Spécialité de Master « Optique, Matière, Paris »

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

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition : 28 October 2018

Responsable du stage / *internship supervisor*:

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Nom du Laboratoire / *laboratory name*:

Code d'identification : UMR7647 - LPICM Organisme : Ecole Polytechnique - CNRS

Site Internet / *web site*: https://portail.polytechnique.edu/lpicm/en

Adresse / *address:* Ecole Polytechnique, Route de Saclay, 91128 Palaiseau

Lieu du stage / *internship place*: Ecole Polytechnique, Route de Saclay, 91128 Palaiseau

Titre du stage / *internship title*: Plasmonic Nano-Structures for Raman Spectoscopy Imaging

Résumé / *summary*

Tip-enhanced Raman spectroscopy (TERS) is often described as the most powerful tool for optical characterization of surfaces and their proximities. It combines the intrinsic spatial resolution of scanning probe techniques (AFM or STM) with the chemical information content of vibrational Raman spectroscopy. Capable to reveal surface heterogeneity at the nanoscale, TERS is currently playing a fundamental role in the understanding of interfacial physicochemical processes in key areas of science and technology such as chemistry, biology and material science. Unfortunately, the undeniable potential of TERS is, nowadays, limited to air and vacuum environments, with it failing to operate in a reliable and systematic manner in liquid.

At the Laboratory of Physics of Interfaces and Thin Films (LPICM) at École Polytechnique we are developing a new generation of Tip Enhanced Raman Spectroscopy (TERS) microscope capable to operate in liquid environments. The approach for TERS in liquids is founded on the employment of pipet-based scanning probe microscopy techniques (pb-SPM) as an alternative to AFM and STM. This ambitious multidisciplinary research project spans several disciplines such as physics, chemistry, photonics, engineering and nanotechnology and it is sponsored by an European Research Council Starting Grant (ERC-StG), the most prestigious funding scheme in Europe for young research groups. Taking part in one of those projects can be considered as an opportunity and highlights in any CV.

The master project will focus on the design, grow and characterisation of plasmonic nanostructures to obtain unprecedented scanning probes suitable for enhanced Raman spectroscopy imaging. The student will contribute to the development and posterior applications of this unique nanospectroscopy imaging instrument employing the developed probes in relevant fields of science and technology where the presence of aqueous media is fundamental, such as biology, electrochemistry, crystal growth, etc. The candidate will receive support and training throughout the project in a regular basis, and have the opportunity to interact with other scientific collaborators and industrial partners (e.g. Horiba). At the end of the project, the student will become proficient in the use of key physical-chemistry concepts/techniques (e.g. electrochemistry) and nanotechnology tools such state-of-the-art microscopies of nanometric resolution, such as AFM, SEM, TEM, etc. with the opportunity to pursue his/her PhD on this topic through a fully funded scholarship.

We value extremely high self-motivation and a "can-do attitude" and initiative, independent thinking and work as a team. Due to the nature of the project, skills in experimental sciences and handling sensitive equipment are required. Excellent communication skills in fluent English are necessary as the project runs in an international environment of researchers and research engineers.

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***: ERC Starting-Grant**

Lumière, Matière, Interactions	**YES**	Lasers, Optique, Matière	**YES**

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