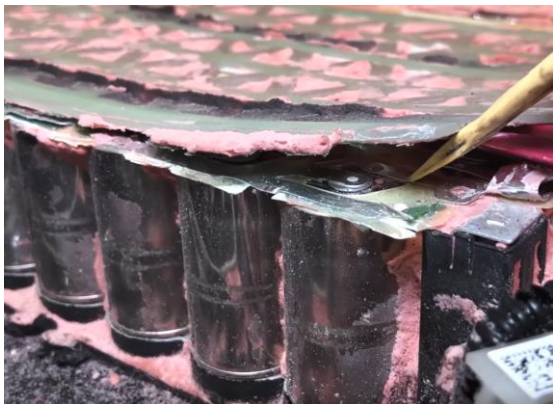
Vehicle Safety Institute

MSc Thesis – Analyzing the Disassembility of Battery Packs

Background



Source: https://insideevs.com/news/600847/tesla-4680-battery-teardown-under-foam/

After their initial use, battery packs of Electric Vehicles still retain about 80% of their original capacity. Repurposing the batteries in 2nd life applications prolongs their lifespan and minimizes the environmental impact. For 2nd life applications, dismantling the battery pack into single modules or cells is required. The main challenge lies in separating the cells from the module or pack housing, as thermally conductive adhesives are commonly used for their versatile properties in thermal conduction, electrical insulation, and mechanical crash behavior. In general, the mechanical properties resulting from these requirements for operation are very disadvantageous for the disassembly process at the end of their life and greatly diminish the possible output. The ability to safely separate the cells by debonding these adhesive connections would significantly increase the potential for second-life applications and directly impact resource efficiency.

Your goal is to analyze which parameters (e.g. temperature, UV radiation, …) influence the adhesive properties of thermally conductive adhesives to improve the disassembly of battery packs and propose an approach for safe disassembly

Tasks

- **Get familiar** with experimental testing methods and possible separation processes.
- **Understand** the mechanical properties of thermally conductive adhesives and how their mechanical properties can be manipulated in favor of disassembly
- **Develop** test configurations that represent dismantling processes and can be used to investigate the influence of possible manipulations (eg. temperature, UV radiation, …)
- **Implement your ideas** by designing and executing tests to validate the effectiveness of the developed test configurations.
- **Cooperate** with renowned industry partners

Literature

- Mulcahy et al.(2022): *Debondable adhesives and their use in recycling.* DOI: 10.1039/D1GC03306A
- Scott et al.(2023): *Designing lithium-ion batteries for recycle: The role of adhesives.* DOI: 10.1016/j.nxener.2023.100023

Recommended as Master thesis for technical studies (Mechanical Engineering, Mechanical Engineering and Business Economics) interested in battery safety and circular economy.

Organizational

- **Start**: October 2024
- **Scholarship**: min. € 2.500,- for successful completion of thesis
- **Contact**: Stefan Grollitsch, stefan.grollitsch@tugraz.at

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