



Gold Nanoparticles for Plasmonics and Medicine

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► To cite this version:

Sylvie Marguet, Khaywah Mohammad, Caron Jérôme, Habert Aurélie. Gold Nanoparticles for Plasmonics and Medicine. 15th international conference of Near-field Optics and Nanophotonics (NFO-15), Aug 2018, Troyes, France. cea-02327829

HAL Id: cea-02327829

<https://cea.hal.science/cea-02327829>

Submitted on 23 Oct 2019

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Gold Nanoparticles for Plasmonics and Medicine

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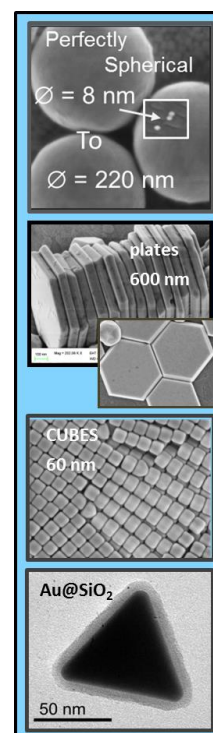
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Gold nanoparticles (NPs) can behave as **nanosources of light, heat and hot carriers**. They have a high potential as contrast agents for several bioimaging modalities such as computed tomography, photoacoustic imaging, dark field scattering, multi-photon luminescence, high frequency ultrasound, quantitative phase contrast. New therapies and surgeries will develop because these NPs are able to generate Reactive Oxygen Species (ROS).

Our research activities concentrate on the **synthesis and assembly** of high quality gold NPs of various sizes and shapes to provide suitable materials for research in the fields of **plasmonics** ⁽¹⁻⁷⁾, **plasmon-driven chemistry, sensing and medicine**. Some of them are very promising and **produced only in very few laboratories worldwide**. For example: Perfect spheres and cubes on top of an Au-film are used for different types of microscopy within the gap. Triangular-NPs are sensitive biosensors and promising for photoacoustic imaging. Plates (hexagonal, triangular or disk-like) can spontaneously self-assemble in ordered 1D-columnar aggregates or 2D-metasurfaces. The large atomically flat facets of plates are promising for (F.I.B.) fabrication of monocrystalline pattern, not otherwise accessible.

Hot-spots are prepared in our lab through **spontaneous** self-assembly. 3D-assembly is obtained by simply evaporating concentrated solutions on non-patterned substrates. We are currently working on 2D assembly.

In the future, we would like to extend the applications of these NPs to **medicine** through collaborations with biochemists, biophysicists or physicians. As a first step towards this objective, we produce Au@SiO₂ core-shell with a thin silica coating while waiting for precise specifications.



Acknowledgements: this work is financially supported by Plan Cancer (HEPPROS project)

References (past and current collaborations):

- 1- Near-Field Localization of Single Au Cubes, a Predictive Group Theory Scheme. [Mitiche et al. J.Phys.Chem.C-2017](#)
- 2- Fano Transparency in Rounded Nanocube Dimers Induced by Gap Plasmon Coupling. [Pellarin et al. ACSnano-2016](#)
- 3- Two-photon luminescence of single colloidal gold nanorods: revealing the origin of plasmon relaxation in small nanocrystals. [Molinaro et al. JPCC-2016](#)
- 4- Engineering the emission of light from a scanning tunneling microscope using the plasmonic modes of a nanoparticle. [Le Moal et al. Phys.Rev.B-2016](#)
- 5- An Electrically Excited Nanoscale Light Source with Active Angular Control of the Emitted Light. [Le Moal et al. Nano Letters-2013](#)
- 6- Mapping the Electromagnetic Near-Field Enhancements of Gold Nanocubes. [Deeb et al. J.Phys.Chem.C-2012](#)
- 7- Spatial Confinement of Electromagnetic Hot and Cold Spots in Gold Nanocubes. [Haggui et al. ACS Nano-2012](#)

