

Call for applications for a PhD position

Laboratory of Excellence PLAS@PAR

Time-resolved studies of the gold solid-liquid phase transition at the femtosecond timescale

The understanding of the phase transition occurring in metallic materials bulk and nanoparticles irradiated by femtosecond laser pulses is a hot topic under investigation since a few years. This specific interaction is characterized by its out-of-equilibrium nature in terms of temperature due to the ultrashort duration of the heating pulse. In these conditions, the laser energy is preferentially deposited on the electronic population while the atomic structure remains unperturbed. This far from equilibrium thermodynamic regime is hardly describes by theoretical models appealing for the development of experimental probing technique. In addition, the reduced size of the nanoparticles implies particular mechanisms with respect to bulk materials. Improving our understanding of this regime of interaction will be an important input on a fundamental point of view and of great importance since metals, and metallic nanoparticles are at the heart of numerous technological applications.

The proposed thesis will develop time-resolved experimental studies using x-ray photoemission electron spectroscopy (XPS) for investigating these questions. The different experiments will be based on a pump/probe experimental scheme where either solids or nanoparticles will be irradiated by a femtosecond laser pulse. The relaxation dynamics will be investigated in a time-resolved manner by an ultrashort x-ray pulse for XPS measurements of the sample valence band. In close collaboration with our theoretician partners, the models currently developed will be tested by comparing their results with the experimental measurements. The candidate will be partially involved in this theoretical part consisting in hydrodynamic, classical molecular dynamic and quantum molecular dynamic simulations.

Requirements for the candidate

The applicant should have a Master-degree in Physics. Knowledge in one of the following topics will be appreciated: atomic and/or plasmas physics, laser-matter interaction, laser technologies, surface science, nanoparticle physics, solid-state physics. The candidate can apply for a Master thesis which can be performed before the PhD on this topic.

Location and starting date

The work will take place at the INSP laboratory (UPMC, 4 Place Jussieu, 75005 Paris, France). The theoretical part of the work will take place at CEA/DAM (Bruyères-le-Chatel, France). The experiments will be performed at CELIA laboratory (Bordeaux, France), SOLEIL Synchrotron (Saint Aubin, France) and on one of the XFEL facility.

The application should be sent by e-mail to the following contacts:

dominique.vernhet@insp.jussieu.fr

anna.levy@insp.jussieu.fr

Applications should include a CV, statement of motivation, copies of degree diplomas and grades, two reference letters, and copies of any previous research-related work.

Deadline is May 31st 2016.