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 : 3/10/2011

Responsable du stage / *internship supervisor*:

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

Code d'identification : UMR 7588 — Organisme : UPMC - CNRS

Site Internet / *web site*: http://www.insp.jussieu.fr/-Agregats-et-Surfaces-sous-.html

Adresse / *address:* Tour 22-12, bureau 325, case courrier 840 ; 4, place Jussieu 75005 Paris France

Lieu du stage / *internship place*: Jussieu

Titre du stage / *internship title*: **Cluster formation dynamics probed by strong collisional perturbation.**

Résumé / *summary*

Large Van der Waals clusters are fascinating objects filling the gap between gas and solids. Their formation dynamics remains poorly known and explained. Clusters are generally produced during an adiabatic expansion of a pulsed supersonic jet. In the case of rare gas clusters, their size can easily be varied between a few atoms up to several million atoms. Our group has now a few years of experience in studying their properties and condensation dynamics associating X-ray spectroscopy techniques and time tagging and combining collision experiments with various projectiles.

- Interaction of intense IR or UV laser pulses produces very efficiently keV X-rays when interacting with clusters. Measuring time dependence of X-ray emission at a sub-microsecond scale enables to determine the time-dependant **cluster density** in the jet.
- Bombardment of clusters by keV electrons allows measuring time dependence of the total **atomic density** in the jet.
- Finally, a drastic decrease in the X-ray signal is expected (and observed) when slow highly charged ions interact with a clustered jet compared to isolated atoms and lead to the measurement of the (isolated) **unclustered atomic density**.

By exploiting the specific properties of cluster dynamics under those three types of projectiles, we have access to the temporal structure of the cluster bunch which gives rise to a direct experimental measurement of the condensation yields in cluster jets.

Complementary measurements with slow heavy ions and synchrotron radiation at SOLEIL and/or XFEL radiation at Hamburg are planned to be performed in the near future: the ratio of surface to bulk atoms can be inferred, and then the mean cluster size determined.

The internship work may correspond either to experiments at SOLEIL and/or with electrons in our laboratory. Analysis of previous results with laser pulses obtained at LUCA (Laser Ultra Court Accordable) at CEA Saclay is also needed. In case of continuation of the internship with a PhD, new experiments with laser pulses, XFEL radiation and highly charged ions will have to be performed.

Techniques utilisées : nanocluster production, X-ray and electron spectroscopy, spectra analysis ; optics and laser pulse shape

Toutes les rubriques ci-dessous doivent obligatoirement être remplies

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***: ED389**

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

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