

Postdoctoral position at CRM2 – University of Lorraine (Nancy, France)

A 24-month postdoctoral fellowship on the development and application of total scattering and X-ray absorption spectroscopy (XAS) under in situ photoirradiation is available at the University of Lorraine in Nancy.

Starting date: end of 2025/ beginning of 2026.

Context and objectives:

Light and optical technologies are increasingly central to our society in the 21st century. Optoelectronics has the potential to highly contribute to sustainability and to the energy transition thanks to renewable energy production, energy-efficient lighting, high- efficiency data communication and data storage, environmental sensing, efficient manufacturing process and efficient transportation. We aim to contribute to these challenges by investigating materials enabling better energy efficiency and device sensitivity.

The combination of photoswitches (PS) and Metal-Organic Frameworks (MOFs) results in materials with extraordinary properties [1]. Understanding interactions occurring inside such host-guest systems represents a key step to pave the way towards advanced functional materials. Since the properties of the guest molecules are determined by their structure and host/guest interactions, adapted characterization techniques are mandatory to draw a full picture of material properties as a function of structural parameters.

One of the expertise of CRM2 laboratory is the characterization of photosensitive molecules and nanoparticles by a combination of spectroscopic (such as infrared spectroscopy or NMR) and diffraction/diffusion methods [2,3,4]. Using such a complementary approach we can therefore study the effect of molecular structure on the generation and thermal relaxation of photo-induced states and thereby unravel the molecular processes at the origin of the optical properties.

The objective of the current project is to combine methods to analyse the local structure, such as XAS, with methods yielding information on larger length scales, such as total scattering with pair distribution function analysis, in order to complement the optical and NMR spectroscopic results on the photoswitchable systems and derive the structure-property relationship. For this purpose, XAS and total scattering experiments with in-situ light irradiation need to be performed, using an appropriate experimental setup available at dedicated synchrotron beamlines, in order to derive structural models and the corresponding light-induced changes with respect to the observed optical properties.

[1] Schwartz, H. A.; Ruschewitz, U.; Heinke, L. Photochem. Photobiol. Sci. 2018, 17 (7), 864–873. <https://doi.org/10.1039/C7PP00456G>

[2] Hsieh, K.-Y. Y.; Bendeif, E.-E. E.; Gansmuller, A.; Pillet, S.; Woike, T.; Schaniel, D. RSC Adv. 2013, 3 (48), 26132–26141. <https://doi.org/10.1039/c3ra45347b>.

[3] Bendeif, E.-E. E.; Gansmuller, A.; Hsieh, K.-Y. Y.; Pillet, S.; Woike, T.; Zobel, M.; Neder, R. B.; Bouazaoui, M.; El Hamzaoui, H.; Schaniel, D. RSC Adv. 2015, 5 (12), 8895–8902.

[4] Schwartz, H. A.; Schaniel, D.; Ruschewitz, U. Photochem. Photobiol. Sci. 2020, 19 (10), 1433–1441. <https://doi.org/10.1039/d0pp00267d>.

Host and research infrastructure:

This project is funded by the DYSPHOM ANR PRCI project. The postdoctoral researcher will work in the CRM2 laboratory and will be supervised by Dominik Schaniel of the CRM2 CRISP team (<https://crm2.univ-lorraine.fr/recherche/equipes/crisp/>), in the framework of a collaboration with the University of Innsbruck, and in close partnership with the CRISTAL beamline of the synchrotron SOLEIL (El-Eulmi Bendeif).

The researcher will have access to the platforms for structural (XRD, NMR, TEM, etc.) and optoelectronic (spectroscopies, microscopies, ellipsometry, calorimetry, etc.) characterization of our interdisciplinary initiative with LUE, fostering the research for sustainable solutions for the digital world. In particular, at CRM2, we have developed XRD, infrared and NMR spectroscopy with in-situ photoirradiation.

Candidate profile

We are looking for a highly motivated PhD graduate with experience in X-ray spectroscopy and/or X-ray total scattering.

Applicants should have a solid background in physics, with specific expertise in X-ray scattering and/or X-ray spectroscopy methods. Familiarity with photoswitchable systems will be considered a strong asset.

Keywords: X-ray scattering, X-ray spectroscopy, photoswitches

Post-Doc duration: initially 12 months, extendable to 24 months.

Salary (net): of the order of 2100-2700 Euros per month, depending on the researcher's experience

Application procedure

Interested candidates are invited to submit the following materials:

- A complete CV, including a list of publications
- A motivation letter
- Contact information for references (or letters of recommendation)

Applications should be sent to both:

dominik.schaniel@univ-lorraine.fr and El-Eulmi Bendeif (el-eulmi.bendeif@synchrotron-soleil.fr)

Deadline for the application: Applications will be considered until the position is filled. Interviews will start in November 2025.

Starting date of the contract: as soon as a suitable candidate is found.