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Gold Nanostars–Satellite Nanolabels for Surface-Enhanced Raman Spectroscopy

The design of plasmonic nanostructures with strong electromagnetic field localization is vital for surface-enhanced Raman spectroscopy (SERS) applications. Anisotropic nanoparticles with sharp features — such as nanostars or pyramids — offer superior near-field enhancement through the "tip effect." Additional signal amplification arises in interparticle junctions ("hot spots") via the "gap effect".[1]
We present a SERS nanolabel design based on gold nanostars–satellite clusters, incorporating Raman reporter molecules via diffusion and encapsulated in a polyelectrolyte shell as depicted in Figure 1. This configuration combines tip and gap enhancements within a single structure, achieving strong signal amplification. The encapsulation eliminates the need for covalent attachment, allowing multilayer reporter loading and further increasing SERS intensity. This approach enables the development of robust, tunable, and highly sensitive SERS nanolabels for analytical and biomedical applications, e.g., in lateral flow tests.

References

[1] Shiohara, A., Novikov, S. M., Solís, D. M., Taboada, J. M., Obelleiro, F., Liz-Marzán, L. M., J. Phys. Chem. C, 119 (2015), 10836–10843.

Figures

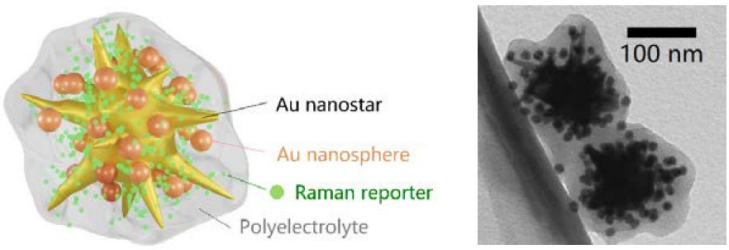

Figure 1: Visualization of the core-satellite system.