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Sylvie Marguet, Khaywah Mohammad, Caron Jérôme, Habert Aurélie

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Gold Nanoparticles for Plasmonics and Medicine

*MARGUET Sylvie**, KHAYWAH Mohammad, CARON Jérôme, HABERT Aurélie

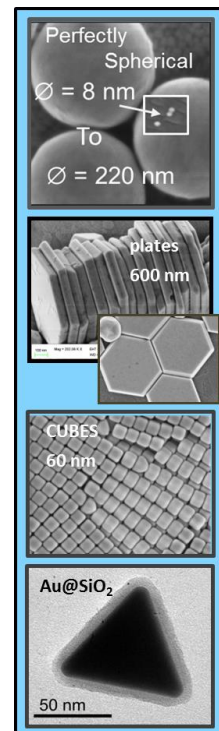
NIMBE, CEA, CNRS, Université Paris-Saclay, CEA Saclay 91191 Gif-sur-Yvette, France
*sylvie.marguet@cea.fr

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.



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