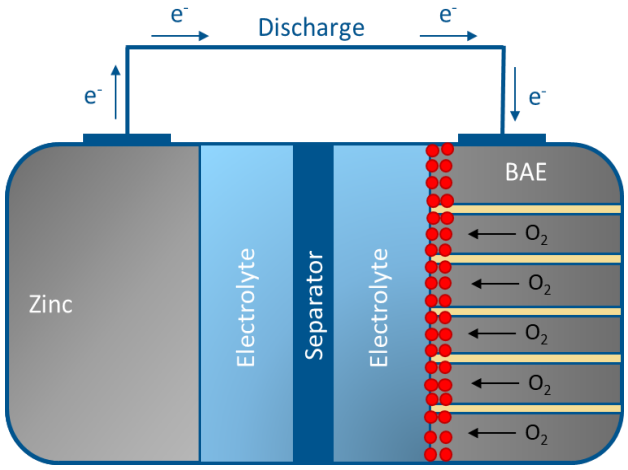
Advanced Manufacturing of Zn Electrodes for Rechargeable Zn-air Batteries (AMAZE)

Develop scalable and techno-economically viable methods for the manufacturing of porous Zn electrodes with excellent electrochemical performance and cycling stability in an alkaline rechargeable Zn-air battery (ZAB) configuration with carbon-free bifunctional air electrode (BAE). AMAZE is expected to deliver a new generation of thick, porous Zn electrodes with an optimal pore structure to maximize the Zn utilization, cell-level specific energy, and discharge capacity. A full cell ZAB will be validated in AMAZE with the best-performing Zn electrode, and carbon-free BAE for at least 250 charge/discharge cycles.



ZAB TECHNOLOGY AND CHALLENGES

ZAB technology as a large-scale renewable energy storage, is interesting from a commercial aspect. Compared to state-of-the-art Li ion batteries, ZABs have significant advantages due to high theoretical specific energy (1086 Wh kg^{-1}), low cost, low toxicity, safe operation and transport. In addition, they are more sustainable owing to abundancy and recyclability.

Rechargeable ZABs are commercially available today to a limited extent, although with low specific energy (< 50 Wh/kg at the system level, < 100 Wh/kg at the cell level) owing to low Zn utilization, poor air electrode performance, electrolyte poisoning and dry out due to primitive and complex cell design.

PARTNERSHIP

Dr Vincent Caldeira, EASYL SA, France, www.easyl.fr

Dr Ozgenc Ebil, IZTECH, Turkey, www.en.iyte.edu.tr

Dr Mari Juel, SINTEF AS, Norway, www.sintef.no

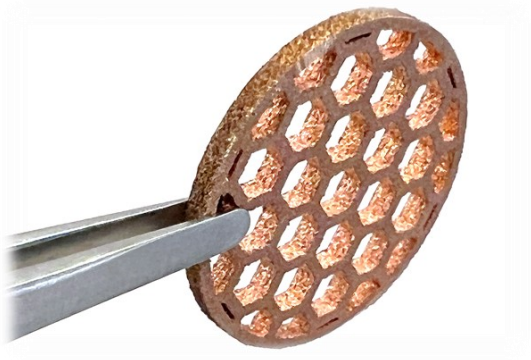
PROJECT COORDINATOR

Dr Kaushik Jayasayee, SINTEF AS, Norway, www.sintef.no

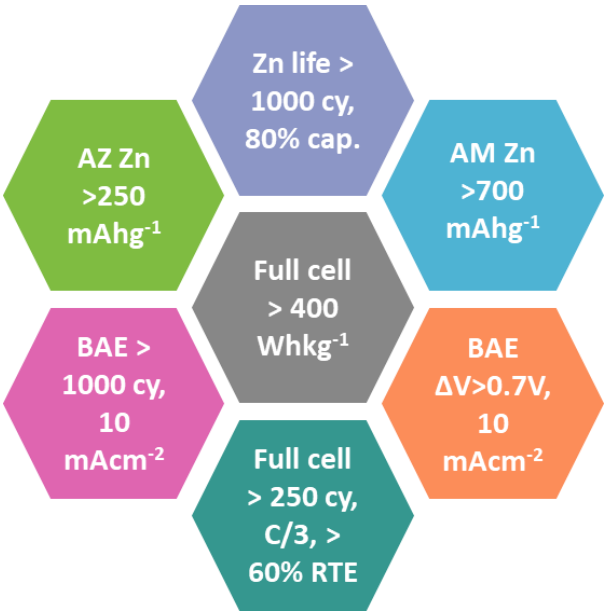
THE AMAZE PROJECT

The overall concept of AMAZE is to build and demonstrate a Zn-air battery (ZAB) with increased energy density, high performance, and extended cycle life through better Zn utilization, electrochemical stability, and structural stability of the Zn electrode. This is achieved by

- Developing calcium zincate (CZ) 3D structures with a low temperature dry mix technology (Easyl)
- Fabricating high energy density 3D Zn structures through additive manufacturing (AM) (SINTEF)
- Developing carbon-free bifunctional air electrodes (BAE) with affordable and sustainable materials (IZTECH)
- Perform an environmental and life cycle costing analysis for future developments (All)



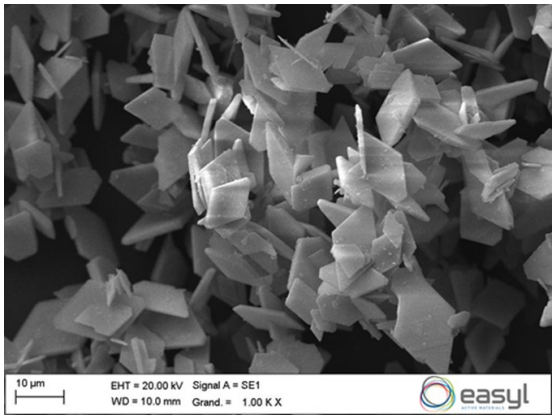
KEY TARGETS



IMPACT

The AMAZE project will contribute to

- Next-generation multifunctional materials for Gen 5 Zn-based technologies
- Developing affordable and safe energy storage technologies with aqueous electrolytes
- Contributing to Europe's competitive sustainable battery value chain with greater recycling potential



FUNDING

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TÜBİTAK

SINTEF

CONTACT:

Kaushik Jayasayee
+47 93003981
kaushik.jayasayee@sintef.no