Colloidal Gold Nanostructures for Plasmonics

Sylvie Marguet, Mohammad Khaywah, Jérôme Caron, Aurélie Habert

Colloidal Gold Nanostructures for Plasmonics

Sylvie Marguet*, Mohammad Khaywah, Jérôme Caron, Aurélie Habert,
sylvie.marguet@cea.fr

NIMBE, CEA, CNRS, Université Paris-Saclay, CEA Saclay 91191 Gif-sur-Yvette, France

Abstract:

Gold nanoparticles (Au-NPs) of high crystalline quality can now be readily synthesized in large quantities thanks to significant advances in colloidal chemistry over the past decade. Assembly of such NPs leads to the appearance of new properties, still relatively poorly explored, and is therefore particularly promising for production of cost-effective devices.

Our research activities concentrate on the synthesis and assembly of gold NPs and aims at providing appropriate materials for researchers working in the various fields of plasmonics[1,2,3].

Over the past years, we have been developed an expertise in the synthesis of NPs with tunable sizes and shapes, such as spheres, rods, octahedra, cubes, triangles and also microparticles. Some of them are very promising and produced only in very few laboratories worlwide, especially in Asia. For example, thick triangles are of particular interest for ultrasensitive sensing and can assemble in the edge-to-edge fashion or through face to face interactions (fig.). Microplatelets (hexagonal or triangular) are very attractive due to their large atomically flat facets and can form ordered 1D-columnar aggregates. In the literature, 3D-arrays of NPs are currently related to SERS applications.

Here, we report the spontaneous self-assembly of gold NPs by simply evaporating concentrated solutions on non-patterned substrates. The degree of reproducibility of this method, the maximum size of the perfectly organized area and the key parameters related to a controlled-deposition are presented. We are looking for collaborations to study the properties of these unusual assemblies.

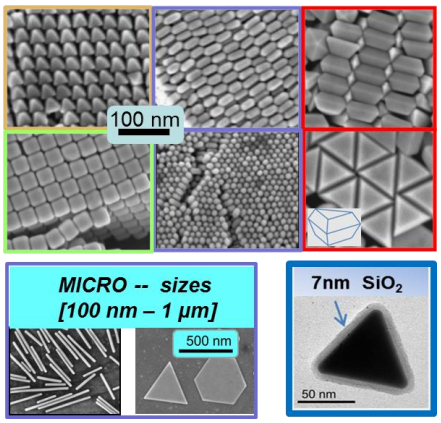

Figure 1: illustration of some of the monodisperse gold particles (nano- and micro-) and gold hybrids (Au@SiO2) that have been synthesized, with tunable sizes and thicknesses.

References:

(1) E. Le Moal et al. (2013) "An electrically excited nanoscale light source with active angular control of the emitted light," *Nano Lett.* 13, 4198-4205

(2) M. Haggui et al. (2012) "Spatial Confinement of Electromagnetic Hot and Cold Spots in Gold Nanocubes", *ACS Nano.* 6(2) , 1299-1307

(3) C. Deeb et al. (2012) ""Mapping the Electromagnetic Near-Field Enhancements of Gold Nanocubes" *J. Phys. Chem. C*, 24734-24740