ZABAT
ZINC-AIR BATTERIES

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ZABAT: Advancing Sustainable Energy Storage through Rechargeable Zn-Air Batteries for the European Green Deal

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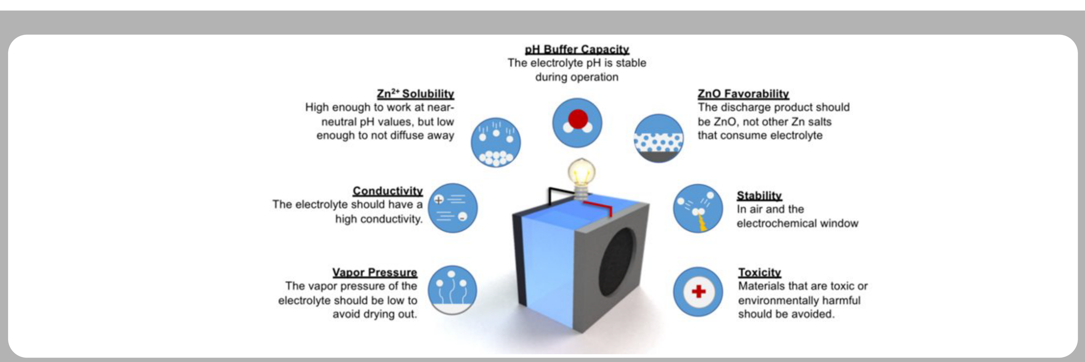
- The transition to a sustainable and resilient energy landscape is crucial in addressing the challenges posed by climate change.
- In line with the European Union's goals for 2030 and 2050, the ZABAT project aims to revolutionize energy storage by developing a high-performance, long-life rechargeable Zn-Air battery.
- This innovation will enable cost-effective behind-the-meter storage applications, facilitating the integration of renewable energy sources and promoting resource circularity by utilizing abundant zinc (Zn) instead of critical materials.
- This poster highlights key advancements by ZABAT towards a more sustainable energy future in Europe.

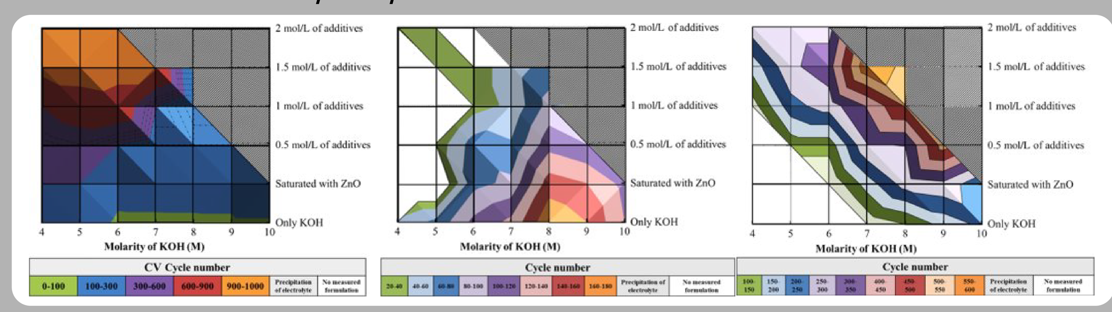
CELL DESIGN



ZAB cell design and components compatibility to solve key bottlenecks of Zn-Air technology by increasing the utilization and rechargeability of Zn electrode, reducing electrolyte poisoning and dry out and increasing the activity and durability of the GDE for the oxygen reduction reaction (ORR) and oxygen evolution reaction (OER) "unlocking" a new 2 electrodes cell design (1 cathode 1 anode).

ELECTROLYTE

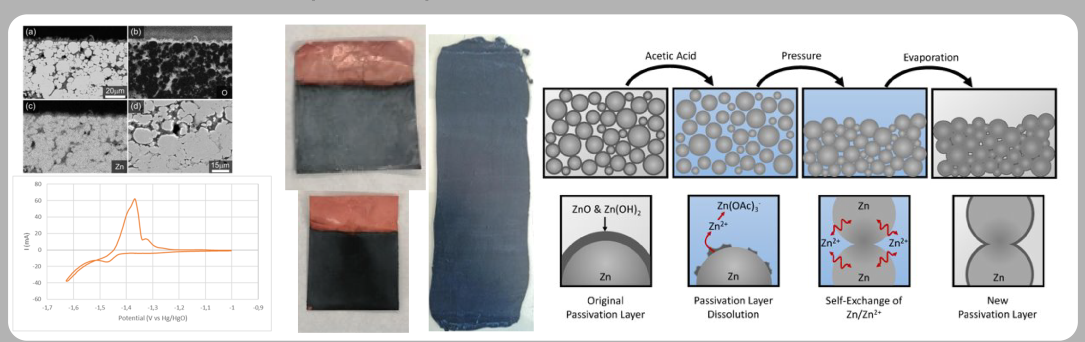
Development of (hydro)gel electrolytes based on semi-interpenetrating polymer networks and hybrid (hydro)gel-solid AEM electrolyte systems



