

## PhD Offer (M/F) : Control of magnetoelectric lithium-based pyroxenes by single-crystal and electrochemical methods

### Context and research topic:

The **magnetoelectric effect (ME)** refers to coupling between the electric and magnetic properties of a material. ME materials are attractive platforms for studying fundamental interactions in condensed matter and have potential application in low-energy microelectronic devices. This project focuses on the preparation of ME pyroxene single crystals with composition  $\text{LiMX}_2\text{O}_6$  where  $M$  is a trivalent transition metal cation and  $X = \text{Si}$  or  $\text{Ge}$ . Single crystals are necessary to study the physical anisotropic properties of these materials in depth.

The research will primarily be carried out at **Institut Néel, Grenoble**, which possesses a large range of equipment and institutional expertise for solid-state chemistry and physics. It is equipped with state-of-the-art tools and instruments for all aspects of the project: from crystal growth, to fine structural characterization, with a brand-new single-crystal diffractometer and electron microscope, to physical properties. A significant portion of the research project will also take place at world-renowned large-scale facilities in the Grenoble area (**Institut Laue-Langevin (ILL)** for neutron diffraction and **ESRF** for synchrotron X-rays).

A further aim of the project is the control of the resulting material properties through electrochemical lithium (de)intercalation. This can be used to modify the oxidation state of the  $M$  cations, and therefore the emergent magnetoelectric properties. This original approach will primarily be carried out at **LEPMI, Grenoble** as well as through *in situ/in operando* measurements at ILL and ESRF in order to investigate the changes to the structural and physical properties.

The successful candidate can expect to work closely with experts in the synthesis and structural and physical characterisation of new solid materials and to develop competencies in a wide range of experimental techniques utilizing both laboratory instruments and large-scale central facilities. They will have the opportunity to present their work at national or international conferences and develop a strong network of collaborators.

### Host laboratory and supervision:

The project is a collaboration between **Institut Néel** (<https://neel.cnrs.fr/>) and **LEPMI** (<https://lepmi.grenoble-inp.fr/>) within the context of the **ECLIPSE project**, funded by the Labex MateriAlps. Supervisors: Dr. Fabio DENIS ROMERO (CNRS Researcher), Claire V. COLIN (MCF-HC HDR) and Renaud BOUCHET (PR).

### Application:

**Candidate profile sought:** Master's degree in Chemistry, Condensed-Matter Physics or a closely related discipline. Strong analytical and problem-solving skills. Excellent written and oral communication skills. Experience with sample preparation and characterisation (solid state chemistry, X-ray diffraction) a bonus. A passion for research and a commitment to excellence. English language proficiency required.

**Contract and remuneration:** The candidate will be employed by Grenoble INP with a fixed-term doctoral contract for a duration of 36 months.

**Thesis start date:** between 1<sup>st</sup> Oct 2024 and 15<sup>th</sup> Dec 2024.

**Application:** Please send CV, cover letter, latest transcripts, and contact details for two references to [fabio.denis-romero@neel.cnrs.fr](mailto:fabio.denis-romero@neel.cnrs.fr).