Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage

Date de la proposition : 29 November 2013

Responsable du stage */ internship supervisor*:

Nom / *name*:	FILLION	Prénom/ *first name* :	Jean-Hugues
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Nom du Laboratoire / *laboratory name*: LPMAA

Code d'identification : UMR 8112 Organisme : CNRS-UPMC-Observatoire de Paris

Site Internet / *web site*: http://lerma.obspm.fr/,

Adresse / *address:* 4 place Jussieu, 3, Paris 5eme

Lieu du stage / *internship place*: Campus Jussieu, Tour 32-32, 3ème étage

Titre du stage / *internship title*: Photon Stimulated Desorption

In the coldest and dense regions of the interstellar medium, almost all the molecular matter, except H_2, is expected to be entirely frozen onto dust particles. However, recent observations of cold gas in these regions cannot be explained without taking into account efficient non-thermal processes, such as desorption of particles induced by Photon Stimulated Desorption. However, laboratory data are missing in order to understand basic processes leading to the ejection of atoms and molecules after absorption of energetic UV photons, which prevent any valuable model to be developed.

In the laboratory, on can investigate this phenomenon in the Vacuum-Ultra-Violet (VUV) energy range ($\lambda <$ 200 nm) thanks to monochromatic sources, such as tunable state-of-the-art synchrotron beam line or LASER pump-probe experiments, which are relevant for simulating interstellar radiation fields. In the present case, these sources can be coupled to our ultra-vacuum chamber to investigate the effect of VUV radiation onto the surface of thin molecular ice films.

The subject of this study will be first to perform LASER experiments with the aim to characterize the quantum states of molecules that are ejected from a cold surface simulating astrophysical ices (T=10 K). The student will develop the Resonance Enhanced Multiphoton Ionisation spectroscopy (REMPI) in order to characterize the relative population of molecular excited states. The technique will be first validated in a separate vacuum chamber, using simple systems such as CO or H_2O, before being adapted in the SPICES set-up ("Surface Processes and ICES"). This set-up is equipped with a quadrupole mass spectrometer for the monitoring of the atoms and molecules escaping the surface and a Fourier-Transform Reflexion-Absorption InfraRed Spectrometer for probing the ice surface transformation. The student will be also involved in the optimization of a tripling-cell chamber in order to generate pulsed laser VUV radiation.
Depending on the timetable, an important part of the work might be devoted to a measurement campaign on the DESIRS beamline at the French synchrotron facility SOLEIL for recording photon stimulated desorption spectra using a technique that has been developed in recent years with the SPICES set-up. Interaction with researchers from the Netherlands is expected during this period. The training will be supervised by Jean-Hugues Fillion and Mathieu Bertin.

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***: MENSR**

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