

# NÉEL INSTITUTE Grenoble

## Topic for Master 2 internship – Academic year 2024-2025

### Engineering the Next Generation of Solid-State Electrolytes

#### General Scope:

Are you interested in working in a large collaborative team to advance the design of next-generation energy storage materials? You will be based at the Institut Néel and the LEPMI laboratory within the GIANT campus of Grenoble. Your role will involve characterizing and performing electrochemical measurements on new electrolytes prepared using the niche technique of Cold Sinter Processing (CSP), a technology poised to revolutionize the autonomy and safety of electric vehicles by enabling the production of new materials and devices at low energy costs.

#### Research Topic and Facilities Available:

Currently, All Solid-State Lithium Battery (ASSLB) technology is limited by the high impedance at solid-solid interfaces, which hinders the effective transport of lithium ions. We have identified the potential of reactive CSP to expand the available phase space and enhance the properties of solid electrolyte materials, with the potential to overcome current limitations and reshape the future of ASSLB technology. The reduction in processing times and temperatures of ceramics in CSP (by up to an order of magnitude) results in a significant decrease in processing costs. Coupled with the streamlined single reaction and sintering step, the potential for scalability makes reactive CSP a promising avenue for ASSLB fabrication.

You will fabricate new electrolyte materials using CSP at the Institut Néel. You will characterize the (micro)structure of these new materials using X-ray diffraction and Scanning Electron Microscopy. Their performance in ASSLBs will be investigated through electrochemical methods under the supervision of experts at the LEPMI laboratory ([Patrice Rannou](#) and [Renaud Bouchet](#)).

You will interact with a multidisciplinary team, and the outcomes of your research will motivate further studies and grant applications by the team, including a PhD studentship.

#### Possible Collaboration and Networking:

Easy access to a wide range of structural characterization techniques at the Institut Néel will inform and expedite the synthesis work. You will establish an interdisciplinary network that brings together research activities at Néel and LEPMI, creating opportunities for pioneering science in a burgeoning field of research.

#### Possible Extension as a PhD:

An extension to a PhD is conceivable, contingent upon the student demonstrating outstanding performance and funding availability.

#### Required Skills:

- This project is suitable for students pursuing degrees in chemistry, chemical engineering, materials chemistry, and materials engineering.
- Candidates with practical experience in a chemistry laboratory will be better suited for the project.
- A hands-on attitude and good organizational skills are essential.
- Interest in researching new materials and energy storage.
- Knowledge of relevant topics (solid-state chemistry, electrochemistry) is a plus.
- Experience working in a multidisciplinary team.

**Starting Date:** Flexible, beginning 15<sup>th</sup> September 2024, or later, based on the student's availability and upon discussion.

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