

LEPMI – Antenne Phelma Campus
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Master internship: Investigation of the lithium plating mechanism using a reference electrode in a Li-ion battery

Keywords: Li-ion battery, Electrochemistry, Li plating, Reference electrode

Offer description

Fast charging of electric vehicles is currently limited by the poor power properties of graphite electrodes, which can lead to the lithium plating mechanism: a parasitic reaction that irreversibly affects the battery's autonomy. Consequently, a good understanding of the onset conditions and irreversibility of Li plating are key points to improve current charging protocols without compromising battery integrity.

According to the literature, the lithium deposition mechanism is triggered when the graphite potential falls below 0 V vs. Li⁺/Li, which requires the integration of a third electrode (namely the reference electrode) to monitor the graphite potential. Additionally, high charge rates and low temperatures are favorable conditions for lithium plating whose irreversibility depends on the deposit formed (quantity, homogeneity).

This internship aims to investigate the appearance conditions of the Li plating for different experimental parameters (charging rates, temperature, etc.) and quantify its irreversibility. This study will be based on integrating a reference electrode in the battery, using a protocol set up in the LEPMI laboratory. A focus on measuring the accuracy of this reference electrode to track lithium plating will be made using complementary techniques such as electrochemical and optical characterization.

This master's internship is an opportunity to discover applied research for a commercialized technology (Li-ion battery), combining bibliographical research, experimental studies, data processing, analysis, and communication of results.

Location: LEPMI laboratory on Grenoble University campus, France

Goals

- Preparation of three-electrode pouch cells (in glovebox)
- Cells cycling and electrochemical/optical characterizations of Li plating appearance
- Quantification on Li plating irreversibility and reference electrode accuracy
- Data treatment, interpretation, and communication of results

Student profile: We are looking for a Master 1 student with a background in material science and/or chemistry. A first experience in electrochemistry/glovebox would be a plus.

Duration: 3 months

Starting date: Mai 2025

To apply to this master's thesis please send your CV to Xavier MOYNE (xavier.moyne@grenoble-inp.fr)