Master Thesis in Recycling Li-ion cell electrolytes

Do you want to take part in developing a sustainable future in collaboration with experienced researchers in a professional and friendly environment? We at Chalmers Industriteknik are looking for ambitious and driven students who are interested in sustainable development and further advancing the circular economy!

Background

With the new EU Battery Regulation recycling of Li-ion batteries from electric vehicles is becoming even more central enabling sustainability throughout the battery life cycle. There is a high focus on recycling of the critical and precious metals in a battery pack but the electrolytes needs attention as well. The challenges will be evaporation and separation of electrolytes as exposure to humidity the electrolyte component will decompose, environmental and health risks and safety in the process at a battery recycling company. The process contains of isolation test, discharging of packs or modules with or without communication protocols prior the disassembly of the battery pack. The shredding of modules or cells is a step prior to the pyro- and hydrometallurgical treatment. The electrolyte separation is not well documented or implemented.

Scope

This diploma work comprises of:

- *Performing a literature study documenting electrolyte contents for NMC grades used in serial produced batteries*
- *Performing a market study of the raw material sources, refining and production steps for the electrolytes. Mapping the electrolyte producers and raw material suppliers*
- *Understanding the basics of the electrolyte compositions and impurities in virgin and degraded Li-ion batteries consisting of NMC technology*
- *Proposing and deciding appropriate limitations of the scope*
- *Analysis how to keep and separate the different compounds in the recycling process*
- *Reasoning what process is needed to upgrade and purify the compounds making them suitable for new cell production. What level of recovered electrolytes can be re-used?*
- *Experimental part: detection of the electrolyte in black mass (1-2 weeks) including focus on workplace health and safety risks*
- *Performing an assessment of raw material criticality from a volume and safety perspective*
- *Interpretation of the results*
- *Presenting the findings to internal and possibly external audiences*

Your contribution

“MSc programmes: Production/Materials/Industrial Design Engineering, Product Development, Industrial Ecology. We are looking for two students with a good understanding of industrial systems and life cycle thinking. They should have a strong interest in environmental sustainability. Additional merits include Circular Economy, Life Cycle Assessment and other environmental analysis courses.”

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The laboratory work will be perfomed in Nuclear Chemistry and Industrial Recycling Group at Chalmers. Thus students need to pass radiation safety examination to get access to the laboratories.

Want to contribute to a sustainable future? Apply here!

To apply for the thesis project please send us your CV and a short introduction letter (100 -200 words) either to hanna.persson@chalmersindustriteknik.se or maria.hammar@chalmersindustriteknik.se.
Examinor will be Burcak Elbin at Energy & Materials, Chemistry & Chemical Engineering
If you have any further questions don't hesitate to reach out to us!

Chalmers Industriteknik

We at Chalmers Industriteknik are a part of the Chalmers family and our role as a research- and development organization is to bridge the gap between academia and industry, with a focus on innovation for a sustainable society. You will be working in close collaboration with the Circular Economy team, which has a broad scope on everything related to the circular economy. Chalmers Industriteknik makes tomorrow ready for the future!