ZABAT (Next generation rechargeable and sustainable zinc-air batteries)

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The ZABAT project develops the next-generation rechargeable and sustainable zinc-air batteries, by leveraging on the potential of technology based on abundant zinc (Zn), thereby reducing the use of critical raw materials (CRMs) such as lithium, natural graphite, and cobalt, while promoting the cir-cular economy. These batteries are intended for energy storage applications in both indus-try and households, cou-pled with renewables, with the aim of developing a critical material-free energy storage system.

The consortium is composed of four key Research and Technology Organization, and University: Leitat from Spain, SINTEF from Norway, Fraunhofer from Germany, and PWR from Poland.

Throughout these last three years, the project is getting closer to its overall aim of developing new multi-functional battery materials and components for rechargeable zinc-air batteries. The final ob-jective is to develop and validate the ZABAT cell prototype with specific and ambitious capacities at the Wh/kg level, as well as demonstrating a high level of uninterrupted hours of operation. The ZA-BAT zinc-air technology is based on scalable and environmentally friendly material and component fabrication processes, using sustainable and EU-available raw materials.

At this stage, key achievements are:

• Developed porous self-standing Zn electrodes with high Zn utilization, coulombic efficiency, and cycle life. These electrodes have shown remarkable stability and performance in pre-liminary tests.

• Development of a hydrogel electrolyte system, that has been performing over expectations for mechanical properties. Requires electrochemical performance evaluation at battery us-age. This system enhances ionic conductivity and mechanical stability overall battery effi-ciency.

• Progress on the multiscale modelling, a combination of thermodynamic and continuum modelling can help screen electrolyte materials and predict cell-level performance. This ap-proach allows for more accurate simulations and optimizations.

• Developed novel cost-effective printed gas diffusion electrode. This innovation reduces pro-duc-tion costs while maintaining high performance and durability.

Gen1 and Gen2 have been successfully accomplished, and the final demonstrator will showcase the full potential of ZABAT technology in real-world applications.

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