Research on advanced recycling technologies for the recovery of strategic metals from electric vehicle batteries – BATERURGIA

PROJECT DESCRIPTION - EXP - 00154596 / MIG-20221014

The demand for **Lithium-ion Batteries (LIBs)** has increased exponentially since their commercialization 30 years ago, as a consequence of the need to reduce **CO_2 emissions**, which is transforming mobility and generalizing the use of **electric vehicles (EVs)**. In 2021, around **7 million electric vehicles (EVs)** were sold[1]. As a result, the **LIB** market is now a business worth approximately **27 billion dollars per year**, and the number of depleted batteries that must be managed has therefore increased. These are classified as **hazardous waste** due to their content of fluorinated compounds, organic solvents, nanoparticles, and leachable metals, and must be transported under safe conditions by **authorized waste managers**, avoiding self-ignition.

The cells of an average **60 kWh battery** contain approximately **185 kg of metals**. This figure excludes the materials of the electrolyte, the binder, the separator, and the battery casing. The **cathode** contains the greatest variety of metals and is possibly the most important and expensive component of the battery. The composition of the cathode is a determining factor in the battery's performance, and each metal offers a unique advantage. For example, **NMC batteries**, which accounted for **72% of the batteries** used in EVs in 2020 (excluding China), have a cathode composed of **nickel, manganese, and cobalt**, in addition to **lithium**. In total, **cathode materials** represented **31.3% of the weight** of the average battery produced in 2020. On the other hand, **graphite** has been the preferred material for **anodes** due to its relatively low cost and long service life.

Therefore, **recycling LIBs** would reduce the demand for raw materials and could make their manufacturing process more sustainable—especially considering that the **European Union (EU)** classifies several battery-related metals (**Li, Co**) and graphite itself as **critical raw materials**. For this reason, the **EU** is considering strategies to reduce dependence on these metals. One such alternative is to **recover strategic metals** from products that have reached the end of their useful life, such as **EV batteries**.

Within the **BATERURGIA** project, **TUBACEX INNOVACIÓN** has the general objective of researching technologies and processes that allow the recovery of **nickel or nickel compounds** from the **black mass** of spent **NMC batteries** and validating their use in the **stainless steel casting process** at its steel plant, **Aceralava**. Its specific objectives are:

- Definition and development of a **cost-effective and environmentally friendly process** for the recovery of **Ni compounds** (sulfates, oxides…) from the **black mass** of electric vehicle batteries.
- Research and definition of the technology and process for the **efficient and integrated use** of **Ni compounds** recovered from the black mass within the **stainless steel production process**, ensuring the required quality.
- **Economic and environmental feasibility study**, taking into account the metal recovery process, its performance in the industrial process, and its potential effect on **raw material and energy consumption**.

BATERURGIA has a duration of **36 months (2022–2025)** and a **total consortium budget of 5.63 million euros**.

CONSORTIUM

Coordinator:

- SACYR CONCESIONES, S.L.

Partners:

- TUBACEX INNOVACION, S.L.
- SACYR FLUOR
- FERROGLOBE
- COLOROBBIA
- RECYCLIA
- LITTLE ENERGY
- COVELESS