



PhD position in optical coherent imaging / ptychography

A PhD position is available from October 2017 at Institut Fresnel, Marseille, an academic research institute of Aix-Marseille University, CNRS and Ecole Centrale, in the framework of the project 3D-BioMat funded by the European Research Council (ERC).

About ptychography

Ptychography is a microscopy technique that extracts the sample image from a series of diffraction patterns obtained by scanning the sample across the illumination beam. It is based on the use of numerical inversion algorithms, able to provide a quantitative picture of the sample (amplitude and phase). Initially developed for electron microscopy, it is nowadays widely exploited in X-rays and optics [1-2].

PhD project

Recently, our team has proposed to extend ptychography to the quantitative imaging of birefringent materials [3]. This requires the introduction of a "vectorial" formalism and of a measurement protocol that allows mapping the full set of optical parameters (retardation, axis orientation, diattenuation, etc.) of the specimen.

The goal of the proposed PhD project is to carry out the first experimental demonstrations and developments of vectorial ptychography, by

- adapting an existing optical ptychography setup to the use of polarized light (optical bench and data acquisition sequence),
- adapting existing inversion algorithms to the vectorial formalism,
- carrying out measurements on calibrated test samples, and comparing them to classical polarization microscopy,
- providing structural images of biomineral samples.

This PhD project program is a part of a 5-year research program, gathering different inversion-based x-ray and optical microscopy approaches for shedding light on the mechanisms of biomineralization.

- [1] Hruszkewycz et al., Nature Mater. (2016), DOI: 10.1038/nmat4798
- [2] Marrison et al., Sci. Rep. (2013). DOI: 10.1038/srep02369
- [3] Ferrand et al., OL (2015), DOI: 10.1364/OL.40.005144

Academic supervision

The PhD student will be supervised by Patrick Ferrand, PhD, associate professor at Aix-Marseille University, and by Virginie Chamard, PhD, CNRS senior scientist and principal investigator of the project.

Terms of employment

The position is a three-year full-time appointment under PhD student contract with the French National Centre for Scientific Research (CNRS), starting preferentially on October 2017. Net salary: approx. 1,300 €/month).

Requirements

- No condition of citizenship
- MSc degree (to be issued before October 2017) with a strong background in physics, optics and imaging
- Skills in experimental physics and computer programming

Application

Candidates are requested to submit as soon as possible

- a detailed CV
- academic transcripts
- publications (if any)
- 2 reference names

to patrick.ferrand@fresnel.fr

Selection will be based of merit and potential, measured in terms of the academic records and personal achievements. Creativity, proactivity and capacity for teamwork will also be taken into account.

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