

# **Lithium ion battery life cycle assessment**





## Overview

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LIBLithium-ion batteryLCALife cycle assessmentRES.

Towards deep decarbonization of energy production, electrical batteries have.

With the requirement to specify the precise unit operation that contributes the most to environmental decay and greenhouse gas emissions, a comprehensive content regarding enviro.

3.1. Goal and ScopeTargets, Functional Units (F.U.), System Boundaries, Allocation Procedures, Cut-off Rules, and Impact Categories & Methods are all defined in.

Recycling methods and technologies are necessary for the consideration of future battery development projects during manufacturing phase. Similar to LIBs, recovery approach.

Do lithium-ion batteries have a life cycle assessment?

Nonetheless, life cycle assessment (LCA) is a powerful tool to inform the development of better-performing batteries with reduced environmental burden. This review explores common practices in lithium-ion battery LCAs and makes recommendations for how future studies can be more interpretable, representative, and impactful.

What are the life cycle inventories of Li-ion batteries?

The life cycle inventories (LCIs) of Li-ion battery contain component production, battery assembly, use phase, disposal and recycling and other related background processes. For process-based LCA, 17 ReCiPe midpoint environmental impact indicators and three end point environmental impact indicators are considered.

What is process-based and integrated hybrid life cycle assessment of Li-ion batteries?

Process-based and integrated hybrid life cycle assessment of Li-ion batteries is used to evaluate and compare environmental impacts.



What metrics are used to describe a lithium ion battery performance?

Table 1 presents several metrics used to describe an LIBs performance as it varies by battery chemistry, namely the battery's cycle life and shelf life. Table 5. Life-cycle assessment studies sorted by system boundary and application area \*Li-ion not primary battery technology evaluated.

Can lithium-ion batteries be recycled?

On the basis of a review of existing life cycle assessment studies on lithium-ion battery recycling, we parametrize process models of state-of-the-art pyrometallurgical and hydrometallurgical recycling, enabling their application to different cell chemistries, including beyond-lithium batteries such as sodium-ion batteries.

Why are lithium-based batteries important?

Lithium-based batteries are essential because of their increasing importance across several industries, particularly when it comes to electric vehicles and renewable energy storage. Sustainable batteries throughout their entire life cycle represent a key enabling technology for the zero pollution objectives of the European Green Deal.



## Lithium ion battery life cycle assessment

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### **A comparative life cycle assessment on lithium-ion battery: Case ...**

Majeau-Bettez G, Hawkins TR, Strømman AH (2011) Life cycle environmental assessment of lithium-ion and nickel metal hydride batteries for plug-in hybrid and battery electric vehicles. Environmental Science & Technology 45: 4548-4554.

### **Life Cycle Analysis of Lithium-ion Batteries: An Assessment of**

This paper is an attempt to study the environmental damages of lithium-ion batteries through a life cycle analysis and suggest appropriate sustainable solutions to overcome such issues.



### **Taking stock of large-scale lithium-ion battery production using life**

Taking stock of large-scale lithium-ion battery production using life cycle assessment MUDIT CHORDIA Division of Environmental Systems Analysis Department of Technology Management and Economics Chalmers University of Technology Göteborg, Sweden

### **Critical review of life cycle assessment of lithium-ion batteries for**

The literature search database is limited to the Web of Science, and the topics "Life cycle assessment" AND "lithium-ion batteries" are used to search the academic papers. A total of 424 papers satisfy the above retrieval conditions



(the retrieval date is December 24, 2021), and the number of papers issued in 2018, 2019, and 2020 is 60, 85, and 101, respectively.



### Comparative life cycle assessment of lithium-ion battery ...

In the past decade, life cycle inventories have been developed for the manufacturing of lithium-ion batteries which has facilitated the modelling of their environmental impacts. Most notably, Zackrisson et al. [8] and Majeau-Bettez et al. [9] produced LCIs for the LFP-C, Notter et al. [10] for the LMO-C, Bauer [11] for the NCA-C and LFP-LTO and Majeau ...

