Deliverable 7.3 Report on recycling process and upscaling requirement

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Publishable Executive Summary

This deliverable presents the laboratory-scale validation and assessment of a recycling process for PULSELiON solid-state battery (SSB) cells, building on the conceptual design developed in Deliverable 7.2.

The work establishes an experimentally validated process flow that combines targeted pre-treatment and hydrometallurgical steps to address the specific challenges posed by lithium metal anode and sulfide-based electrolytes. Key developments include the conversion and recovery of lithium metal to lithium hydroxide (LiOH), removal of the solvent-based electrolyte, and staged separation of transition metals via solvent extraction and selective precipitation.

The results demonstrate the technical feasibility and functional integration of key unit operations, including stagewise separation of Mn, Co, and Ni. However, the process remains at a partially integrated, proof-of-concept stage, with no cumulative recovery efficiencies established.

While recovery pathways are demonstrated for all major components, full KPI verification was not achieved due to limitations in material availability and process integration. The deliverable therefore defines a validated baseline process flow (D7.3) and identifies key priorities for further development, including optimisation of selectivity, mass-balance closure, and validation of lithium recovery across all streams.

From an upscaling perspective, the process is technically viable but not yet optimised for industrial implementation, providing a clear foundation for future optimisation and scale-up.