Upscaling Emerging Sodium-Ion Battery Recycling Technologies for Prospective Life Cycle Assessment

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Study and methods

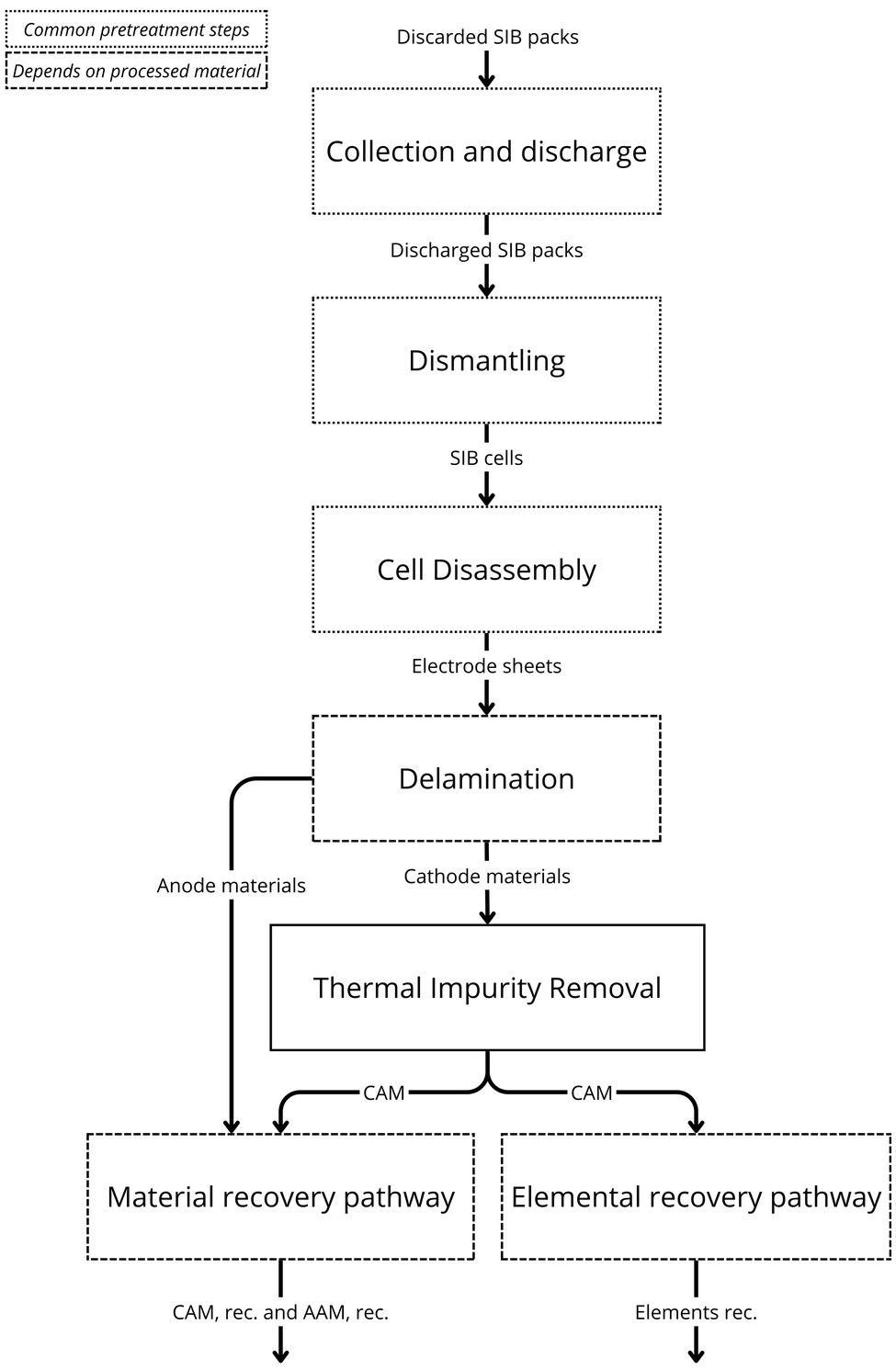
Investigate industrial-scale SIB-specific recycling pathways to guide towards lower environmental impacts.
Upscaling lab-scale studies using process calculations in combination with pLCA to assess the future environmental impact.
Two SIB types with different cathode chemistry are modelled in the study, one layered metal oxide and one polyanion.
Two SIB-specific recycling pathways following a common pretreatment:

- The material recovery pathway, which seeks to recover anode active and cathode active material (AAM / CAM) through direct recycling
- The elemental recovery pathway, which seeks to recover valuable elements through hydrometallurgical recycling.

Research objectives

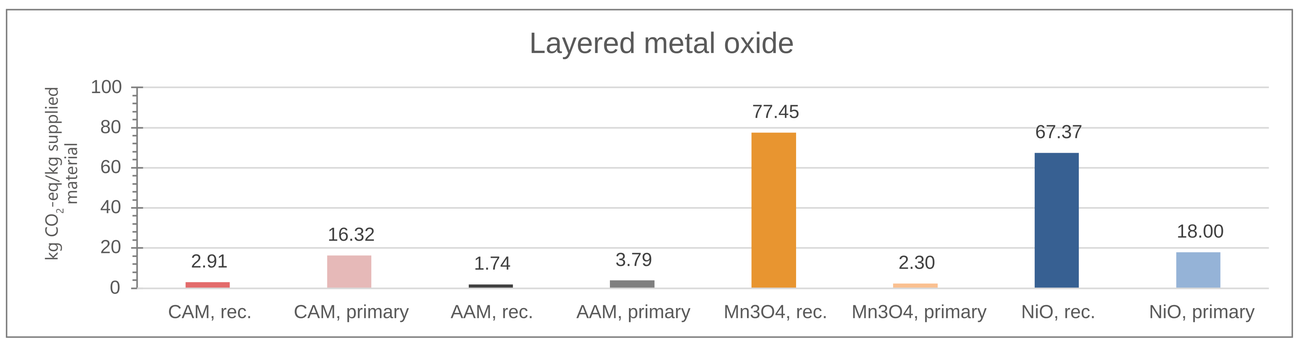
1. Identify environmental and hotspots in the recycling pathways and investigate potentials for reduction
2. Identify which recycling pathway that shows the most promise depending on SIB chemistry
3. Compare impacts from the materials and elements recovered from the two pathways to their primary counterparts

