Anisotropic Core/Satellite Au Nanoassembly for SERS Application

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Au nanoparticles (NPs) are versatile building blocks for self-assembled colloidal superstructures with tailored optical properties via hybridization of plasmon modes [1, 2]. Colloidal plasmonic Au nanoassemblies of a larger core NP with a monolayer of smaller NPs are commonly referred to as core/satellite superstructures, which could offer a tighter control over hot-spot formation by inter-particle coupling. The hierarchical multi-particle architectures are capable to localize the incident light at the nanoscale yielding highly confined electric fields for surface-enhanced Raman spectroscopy (SERS) [3]. However, the coupled modes of isotropic core/satellite structures, composed of spherical NPs, are limited to the visible range and become more and more radiative with increasing size. This issue could be avoided by breaking the symmetry. An anisotropic particle, like Au nanorod, should allow red-shifting the coupling mode into the NIR range. Here we present anisotropic core/satellite Au nanoassembly consisting of a nanorod core decorated with spherical satellite NPs. Our results show the origin of the coupled modes to provide insight into the plasmonic coupling phenomena for high SERS brightness by near infrared illumination (Fig. 1).

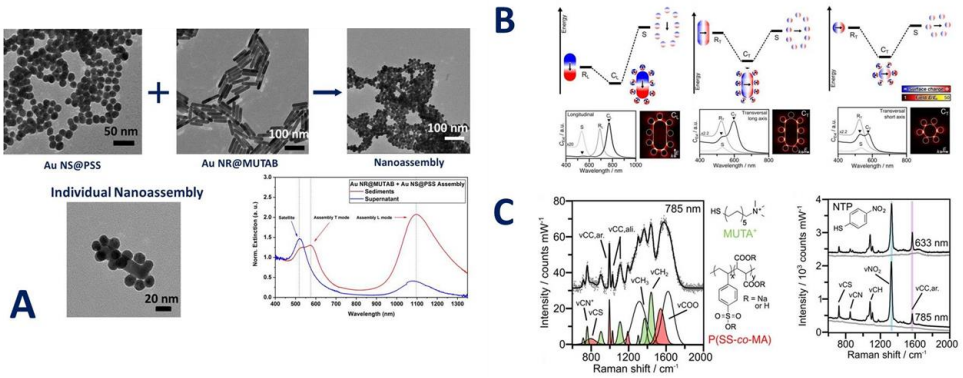

Figure 1. (A) TEM and UV-Vis of anisotropic core/satellite Au nanoassemblies. (B) Plasmonic couplings and surface charge density distributions of individual Au nanoassembly. (C) SERS spectra of Au nanoassemblies upon excitation at 633 nm and 785 nm.

[1] J. A. Fan et al., *Science* **328** (2010), 1135.
[2] E. Prodan et al., *Science* **302** (2003), 419.
[3] R. Höller et al., *ACS Nano* **10** (2016), 5740.

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