



# ZIM Success Story

## Better than New: Battery Recycling

*The recycling of raw materials from used lithium-ion batteries plays a key role in shaping the circular economy for Europe. Europe's first industrial-scale lithium recovery plant was just completed in Krefeld, Germany. The transnational ZIM research and development project LIBERO was instrumental in laying the groundwork for its implementation.*

The demand for lithium will increase in the coming years as e-mobility keeps becoming more prevalent. According to the German government's climate protection plan, around a third of all vehicles in Germany should be electric by 2030.

In order to cover the raw material requirements needed for this and to reduce dependence on primary producing countries for critical resources, European industries are looking for cost-effective ways to recycle used batteries and circumvent market-related shortages of raw materials. In addition to precious lithium, the main metals involved are cobalt, nickel, copper and graphite.

### The Product and Its Innovation

The research driven by the ZIM project LIBERO provided groundbreaking findings for energy-efficient and virtually waste-free recycling of lithium-ion batteries. In addition to ACCUREC Recycling GmbH, German RWTH Aachen University and Swedish Chalmers University of Technology as well as MEAB Metallextaktion AB were involved in the project.

ACCUREC primarily researched mechanical and thermal pre-treatment steps for Li-ion batteries required to recover the important active materials. It contains the target materials cobalt, nickel, lithium and graphite. To this end, ACCUREC has developed a

patented solution for the complete discharge of used batteries. This counters the danger of overheating lithium battery cells and the risk of fire as a result of self-discharge during the mechanical separation of the battery housing. Further research was directed toward creating processes for distilling the battery solvents and removing the remaining organics from the cells based on pyrolysis. This allows for separating magnetic cell components (cell casings made of steel) from copper and aluminum materials alongside the main product, i.e., the active material. The Institute of Metallurgy and Electrometallurgy (IME) at RWTH Aachen University developed a



Lithium carbonate



Mechanical processing of pyrolyzed batteries

### Project Information

**Duration:** 09/2019 until 08/2021

**Project type:** Cooperation project

**Technology field:** Environmental technologies

**Contact person:**

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This project was carried out as a result of the second German-Swedish call for proposals for research and development projects.

multi-stage “near-zero-waste” leaching process for the next treatment phase to further break down its active materials. The degree of purity of the resulting hydroxide mixture and the lithium carbonate has already been increased to over 90 percent, enabling further processing in subsequent refining steps by means of solvent extraction. This was accomplished at Chalmers University of Technology in Sweden. In addition to performing various individual processing steps, MEAB Metallextraktion AB was also in charge of developing a pilot plant.

### Market and Customers

Based on various research and implementation projects, ACCUREC was able to further refine and scale up the recycling processes. The critical resource lithium can now

be recovered in an energy-efficient manner with a purity of around 99% as a carbonate from the Li-ion batteries in electric vehicles, electronic devices, e-scooters and e-bikes, making it available for reuse in the battery cycle. This technology makes it viable to cover the demand for lithium not just from primary raw material sources alone.

### Cooperation Partners

ACCUREC-Recycling GmbH was founded in 1995. The business focus of the company based in North Rhine-Westphalia includes the development and commercial use of recycling technologies for the recovery of secondary raw materials from used batteries. The recovery of recyclable materials from nickel-cadmium and lithium-ion batteries is at the core of ACCUREC’s activities.

The IME - Metallurgical Process Engineering and Metal Recycling Institute at RWTH Aachen University is a teaching and research institute in the field of metallurgical extraction, recycling, refinement and synthesis of non-ferrous metals and alloys. Current research focuses strongly on circular economy processes.

### Information about the program

The Central Innovation Programme for SMEs (ZIM) of the Federal Ministry for Economic Affairs and Climate Action provides funding to all technologies and sectors:

- Individual projects
- Cooperation projects
- Innovation networks and feasibility studies prior to R&D projects.

**Information and advice on cooperation projects**  
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