

Lithium-ion batteries are ubiquitous in our daily lives - from mobile phones to electric cars. However, recycling them poses a major environmental challenge. A new research project proposes a ground-breaking approach to recovering valuable metals from used lithium-ion batteries, while minimising harmful environmental impacts. Traditional battery recycling methods are associated with the emission of highly toxic compounds such as dioxins. The proposed solution combines an innovative pyrometallurgical approach (high-temperature treatment) with hydrometallurgical technologies (chemical leaching of metals) to effectively recover lithium, nickel and cobalt.

The key milestones of the project are:

- Development of a strategy to inhibit dioxin formation during high-temperature processes
- Development of eco-friendly, biodegradable extractants for efficient extraction of valuable metals
- Application of advanced purification techniques: nanofiltration and electrodialysis as well as use of modified chitosan-based materials for selective capture of metal ions.
- Process optimization using machine learning to optimise the process and life-cycle analysis and techno-economic evaluation to verify its effectiveness.

The research work is carried out through international cooperation, with teams from Poland and China contributing their expertise in different areas.

This innovative approach has the potential to revolutionise the way lithium-ion batteries are recycled, making it more environmentally friendly and economically viable, which is particularly important given the growing demand for batteries in the electromobility economy.