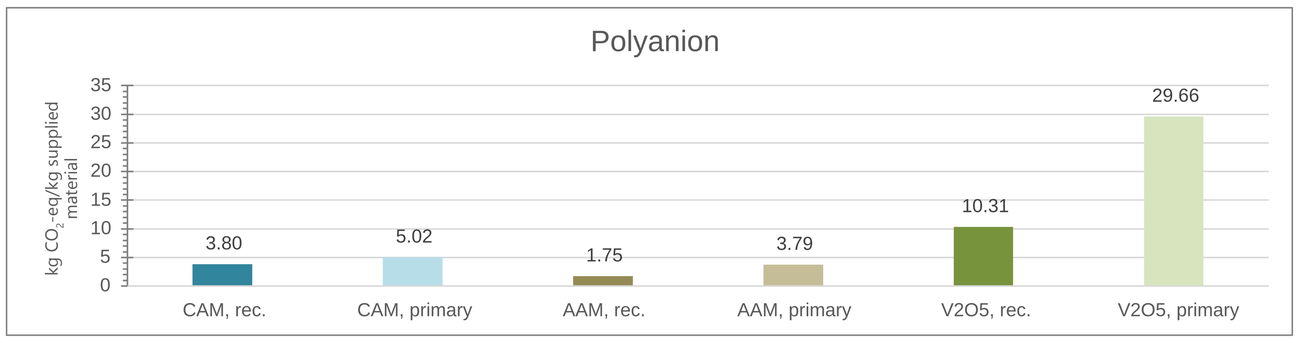
System overview



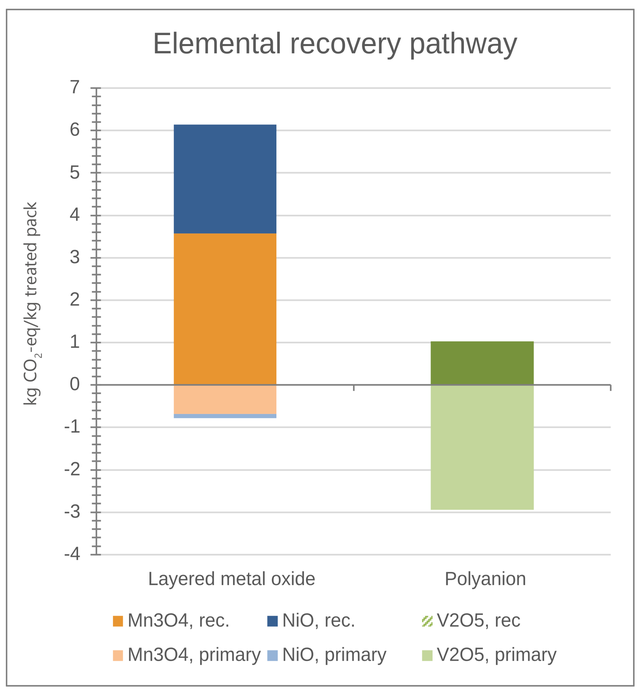
Preliminary results

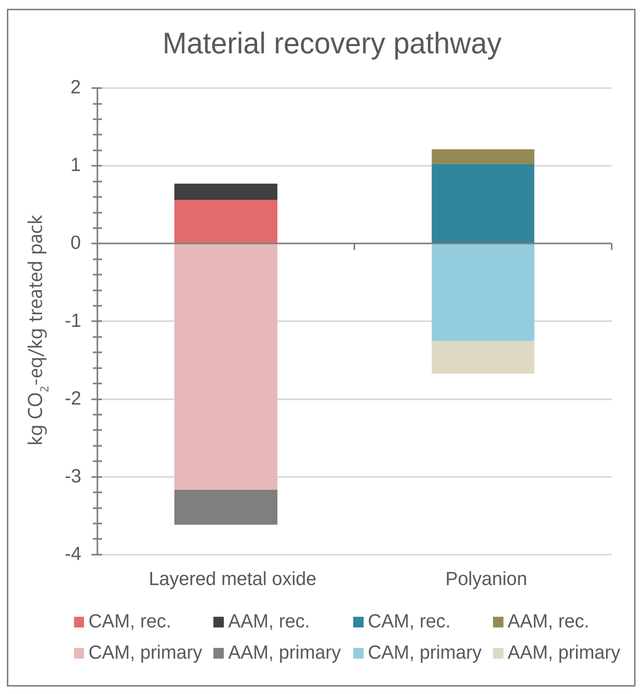
Supply perspective, functional unit: 1 kg supplied material





Treatment perspective, functional unit: 1 kg treated pack





Key takeaways

- Spent organic solvents stand for the majority of the impacts in both recovery routes.
  Increasing the efficiency of organic solvent recycling can mitigiate this.
- For the polyanion both recovery pathways are beneficial but the elemental recovery pathway shows the most promise.
  For the layered metal oxide the material recovery pathway is the most beneficial.
- The impacts from recovered materials and elements only exceed their primary counterparts for the elements gained from the layered metal oxide type.

Stay in touch!

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