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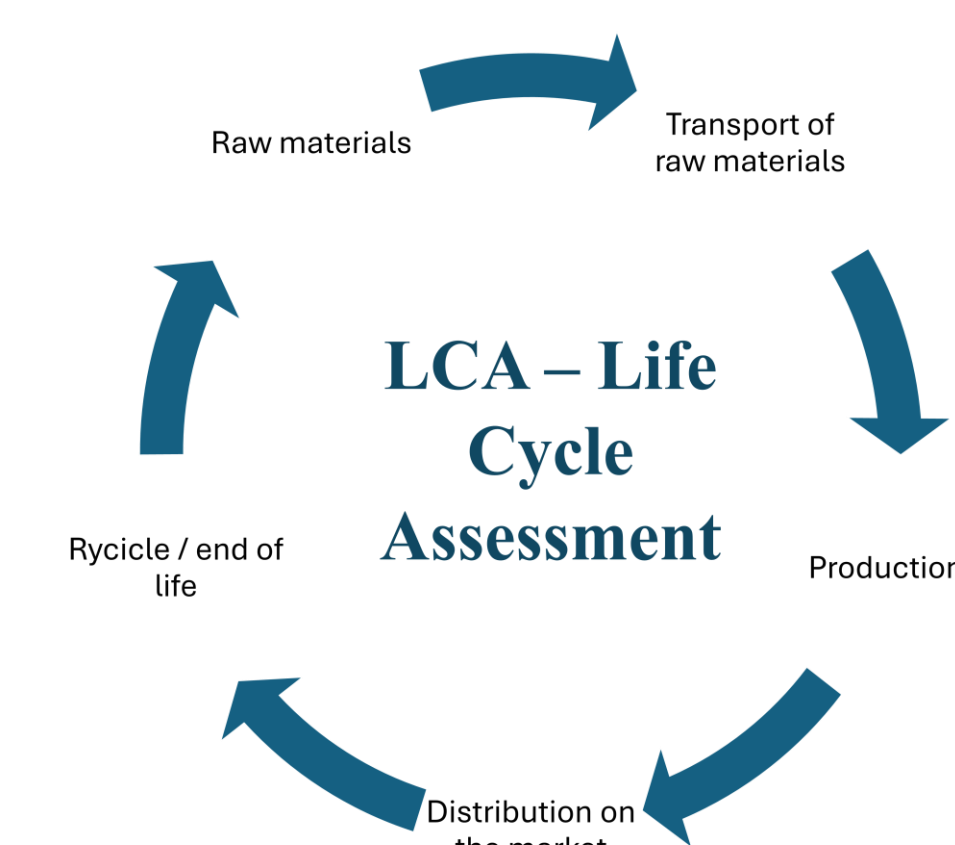
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Introduction

The Horizon Europe-funded project **TALISSMAN** focuses on the development of next-generation **lithium-sulfur (Li-S) batteries**, integrating technological innovation with eco-design, circularity, and recyclability principles. From material sourcing to end-of-life recycling, the project will embed **life cycle thinking** from the earliest stages of development. This approach aims to support the design of batteries that are resource-efficient, safe, and aligned with EU sustainability targets.

