Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars 2012)

Proposition de stage pour l'année 2011-2012 (ne pas dépasser 1 page)

Date de la proposition :

Responsable du stage / *internship supervisor*:
Nom / *name*: Margueritat — Prénom/ *first name* : Jérémie
Tél :0472448337 — Fax :
Courriel / *mail*: jeremie.margueritat@univ-lyon1.fr

Nom du Laboratoire / *laboratory name*: LPCML
Code d'identification : UMR CNRS 5620 — Organisme : Université Claude Bernard Lyon1
Site Internet / *web site*: http://pcml.univ-lyon1.fr/
Adresse / *address:* Bat A.Kastler, 10 rue Ampère
69622 Villeurbanne cedex, France
Lieu du stage / *internship place*: LPCML, Lyon

Titre du stage / internship title: "Low Frequency" Surface Enhanced Raman Scattering (LF-SERS) of Polystyrene Nanoparticles using photonic crystals

Résumé / *summary :*

Surface Enhanced Raman Scattering (SERS) was discovered in 1974 when Fleischman and co-workers deposited pyridine on a roughened silver electrode. The geometry of the silver surface generates at some points huge enhancement of the electromagnetic field, then the Raman signal of the pyridine molecules staying at these places was also enhanced. This technique has been widely explored and actually allows studying single molecules. However this technique is limited to the study of the optical vibration modes (from 200 cm-1 to 3000 cm-1) from molecules (often biological molecules).

The aim of this work is to transpose this SERS method to the study of acoustic vibrations confined in nanoparticles (from 50 to 300 nm). These vibrations are observed in polystyrene nanoparticles (Fig.) and are characteristic of their size and shape. Nevertheless to observe such vibrations it is necessary to have lot of material (i.e. lots of nanoparticles under the laser spot) and long acquisition times. To circumvent this problem it is thus necessary to enhance the signal. In this perspective we would like to use the properties of photonic crystals (Fig.) to enhance the LF-SERS of polystyrene nanoparticles.

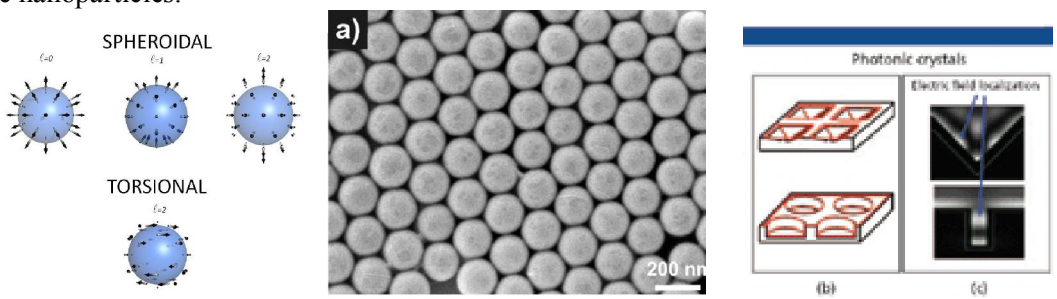

Fig.:Left. *Vibrational modes of Nps.* ***a.*** *Self-organized polystyrene NPs.* ***b.*** *Example of photonic crystal geometries and* ***c.*** *the electric field localization in both cases.*

In a first step, the student will learn laser spectroscopy technique (Raman, inelastic lihght scattering). Moreover this work is at the interface between many different physical concepts such as electromagnetic enhancement, Plasmon, Purcell effect, acoustic vibrations,etc... Although mainly experimental, a theoretical approach would be interesting to determine the ideal structure of the photonic crystal to maximize the enhancement of polystyrene nanoparticles. The work proposed could be continued as a PhD in our team.

Toutes les rubriques ci-dessous doivent obligatoirement être remplies

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

Si oui, financement de thèse envisagé/ *financial support for the PhD***: contrat doctoral MESR**

Lasers et matière		Lumière, Matière : Mesures Extrêmes	
Optique de la science à la technologie		Plasmas : de l'espace au laboratoire	

Fiche à transmettre (fichier pdf ***obligatoirement****) sur le site http://stages.master-omp.fr*