



HAL
open science

Colloidal Gold Nanostructures for Plasmonics

Sylvie Marguet, Mohammad Khaywah, Jérôme Caron, Aurélie Habert

► **To cite this version:**

Sylvie Marguet, Mohammad Khaywah, Jérôme Caron, Aurélie Habert. Colloidal Gold Nanostructures for Plasmonics. International Conference on Energy, Materials and Photonics (EMP-16), Jul 2016, Troyes, France. cea-02327837

HAL Id: cea-02327837

<https://cea.hal.science/cea-02327837>

Submitted on 23 Oct 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

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 micro-particles. Some of them are very promising and produced only in very few laboratories worldwide, 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.

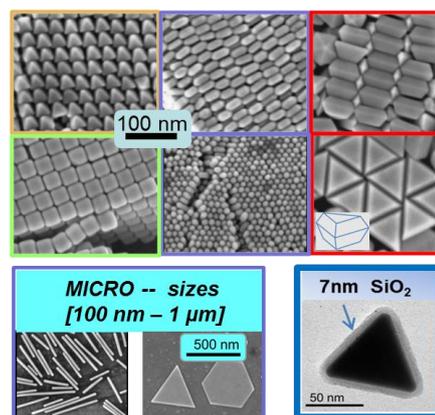


Figure 1: illustration of some of the monodisperse gold particles (nano- and micro-) and gold hybrids (Au@SiO₂) that have been synthesized, with tunable sizes and thicknesses.

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