

PhD thesis subject

Title: Irradiation of cold molecular nanosystems by (20-150keV) protons

Location : Institut de Physique Nucléaire de Lyon-Université de Lyon
Groupe IPM

Abstract:

The Institut de Physique Nucléaire de Lyon is seeking applications for a three years Ph.D studentship on the experimental investigation of ionisation-induced processes in ultra-cold mixed clusters, funded by the COLDIRR Project (ANR programme Blanc 2010)

The COLDIRR project focuses on the irradiation of mass-selected protonated cold molecular clusters by (20-150keV) protons in order to probe molecular processes subsequent to energy deposition: e.g., the out-of-equilibrium relaxation of molecular systems after irradiation. Two comparative model situations will be explored: mass-selected protonated molecular clusters isolated in the gas phase and mass-selected protonated molecular clusters embedded in cold nanodroplets.

The key idea of the COLDIRR project is to deposit a selected nanosystem onto a cold rare gas droplet prior irradiation. As the irradiation dynamics are complex processes involving several competing microscopic mechanisms, well controlled experimental conditions are advantageous for a detailed analysis of elementary mechanisms. The dynamic processes are various and may involve strong non-linear response to the energy deposition. Some molecular properties can also be drawn out from the analysis of nanosystems at ultra-cold temperature. Rare gas droplets (Argon, Helium) offer thus a remarkable opportunity to control the external conditions (temperature, orientation) under which irradiation takes place.

The scientific objective is then to observe and characterize the interaction between molecules after irradiation. The whole experimental project will be accompanied by theoretical modelling relying on state of the art calculations of embedded molecular species submitted to non linear electromagnetic perturbations.

The student will participate in the construction of a cold rare gas droplets source combined with a detection system based on time-of-flight (TOF) measurements and the “event-by-event” technique allowing statistical analysis of the experimental data.

Applicants must be graduated (or about to be) with an honours degree in Physics. Enquiries and/or applications consisting of a resume, a brief statement of research interests, and the names and addresses of at least three references (3-page limit), should be submitted to:

Michel FARIZON Dr, Univ. Pr (m.farizon@ipnl.in2p3.fr)

Hassan ABDOUL-CARIME Dr, Ass. Pr (hcarime@ipnl.in2p3.fr)

Evaluation of candidates will start immediately and continue until the position is filled.

*3 years contract, in the frame of the “Ecole doctorale PHAST de l’Université de LYON”
Ph.D studentship funded by the ANR -COLDIRR Project*

<http://www.ipnl.in2p3.fr/spip.php?rubrique62&lang=fr>