Gold nanoparticles for plasmonics and medicine

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TITLE : GOLD NANOPARTICLES FOR PLASMONICS AND MEDICINE

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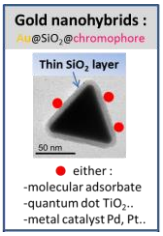
Abstract

The excitation of the plasmon resonance of a **gold nanoparticle (NP)** generates very intense electromagnetic fields, which can be used to enhance or initiate a photochemical reaction in a nearby "chromophore"(see fig.). Gold nano hybrids can behave as nanosources of LIGHT, HEAT and CHARGE CARRIERS depending on the mode of irradiation (continuous or pulsed), the nature of the environment (molecular adsorbate or semiconductor) and the morphology of the gold NP.

Our research activities concentrate on the **synthesis** and **self-assembly** of high quality gold NPs, e.g. perfect spheres, cubes, triangular-shapes, ultra-small rods, wires, octahedra, nanodisks and microplates (hexagonal, triangular) with sharp tips. Hot-spots are prepared through spontaneous self-assembly. These nanostructures are studied in collaboration with teams of experts [1-8] in order to understand the role of the morphology and of the assembly upon these three properties: sources of light/ heat/ hot charge carriers.



We wish to **expand their application to medicine** through new expected collaborations.

New therapies and surgeries will develop because gold NPs are able to generate Reactive Oxygen Species (1O2, OH°, O2°-, H_2O_2..) and Heat. They are excellent contrast agents for several bioimaging modalities such as photoacoustic imaging, dark field scattering, multi-photon luminescence… The recent discovery of a third and fourth biological transparency windows centered respectively at around 1.8 µm and 2.2 µm and the recent commercialization of new NIR-lasers make gold-nanoplates attractive for biomedicine in this still unexplored spectral domain.

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

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