Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage

Date de la proposition : MARS-JUIN/JUILLET 2014

Responsable du stage / *internship supervisor*: Luke MACALEESE, Steven DALY, Philippe DUGOURD

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Nom du Laboratoire / *laboratory name*: Institut Lumière Matière (ILM)

Code d'identification : UMR5306 CNRS+UCBL Organisme : ILM

Site Internet / *web site*: http://ilm.univ-lyon1.fr/spectrobio

Adresse / *address:* campus de la Doua, bat.KASTLER – 43, bd du 11 Novembre 1918 / 69622 Villeurbanne

Lieu du stage / *internship place*: CLEA, 5 rue de la Doua, 69100 VILLEURBANNE

Titre du stage / *internship title*: Understanding and controlling FRET energy transfer in the gas-phase

Résumé / *summary*

Located at the heart of the newly created « Cité Lyonnaise de l'Environnement et de l'Analyse », our research group focuses on experiments coupling physics tools (UV-Vis spectroscopy, lasers/OPO, pico-/nanosecond) with mass spectrometry and ion traps. This type of coupling enables fundamental studies on nano systems and molecular processes triggered by photon excitation, such as energy transfer, charge transfer, relaxation and fragmentation. An ERC grant was recently awarded to the group for the development of those couplings.

Among the molecular processes investigated, Foerster resonant energy transfer "FRET" has been recently studied in our group. FRET corresponds to the energy transfer between two chromophores. One chromophore is specifically photo-excited, but energy flows afterwards from this "donor" chromophore towards an "acceptor" chromophore. This phenomenon is attested by a decrease of the donor-specific fluorescence and simultaneous increase in acceptor-specific fluorescence. This phenomenon of course strongly depends on empirical but well defined resonance conditions. FRET has been known and used for decades in solution by biologists and biochemists in order to follow protein folding and aggregation, molecular association etc. The aim of our study is to observe and characterize this energy transfer in the gas phase. Ultimately the powerful FRET technique would be transferred to the gas phase to study conformational dynamics, thermodynamics and aggregation processes of well characterized molecular systems (prepared, then mass selected and isolated in ion traps).

A few months ago the proof of concept of gas-phase FRET detection by means of mass spectrometry was obtained in our group on small molecules trapped in a linear quadrupole ion trap. The purpose of this current training is to extend this proof to larger systems. The student will perform ion spectroscopy experiments (laser+mass spectrometry), possibly run complementary ion mobility experiments, and propose an interpretation for ion fragmentation pathways in terms of molecular folding. Molecular dynamics could be used to help interpretation for large systems.

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***: MENRT, ANR, ERC**

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

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