

# NÉEL INSTITUTE Grenoble

## Topic for PhD Thesis – Academic year 2024-2025

### Cold Sintering Advancements for Next-Gen Solid-State Cathodes for Lithium Batteries

#### 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 SyMMES laboratory (CEA) within the GIANT campus of Grenoble. Your role will involve characterizing and performing electrochemical measurements on new cathode materials 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:

This thesis addresses the challenge of All Solid-State Lithium Batteries (ASSLBs) by developing new cathode hybrid electrodes using CSP synthesis. These electrodes, made from new nanostructured Co- and Ni-free compositions, aim to overcome ASSLB limitations and pioneer sustainable processing methods. By increasing the concentration of active ceramic material and reducing inactive polymer electrolyte, CSP enhances overall energy density. We will also assess the impact of polymer choice and sourcing on the performance of these materials, addressing battery production challenges such as cost and sustainability. With reduced sintering temperature and time, CSP offers a more cost-effective and sustainable method for scaling up ASSLB manufacturing.

This studentship leverages the expertise of Neel and SyMMES, focusing on three main areas: synthesizing new CSP-based materials (Néel), evaluating their performance in batteries (SyMMES), and advanced nanostructure characterization (Néel, SyMMES). We will use various characterization techniques, including X-ray/neutron Total and Small Angle Scattering (SAXS/SANS), complemented by 2D and 3D imaging techniques (e.g., SAXS/WAXS-CT). This comprehensive analysis is essential for understanding the relationship between processing, structure, and properties, guiding future synthesis efforts.

#### Possible Collaboration and Networking:

You will establish an interdisciplinary network that brings together research activities at Néel and SyMMES (under the supervision of [Sandrine Lyonard](#)) and [large scale facilities](#), creating opportunities for pioneering science in a burgeoning field of research.

#### Required Skills:

- This project is suitable for students pursuing undergrad/graduate/master degrees in chemistry, chemical engineering, materials chemistry, and materials engineering.
- Practical experience in a chemistry laboratory.
- Knowledge of electrochemical characterization of battery materials is desirable.
- A hands-on attitude and good organizational skills are essential.
- Interest in researching new materials and energy storage.
- Experience working in a multidisciplinary team.

**Starting Date:** Flexible based on the student's availability and upon discussion.

#### Contact:

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