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Defence announcement **Public Defence on 13 September 2024**

Enrichment of Valuable Components from Li-ion Battery Waste through Froth Flotation

Title of the doctoral thesis	Innovations in Li-ion Battery Recycling: Advanced Physical Separation, Characterization, and Industrial Process Integration
Content of the doctoral thesis	The growing demand for sustainable energy storage solutions has led to a significant increase in Li-ion battery production. As a result, the demand for raw materials essential in battery production, such as Co, Ni, Cu, graphite, and Li, is expected to increase in the coming years. This dissertation investigated the potential of froth flotation in the enrichment of Li-ion battery waste into valuable products that can be recycled. The work included several research directions, such as understanding flotation mechanisms and industrial process integration. A novel method based on X-ray tomography was developed to characterize froth fractions, allowing the observation of the distribution of solids in different carrier phases of the froth (air, water). Based on this information, the flotation chemistry of battery waste was optimized. Additionally, the study explored cathode-selective flocculation as a pre-treatment process for flotation and demonstrated potential in thus improving the purity of the recovered graphite streams. The research also investigated the further processing of fractions separated by flotation in combination with industrial slag cleaning processes and demonstrated that Cu, Co, Ni, and Fe can be effectively refined from both streams into valuable metal alloys through high-temperature processes. The observations made in this work contribute to the development of more cost-effective and sustainable battery recycling methods. The methods studied can be applied in the future to meet the growing demand for critical battery raw materials.
Field of the doctoral thesis	Processing of Materials
Doctoral candidate and contact information	M.Sc. (Tech.) Tommi Rinne tommi.rinne@aalto.fi
Public defence date and time	13 September 2024 at 13 o'clock (in Finnish time)
Remote defence	https://aalto.zoom.us/j/63666935082
Place of public defence	Aalto University School of Chemical Engineering, Lecture Hall Ke1, Kemistintie 1, (main door at Biologinkuja) Espoo
Opponent(s)	Professor Saeed Chehreh Chelgani, Luleå University of Technology, Sweden
Custos	Professor Rodrigo Serna-Guerrero, Aalto University School of Chemical Engineering
Link to electronic thesis	https://aaltodoc.aalto.fi/handle/123456789/51

Dissertation will be on public display at https://aaltodoc.aalto.fi/doc_public/eonly/riiputus/