Post-doctoral position ***Atom Probe Tomography driven by ultrashort pulses in the extreme ultraviolet (EUV)***

Spatially coherent sources of high-energy extreme-ultraviolet (EUV) photons and the tight focusing associated to the EUV beams are required for various scientific and industrial applications such as nanoscale imaging by atom probe tomography. The atom probe tomography (APT) is an advanced characterization method with very high spatial resolution that allows performing analytical imaging of materials in three dimensions at the atomic scale [Blavette1993, Gault2006]. Remarkable advances in the analysis of insulating materials were only achieved using UV laser pulses (around 340-400 nm) thanks to their high photon energy, thus paving the way for APT exploitation in new areas such as geophysics and biology. The use of EUV sources with photon energy up to 20 eV will allow the analysis of ultrawide band gap materials and will also improve the chemical composition measurements.

This project aims first to build a EUV photons source based on High Harmonic Generation (HHG) in large bandgap material (amorphous silica) using a long wavelength (mid-infrared) few-cycle (sub-30 fs) laser. Indeed, HHG in amorphous silica has already enabled the production of high photon flux at energies up to 25 eV [You2017].

The second objective will concern the coupling of the EUV source to an APT chamber to analyse wide band-gap materials in order to explore the evaporation process induced by such high energy photons and thus evaluate their potential for APT' performances improvement [Vella2013].

The generation of EUV light in large band-gap materials and its application to APT are in the focus of the ANR project (Flex-UV) that will be conducted in collaboration between the GPM group (The University of Rouen, gpm.univ-rouen.fr, the laboratory LOA (École Polytechnique https://loa.ensta-paris.fr/the-laboratory/organization/) and the laboratory Xlim (The University of Limoges : https://www.xlim.fr/)

Post-doctoral position (starting from October/November 2022)

The work consists to develop an optical bench to generate EUV pulses starting from the post-compression of sub-picosecond pulses delivered by a fiber laser and their focusing on oxide materials. After characterization, the EUV light will be coupled to the Atom Probe Tomography chamber, assuring the focusing of EUV wavelengths on the nanometric sample.

The work will be aimed at the activation and optimization of the ATP results, such as time-of-flight spectra, and the study of photo-ionization process.

The successful candidate can be specialized in physics with particular knowledge in optics, non-linear optics and laser-matter interactions. Previous experience in laser development or high harmonic generation will be highly appreciated.

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