Prospective LCA

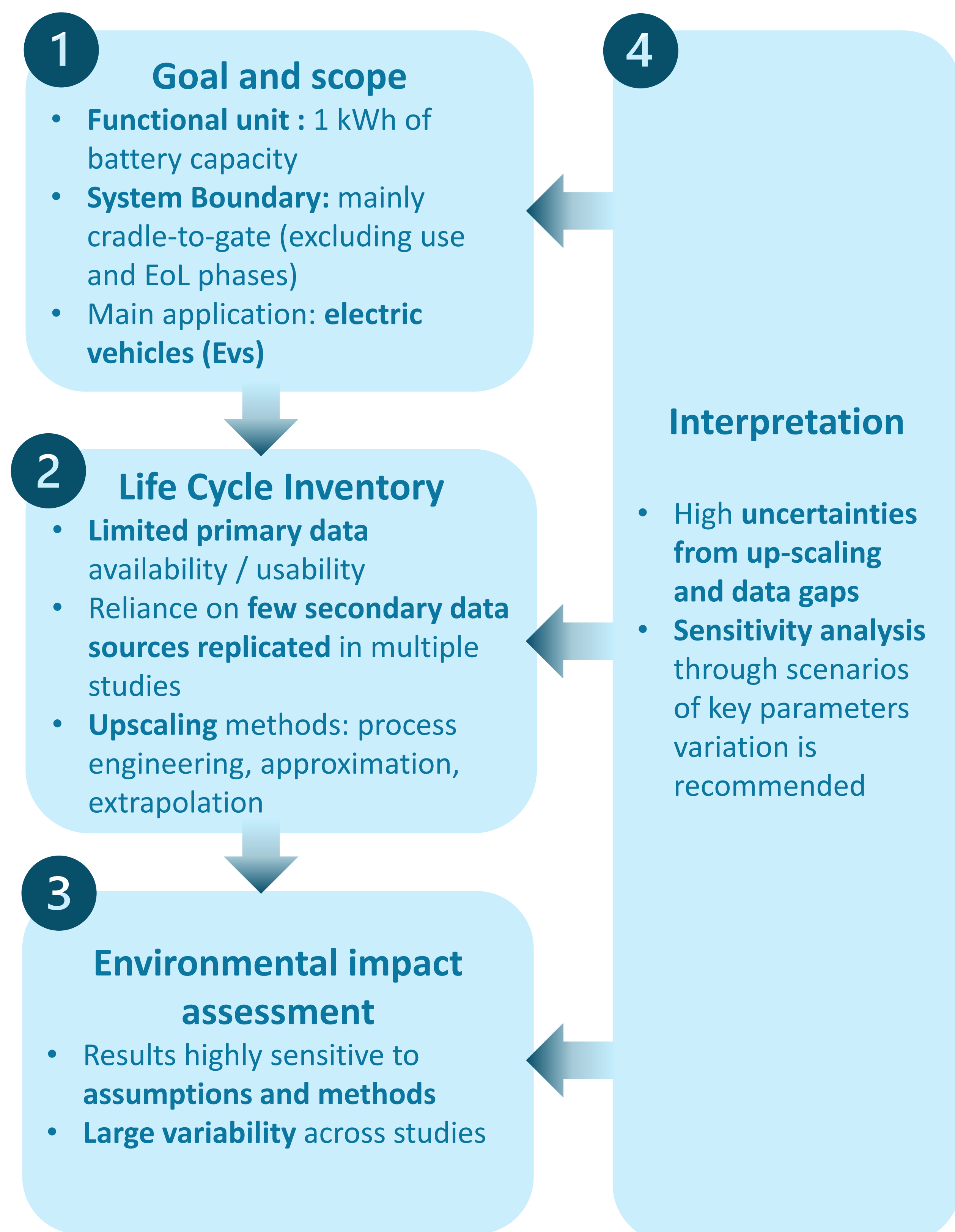
Integrating **life cycle thinking** into early-stage research is key to individuate potential hotspots and to help steering sustainable design. **Prospective Life Cycle Assessment (pLCA)** enables the evaluation of emerging technologies under future industrial-scale scenarios. By identifying potential environmental hotspots and trade-offs, pLCA can guide material selection, cell design, and process development. **This work aims to identify good practices and methodological recommendations from literature to support the robust implementation of pLCA for emerging Li-S battery technologies within a life cycle thinking framework.**



pLCA challenges in Li-S Battery Field

pLCA is a particular type of LCA applied to emerging technologies at low TRL, with the goal of anticipating environmental impact at full scale. Guidelines exist, but there is not yet consensus on how to upscale impacts, nor on how to deal with data gaps and uncertainty. The main methodological approaches and challenges in applying pLCA to Li-S battery technologies are analyzed according to the four LCA phases.

