We are pleased to introduce you to Fraunhofer TechFlash - Fraunhofer's Flash News on latest and exciting technologies.
This week's TechFlash is about a research project **>>DiLiRec<<** showcasing a better recycling method, compared to extraction of Nickel and Cobalt.

DiLiRec - Direct recycling of Lithium Iron Phosphate batteries

Fraunhofer Institute for Ceramic Technologies and Systems IKTS, established in 1992, is Europe's largest R&D facility dedicated to applied research on high-performance ceramics, with its two sites in Dresden (Gruna and Klotzsche), one in Hermsdorf (Thuringia) and other application centres in Berlin and Cottbus. Its core expertise & capabilities include, 1. tailored ceramic & composites development, 2. system integration with advanced manufacturing, analytics, and sensor tech for electronics, medical, and energy systems, 3. material diagnostics & non-destructive testing and 4. process engineering research in catalysis, recycling, and circular water and material systems. Apart from these, other research areas of Fraunhofer IKTS include, 1. high-strength oxide ceramics for medical applications and bio-nanotechnology, 2. robot-assisted measurements, and AI for data acquisition and evaluation, 3. hydrogen technologies, 4. applying artificial intelligence, cognitive systems and machine learning to various areas, and 5. exploring new applications in quantum engineering.

Image 1 – Lithium Iron Phosphate recycling

Most of the activities around battery recycling so far have concentrated on the recovery of Nickel and Cobalt from the cathode materials of NCM (Nickel Cobalt Manganese Oxide) or NCA (Nickel Cobalt Aluminium Oxide). In both types above, approximately 30-80% of Nickel and 10-30% of Cobalt proportions are observed along with 10-20% Manganese & 5% Aluminium. In contrast, the project **>>DiLiRec<<** is developing a sustainable material recycling process for the cathode material, Lithium Iron Phosphate (LFP) instead. The LFP cathodes of large format, round cells in particular, offer the highest potential for recycling. The project covers end-to-end recycling, intelligent cell sorting, dismantling, electrode de-coating (both wet and dry mechanical methods), and advanced black mass optimization.

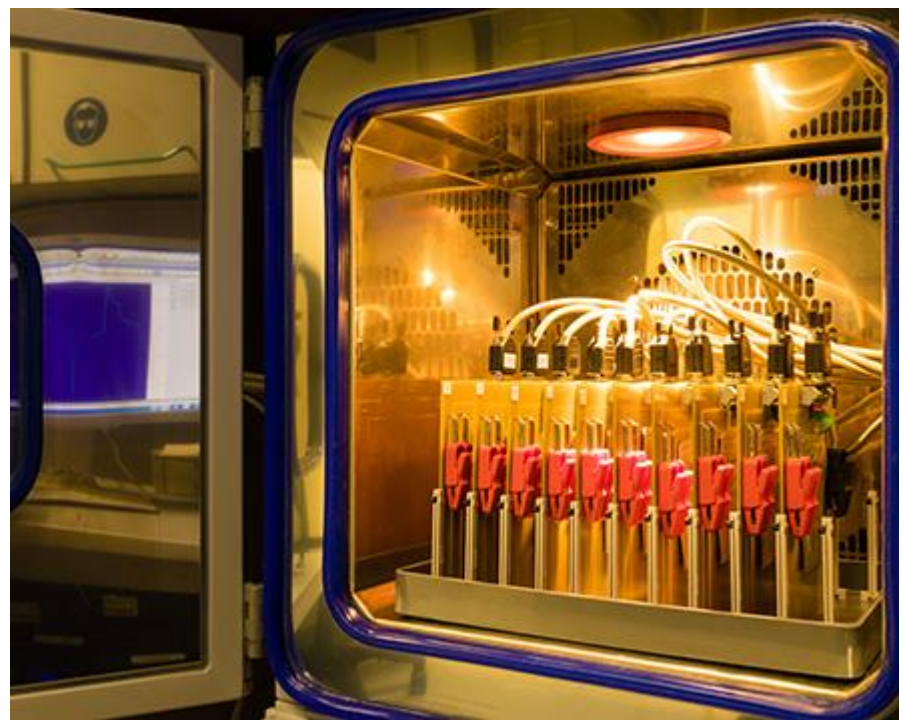

Image 2 – electrochemical characterization of recyclable content, black mass and by-products.

- In direct recycling, the aim is to fully recover the LFP as an active material and reuse it in processed form.
- In the standard recycling process, precursors of the LFP synthesis are to be isolated and used as secondary raw materials.
- In contrast, from NCM and NCA, less complex and energy-intensive hydrometallurgical steps can be used to recover the lithium from LFP. Furthermore, direct recycling of LFP appears promising due to its material properties.
- One focus of Fraunhofer IKTS in the project is on defining the requirements for the black mass and the possible recyclable content in terms of their purity and properties.
- In addition, Fraunhofer IKTS uses its extensive expertise in the field of characterization to chemically and morphologically investigate recyclable materials, black mass and by-products from hydrometallurgical and mechanical processing.
- Strategic Significance:
    - As LFP becomes the battery chemistry of choice in EVs and stationary storage, efficient recycling is crucial for resource security and meeting EU battery regulation demands.
    - Thanks to LFP's material properties, simpler and less energy-intensive recycling steps suffice, making direct recycling economically attractive and scalable.

Project Funding is given by the Federal Ministry of Education and Research (BMBF) and the Project partners are, BLC – The Battery Lifecycle Company GmbH, EAS Batteries GmbH, EDI GmbH – Engineering Data Intelligence, FNE Entsorgungsdienste Freiberg GmbH, Fraunhofer Institute for Ceramic Technologies and Systems IKTS, IBU- tec advanced materials AG, Omron Electronics GmbH, REELEMENTS GmbH, Technological University at Bergakademie Freiberg.

Please click below to collaborate with us on your innovative ideas. We look forward to hearing of your interest to discuss this and other numerous exciting technologies.

Yes, I am interested

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