

Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage (**ne pas dépasser 1 page**)

Date de la proposition : 23 Octobre 2015

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Lieu du stage / internship place:	LOA à l'Ecole Polytechnique à Palaiseau	

Titre du stage / internship title:

Study of the dynamics of phase transitions using ultrafast electron diffraction

The physical and chemical properties of solid materials are intimately related to the basic dynamics of matter, in particular the dynamics of electrons and atoms in the crystal lattices. To understand the role of atomic motion in solids, it is necessary to probe the lattice on very short time scales, on the order of femtoseconds (10^{-15} sec) to picoseconds (10^{-12} s). This can be done experimentally using *time resolved electron diffraction*, a very powerful technique which allows us to "follow in real time" the motion of atoms in solids. In our group, we have recently developed a sophisticated electron diffraction experiment.

In the proposed thesis, the student will use this existing platform and will perform electron diffraction experiments in order to understand the role of the lattice dynamics in various materials. The first experiments will consist in the study of the phase transition in charge density wave materials such as TbTe_3 but also lattice distortion in misfit compounds such as LaVS_3 . In this thesis, the student will learn the technique of electron diffraction, the physics of the electron source and more importantly will focus on the solid-state physics of various materials (charge density wave systems, nanomaterials such as graphene...).

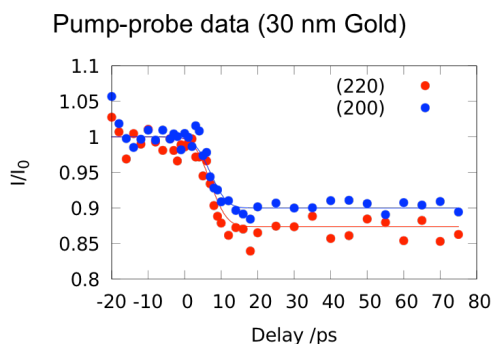
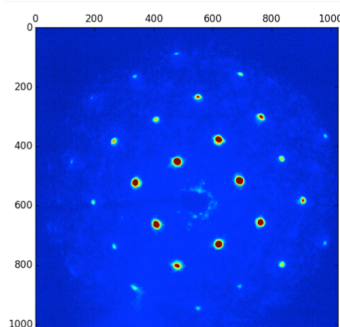


Figure 1

Left: diffraction image obtained on an ultrathin Gold film. Right: time resolved dynamics of the Bragg Peaks showing a picosecond heating of the lattice.

Required background of the student:

A background in optics, lasers and/or solid state physics is required for the proposed work.

2-3 representative publications of the group: (Related to the research topic)

J. Faure et al., Phys. Rev. B **88**, 075120 (2013). Z.-H. He et al. Appl. Phys. Lett. **102**, 064104 (2013). D.Boschetto et al., Nano Letters **13**, 4620 (2013)

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: Bourse Ecole Doctorale

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

Fiche à transmettre (fichier pdf **obligatoirement**) sur le site <http://stages.master-omp.fr>