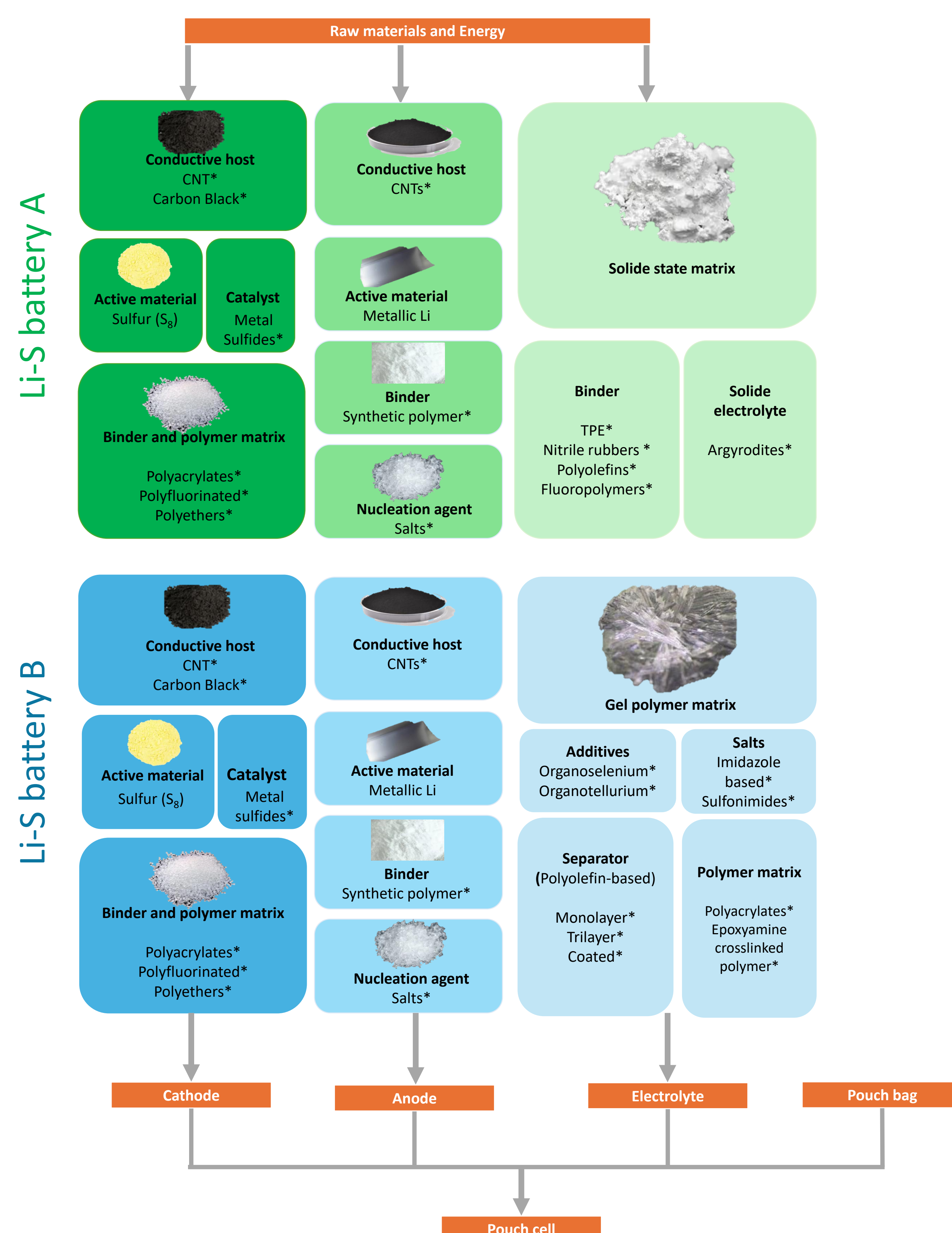
- **Keywords:** «LCA», «environmental assessment», «Lithium-sulfur batter*»
- **Database:** Scopus
- **Total of papers:** 13



TALISSMAN battery

A detailed flowchart of materials and processes has been developed to represent the system at laboratory scale, supporting the integration of life cycle thinking into technology design. TALISSMAN explores two technological pathways:

- **Li-S battery A**
- **Li-S battery B**



*The study involves a comprehensive screening of materials belonging to these chemical families, along with other specific compounds, evaluated as potential alternatives for individual or combined use.

TAKE-HOME MESSAGE

To support sustainable battery design, pLCA must ensure robust LCI data, transparent upscaling assumptions, and proper treatment of uncertainty