due to oxidation. As a result of the reported core-shell Ag NDs, the use of Raman tags for labeling biomolecules now has a much better prospect. Raman-based labeling is known to be a better choice than the common fluorescence approach because of the wide spectral diversity offered by Raman tags. In addition, field enhancement due to LSPR in the core-shell Ag NDs may lead to a variety of applications including non-linear harmonics generation, photo-induced reaction with long wavelength radiation and fluorescence enhancement.

Biography

Ho-Pui Ho received his Ph.D. in Electrical and Electronic Engineering from the University of Nottingham in 1990. He is currently a Professor in the Department of Electronic Engineering, Chinese University of Hong Kong. His interests covers nano-sized semiconductor materials for photonic and sensor applications, optical instrumentation, photonic biosensors based on the surface plasmon resonance effect and biophotonics. He has published over 230 journal/conference/book chapter articles and 5 US patents. He is a fellow of the Hong Kong Institute of Engineers.