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mob. 050 577 3736 Sirje Liukko

Press release **Public Defense on 22 November 2022**

Improving the recycling efficiency of lithium ion batteries

Title of the doctoral thesis	Lithium-ion batteries recycling with froth flotation – A study on characterization and liberation strategies
Content of the doctoral thesis	With the constant growth in portable electronic devices and the expected market growth for electric vehicles, the demand for lithium-ion batteries (LIBs) is booming. A combination of mining and recycling will be the essential and unavoidable solution to meet the upcoming (raw) material production demand for LIBs. To their disadvantage, majority of the state-of-the-art recycling technologies for LIBs focus on the recovery of components that have a high economic value such as Co, Ni, and Cu. The fine fraction resulting from the mechanical pre-treatment, containing the lithium metal oxides and graphite particles, commonly referred to as "black mass", is generally used as a starting point for the recovery of metals by metallurgical means. Indeed, in industry, this black mass is usually not further sorted, but directly fed to pyro- and/or hydrometallurgical processing routes to extract metals from the lithium metal oxides, at the expense of graphite recovery and black mass fraction being underutilized. This thesis work aims to increase the overall materials recovery from LIBs by improving the black mass beneficiation through froth flotation as means to separate the graphite particles from the lithium metal oxides. Ultimately, the findings of this research indicate the possibility of recovering and reusing graphite into new batteries. With this approach, the LIB recycling processes can verge upon the circular economy objective of closing the loop for raw materials.
Field of the doctoral thesis	Processing of materials
Doctoral candidate and contact information	Dipl. –Ing. Anna Vanderbruggen a.vanderbruggen@hzdr.de
Public defence date and time	22 November 2022 at 13 o'clock (in Finnish time)
Remote defence	https://aalto.zoom.us/j/63550710905
Place of public defence	Aalto University School of Chemical Engineering, lecture hall E, Otakaari 1, Espoo
Opponent(s)	Dr. Pablo Brito-Parada, Imperial College London, United-Kingdom
Custos	Professor Rodrigo Serna-Guerrero, Aalto University School of Chemical Engineering
Link to electronic thesis	http://urn.fi/URN:ISBN:978-952-64-1019-7
Keywords	Lithium ion battery, black mass, recycling, automated mineralogy, liberation, froth flotation, graphite, lithium metal oxides, mineral processing,

Aalto University
School of Chemical Engineering

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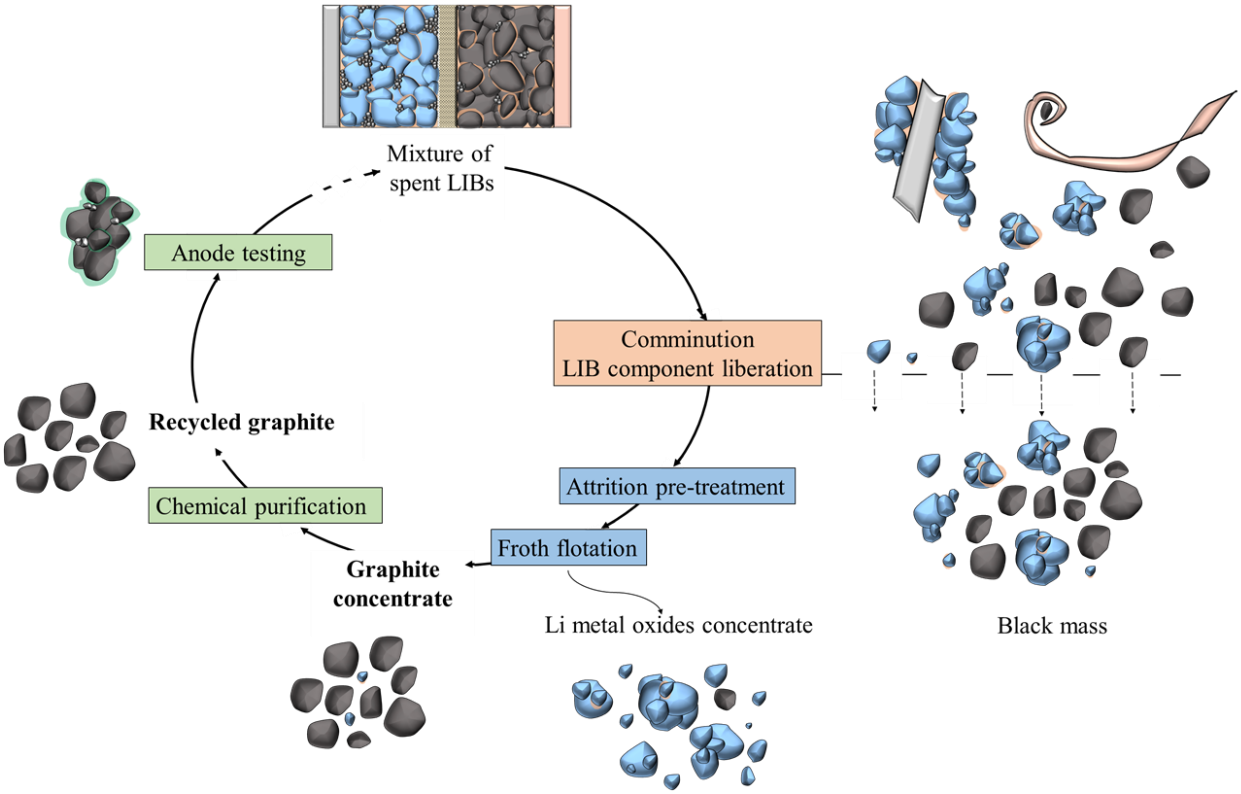

Overview of the PhD research – Graphite recycling from spent lithium ion battery.
Picture © Anna Vanderbruggen