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Investigation on the transport properties within solid state composite electrode

Keywords: solid-state, polymeric binder, electrochemical performance

Offer description:

Solid state batteries are attracting more and more interest, since they could solve both issues of safety and energy densities of the current Li-ion technology. The development of this new technology is relying on the choice of a solid electrolyte and lithium argyrodite, Li_6PS_5Cl (LPSCl), appears as good candidate since it has a high ionic conductivity 10^{-2}-10^{-3} S/cm, close to that of liquid electrolyte.

But replacing a liquid electrolyte by a solid one in a composite electrode made of $LiNi_{0.6}Mn_{0.2}Co_{0.2}O_2$ (NMC) and LPSCl is far from trivial. Indeed, at the interface NMC/LPSCl, chemical and mechanical changes occur during battery operation and they degrade the electrochemical performance of the cells. to buffer the mechanical issue, one solution is to use a polymer as a binder that could give a certain elasticity to the system. It should create a mechanical link between particles and helped maintain the integrity of the composite electrode and consequently the ionic and electronic transport within the electrode.

In this context, we are offering master thesis in our laboratory in the field of materials science and electrochemistry. The master thesis will focus on the implementation of a binder into the composite electrode using solvent route to address mechanical issues. The student will prepare composite electrode by playing on the type of binder (molecular weight/chemistry), the ratio of the different components in the electrode and the composite preparation (densification time/pressure). The electrochemical performance will be evaluated with a custom cell designed for solid state battery and will be measured using advanced electrochemical methods such as CV, GCPL etc... And it will be correlated with imaging techniques such as scanning electron microscopy (SEM) and chemical analysis with X-ray photoemission spectroscopy (XPS).

Location: LEPMI, Grenoble university campus, 1130 Rue de la Piscine, 38402 Saint Martin d'Hères, FRANCE

Student profile:

- Master student in Materials Science, Electrochemistry, Chemistry, or a related field.
- Knowledge in electrochemical characterization (galvanostatic cycling, EIS) or material morphology characterization
- Good experimental skills, ability to work collaboratively, curious and eager to learn, open.

This position offers an exciting opportunity to contribute to next-generation battery technology in a dynamic research environment. If you are passionate about advancing energy storage technologies and enjoy working on complex challenges, we encourage you to apply by sending your resume and cover letter to Enzo MOUREY PINEIRA (enzo.pineira@grenoble-inp.fr).

Duration: 6 months **Starting date**: February-March 2026