Assembly of Janus gold-silica plasmonic particles

U. Martino1*, S. Lau-Truong1, N. Félidj1, L. Boubekeur-Lecaque1

(1) Laboratoire ITODYS UMR 7086, Université Paris Diderot, Sorbonne Paris Cité, 15 rue J-A de Baïf, 75205 Paris Cedex 13, France

As researchers began to investigate the Surface enhanced Raman scattering (SERS) effect using colloidal nanoparticles (NPs), it soon became apparent that the extremely intense SERS signals originate mainly from aggregated NPs.[1]

Our group reported on a simple and efficient strategy to assemble gold nanorods (AuNRs) into long-term stable dimers. [2] Both experimental (SERS) and theoretical (DDA calculations) studies of the near-field characteristics revealed two-orders of magnitude increase of the SERS enhancement factor for the dimers as compared to isolated AuNRs. [3] The removal of isolated AuNRs (unavoidable by-products) from aggregates is particularly desirable given that AuNRs dimers have been clearly shown to provide much higher enhancement. However, important issues related to the purification of the final colloidal assembly containing AuNRs dimers and monomers remain unresolved for solution-based SERS. In this work, a bottom-up approach has been adopted for addressing these critical issues in solution-based SERS experiments and advancing the search for an optimal SERS substrate.

The control of the number of AuNRs involved in each cluster and their relative arrangement would rely on the partial and regioselective coating of GNRs tips with a mesoporous silica layer (Au@SiO2 Janus nanorods). We explored different synthetic strategies to obtain anisotropic Janus particles which are the building blocks for assembly. Besides thermal and colloidal stability, mesoporous silica coating of nanoparticles imparts other notable advantages due to its porosity which can be exploited for drug or dye loading.

References


Corresponding author email: martino.umberto@etu.univ-paris-diderot.fr