

## **THE IMPROVEMENT OF LITHIUM BATTERIES LIFETIME - THE CHALLENGE OF THE EUROPEAN PROJECT: HIDDEN.**

The question of the environmental protection and the global warming have been at the heart of numerous concerns the past years. At its level, Europe has set as target to reach carbon neutral territory for 2050. In that context, we must collectively endeavor to find solutions and to do so, research plays a prominent role.

Among the various ways to make a difference, we are searching for alternatives in the energy storage. Improvements in that area can benefit the transport sector, in particular today with the development of new electric and hybrid cars. And there are real progresses to make in the transport sector which contributes to 27% of carbon emissions in Europe and in which cars pollutions represent 44%.

In terms of research, a special attention is given to the improvement of lithium batteries, broadly employed in numerous application fields. However, because of the presence of lithium in the battery, negative reactions can occur and need to be solved to develop more sustainable and reliable batteries. In addition, the limited energy density and lifetime of such batteries hinder wider use. It is in that sense that the HIDDEN project has been created.

### **HIDDEN: HINDERING DENDRITE GROWTH IN LITHIUM METAL BATTERIES**



The objectives of such innovative project are precisely organized around the topic of energy storage and in particular to enhance lithium batteries, the most commonly used batteries nowadays.

Because of the growing need of more efficient batteries, it is crucial to find solutions by creating next generation lithium metal batteries with improved quality, reliability and lifetime.

The HIDDEN project is a European project promoted by Horizon 2020, the European Union Funding for Research & Innovation. It is undertaken by a consortium of seven partners: Teknologian tutkimuskeskus VTT Oy, Belenos Clean Power Holding AG, BERNER FACHHOCHSCHULE, CNRS, CSEM, RTD TALOS LIMITED and SPECIFIC POLYMERS. These different stakeholders involved in the project are working together to reach the following goals:

- Prevent common issues (as dendrite growth for instance) linked to lithium metal batteries which lead to battery overheating and short circuits. Obviously, this improvement will benefit to the lifetime of the batteries.
- Demonstrate on-demand and repeatable self-healing solutions to overcome the identified challenges. These methods must demonstrate stability over self-healing cycles to be applied more than one time and thus, ensure the sustainability of the battery.
- Make these innovative technologies compatible with current industrial processes to ensure their rapid deployment on the market.

### **DEVELOPMENT PROCESS BASED ON SELF-HEALING TECHNIQUES**

The project is following different steps to reach the objectives. It starts with the materials and battery cell layers developments and continues with the cell production characteristics to finish

by the analysis, modelling features definition and the proof-of-concept demonstration with various tests.

To avoid battery risk of damages and progress towards a better battery lifetime, two compatible methods based on self-healing techniques are going to be used. The first method addresses the root of the problem with the dendrites inhibition whereas the second one is dedicated to the neutralization of the dendrites right after their formations. To develop these methods, SPECIFIC POLYMERS is working with different partners of the project consortium.

### **SPECIFIC POLYMERS' ROLE WITHIN THE HIDDEN PROJECT**



Thanks to years of activities in various application fields, SPECIFIC POLYMERS is able to combine its cross-fertilizing expertise to define innovative synthetic pathways to fulfill HIDDEN's ambitions. Regarding lithium battery activities, SPECIFIC POLYMERS has developed over the past years breakthrough electrolyte components such as TFSI-based lithium salt monomers, single lithium-ion conductors as well as conductive additives and polymers. Those components are useful in the development of innovative battery with improved characteristics.

In that sense, SPECIFIC POLYMERS will contribute to this project by developing, characterizing, up-scaling and formulating the electrolytes that will be integrated to obtain the self-healing properties targeted. Such project will contribute to the improvement of the company's knowledge and skills regarding the synthesis of specific lithium-based monomers, building-blocks and polymers.

### **TOWARDS A EUROPE LEADER ON THE LITHIUM BATTERY MARKET**

In the long term, the project will lead to the development of the high-quality battery market and it will place Europe as a leader in the production of reliable and long-lasting batteries. We predict a massive uptake in lithium-ion battery by 2028 mainly due to the increase of the electric vehicles market. Obviously, such innovative solution in batteries can be useful for other applications such as electronic devices.



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957202.*

