Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars)

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition : 4 /10 /2013

Responsable du stage / *internship supervisor*:

Nom / *name*:	Borensztein	Prénom/ *first name* :	Yves
Tél :	01 44 27 61 55	Fax :	
Courriel / *mail*:	yves.borensztein@insp.jussieu.fr		

Nom du Laboratoire / *laboratory name*: Institut des NanoSciences de Paris

Code d'identification : UMR7588 Organisme : CNRS - Univ.PM. Curie (Paris6)

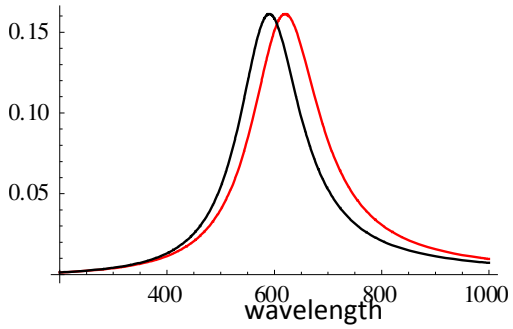
Site Internet / *web site*: http://www.insp.jussieu.fr/yves-borensztein.html

Adresse / *address:* 4 place Jussieu 75005 Paris

Lieu du stage / *internship place*: Tour 22 -12, 4e étage

Titre du stage / *internship title*: **Development and study of plasmonic sensors**

Résumé / *summary*



Au metallic nanoparticles display particular optical properties, related to the surface plasmon resonances, which are collective oscillations of the conduction electrons, confined within the particles. The plasmon resonance for Au is located in the visible optical range, and gives a red or a violet color to the Au nanoparticles. Such plasmon resonance is very much sensitive to the immediate environment of the particles, and can change strongly when the particles interact with molecules or ions [1,2]. Thanks to this high sensitivity, biologic or gas sensors, based on Au or Au alloys nanoparticles, are being developed nowadays [3].

The aim of the project is to elaborate anisotropic arrays of Au nanoparticles, and to investigate the change of their plasmon resonances upon adsorption of gas or biological molecules, by mean of an ultra-sensitive optical technique which has been developed in the laboratory, the Reflectance Anisotropy Spectroscopy (RAS).

Due to the anisotropy of the array (e.g. rectangular ordering), the sample will display two distinct plasmon resonances shifted in wavelength, one with respect to the other one, that will be clearly observed by RAS (see figure).

The first part of the work will be the elaboration of the samples, the experimental investigation and the modeling of their optical properties, taking into account the interaction of the plasmon resonances located on the neighbor particles.

In a second time, the samples will be exposed to reactive gases and to reactive molecules in a controlled way. The modifications of the plasmon resonances will inform on the amount of adsorbed molecules and will show the ability of such systems for acting as sensitive and quantitative sensors.

1. Monitoring of the Plasmon Resonance of Gold Nanoparticles under Oxidative and Reducing Atmospheres, Y. Borensztein et al J. Phys. Chem. C ***114****, 9008 (2010)*

2. Kinetics of the plasmon optical response of Au nanoparticles/TiO_2 catalyst Y. Borensztein et al, Eur. Phys. J. D ***63****, 235 (2011)*

3. Biosensing with plasmonic nanosensors, J.N. Anker et al, Nature Materials, 7, 442 (2008)

Ce stage pourra-t-il se prolonger en thèse ? *Possibility of a PhD* **? : Oui**

Si oui, financement de thèse envisagé/ *financial support for the PhD*: **Ecole doctorale**

Lasers, Optique, Matière	**x**	Lumière, Matière : Mesures Extrêmes	**x**
Plasmas : de l'espace au laboratoire			

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