Source: https://doi.org/10.1002/ese3.191

ANODE

Development of porous Zn electrodes with high Zn utilization, coulombic efficiency, and cycle life.



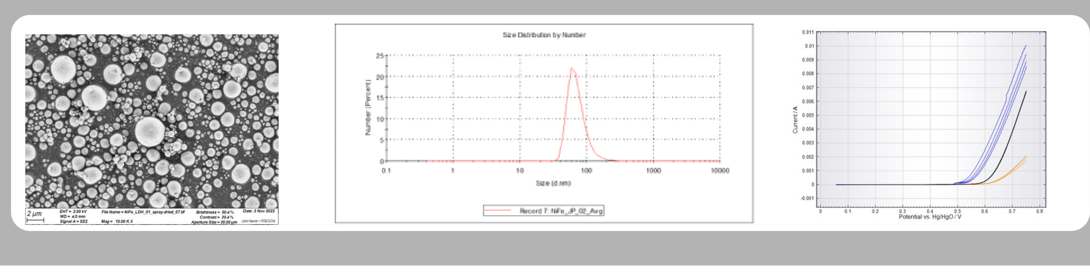
Source: https://doi.org/10.3390/pr8050592

RECYCLING

ZABAT targets the environmental, toxicity, and societal impacts of the materials and processes employed in the current r-ZAB technology through sustainability

CATHODE

Development of 3-dimensional bifunctional electrode (or Gas diffusion electrode, GDE) with non - precious CRM - free catalysts and 3D structured corrosion - resistant carbon materials



Objectives

Develop High-Performance Electrodes: Develop porous zinc (Zn) electrodes with enhanced utilization, high coulombic efficiency, and extended cycle life to address critical limitations in Zn-Air battery technology.

Innovate Electrolyte Solutions: Formulate (hydro)gel electrolytes based on semi-interpenetrating polymer networks (semi-IPNs) and hybrid (hydro)gel-solid anion exchange membrane (AEM) electrolyte systems to mitigate electrolyte poisoning and drying-out issues.

Advance Bifunctional Electrodes: Develop 3-dimensional bifunctional electrodes (Gas diffusion electrodes, GDE) with non-precious, critical material-free catalysts and durable 3D structured carbon materials.

Design a New Cell Architecture: Investigate and design a novel two-electrode cell architecture (1 cathode, 1 anode) to enhance the rechargeability and overall performance of the Zn-Air battery.

Demonstrate a 1Ah r-ZAB Cell: Integrate all novel materials and components into a 1Ah rechargeable Zn-Air battery cell and conduct long-term cycling tests to showcase improved performance.

High Recycling Potential: Demonstrate the high recycling potential of zinc and GDE materials, supporting the circular economy and sustainable battery practices.

Expected Achivements:

Enhanced Zn-Air Battery Performance: Achievement of a Zn-Air battery with superior performance, including higher energy density (> 300 Wh/kg) and extended cycle life (> 2,000 hours), surpassing current industry standards.

Critical Material-Free Battery: Development of a critical material-free energy storage system, reducing dependence on critical raw materials such as lithium and cobalt, aligning with sustainable development goals.

Novel Electrode Technologies: Introduction of innovative electrode materials and structures, addressing key bottlenecks in Zn-Air battery technology and unlocking new possibilities for battery design.

Sustainable Energy Storage: Contribution to the promotion of sustainability in energy storage by utilizing abundant zinc, thereby reducing the environmental impact of battery production and disposal.

Interdisciplinary Collaboration: Successful collaboration among partners from academia, research organizations, and industry, demonstrating the feasibility of advancing Zn-Air battery technology with a holistic approach

Environmental and Societal Considerations: Comprehensive assessments of the environmental, toxicity, and societal impacts of the materials and processes employed, fostering responsible battery development.

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