Press release M36

The project

The HIDDEN project aims to extend the lifespan of Li-Metal (Li°) Batteries (LMBs) by 50%, while increasing the batteries' energy density 50% above the current level achievable with Li-ion batteries (LIBs). For these goals to be achieved, HIDDEN develops self-healing thermotropic liquid crystalline (TLC) electrolytes (Thermotropic Ionic Liquid Crystals: TILCs) and piezoelectric separator technologies to prevent dendrite nucleation and growth. In order to expedite the development of new materials, the consortium uses multiscale modelling for advanced electrolyte design. Algorithms monitor the dendrite growth, allowing for the effects of the self-healing methods to be followed and triggered at the correct time, by increasing the cell temperature. In the first period of the project, the consortium focused on the development of such self-healing methods and materials, while on the second period they focused on the testing, modification and validation of the methods, as well as upscaling the production.

Project achievements

The HIDDEN consortium has focused both on upscaling the processes and developing and testing the self-healing materials simultaneously. There are two different self-healing methods in the project: the piezoelectric separator and the liquid crystalline electrolyte – both targeting to hinder the growth of dendrites in the studied LMBs.

The materials and processing of the piezoelectric separator were developed at CSEM's lab scale during the first half of the project. Based on recent measurements, the ionic conductivity was increased during cycling. Moreover, liquid crystalline electrolytes proved to be important for conductivity purposes. There was an agreement on repeating the self-healing in coin cells and pouch cells and it was suggested to focus on TILC self-healing methods rather than PVDF, since it was proven that self-healing can work with TLC. All test cells are now produced and the selection of the upscaled battery set-up is completed.

The now embedded algorithm will elaborate the input data to detect Li°-dendrite and give a different feedback response for each case. In case of the detection of dendrites, it will provide a positive feedback response that will lead to activation of the self-healing mechanism. After the treatment, the performance evaluation will run once more, to quantify the positive effect of the self-healing function. On the other

hand, in case of proper operation of the cell, the algorithm will give a negative feedback response. Additionally, porting the algorithm into Battery Management System (BMS) solution from BCP, enables the BMS to get information on dendrite detection. This way, the system will be able to activate and utilise the self-healing functionalities, to prevent the nucleation and growth of dendrite.

Consortium news

HIDDEN's M36 General Assembly was held on the 3rd and 4th of October 2023 in Grenoble, France, hosted by CNRS and University Grenoble Alpes (UGA). Partners have gone through the latest achievements and planned the final steps towards successful conclusion of project activities.

HIDDEN project took part in Battery 2030+ Annual Conference in May 2023. At the conference, Dr. Marja Vilkman, the project coordinator, presented the success stories of the HIDDEN project. The event provided an excellent opportunity to engage in discussions about the latest developments in battery research.