### Comparative Life-Cycle Assessment of Li-Ion Batteries through ...

This paper analyzes and compares the life cycle environmental impacts of two major types of Li-ion batteries using process-based and integrated hybrid life-cycle assessment (LCA) approaches. The life cycle inventories (LCIs) of Li-ion battery contain component production, battery assembly, use phase, disposal and recycling and other related background ...



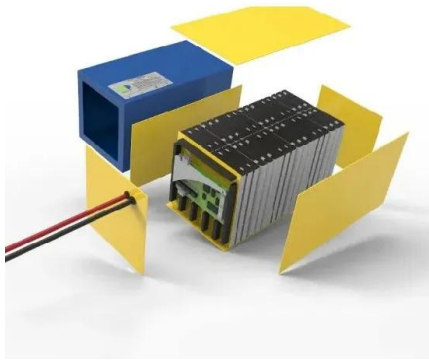
### Comparative Life Cycle Assessment of Lithium Mining, ...

The clean energy transition requires a considerable amount of different minerals, and lithium is one of the most critical elements owing to its use in Lithium-ion batteries for various applications. Axevedo, M., Baczynska, M., Hoffman, K., and Krauze, A., 2022.



### Life Cycle Assessment of a Lithium-Ion Battery Pack ...

Saving energy is a fundamental topic considering the growing energy requirements with respect to energy availability. Many studies have been devoted to this question, and life cycle assessment (LCA) is increasingly acquiring ...



### Comparative life cycle assessment of lithium-ion batteries with lithium

Lithium metal and silicon nanowires, with higher specific capacity than graphite, are the most promising alternative advanced anode materials for use in next-generation batteries. By comparing three batteries designed, respectively, with a lithium metal anode, a silicon nanowire anode, and a graphite anode, the authors strive to analyse the life cycle of different ...

### Extended life cycle assessment reveals the spatially

For a 2 MWh Lithium-ion battery storage, the quantitative Water Scarcity Footprint, comprising physically used water, accounts for 33,155 regionally weighted m3 with highest contributions from



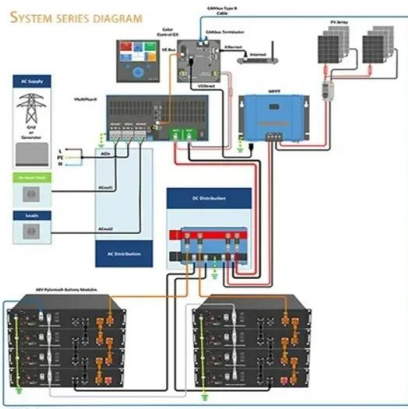
### Life cycle environmental impact assessment for battery

Majeau-Bettez, G., Hawkins, T. R. & Stromman, A. H. Life cycle environmental assessment of lithium-ion and nickel metal hydride batteries for plug-in hybrid and battery ...



### Best practices for life cycle assessment of batteries

Life cycle assessment (LCA) is a prominent methodology for evaluating potential environmental impacts of products throughout their entire lifespan. However, LCA studies often lack transparency and



### Environmental Impact Assessment in the Entire Life Cycle of Lithium-Ion

The growing demand for lithium-ion batteries (LIBs) in smartphones, electric vehicles (EVs), and other energy storage devices should be correlated with their environmental impacts from production to usage and recycling. As the use of LIBs grows, so does the number of waste LIBs, demanding a recycling procedure as a sustainable resource and safer for the ...



### Life cycle assessment of lithium-based batteries: Review of

This review offers a comprehensive study of Environmental Life Cycle Assessment (E-LCA), Life Cycle Costing (LCC), Social Life Cycle Assessment (S-LCA), and Life Cycle Sustainability ...



### Life cycle assessment of lithium-ion batteries and

Contribution of lithium-ion battery (LIB) and vanadium redox flow battery (VRB) components to the overall life cycle environmental impacts, along with life cycle phases of the ...

### Life cycle assessment of lithium ion battery recycling

6 Summary This report contains a life cycle assessment, LCA, of recycling of lithium ion battery cells. It was performed in the context of the Swedish ReLion project. The study aims to highlight environmental hotspots with LIB recycling and show the potential of LIB



### Non-destructive characterization techniques for battery

This work utilizes an ultrasonic imaging technique to investigate the wetting process of lithium-ion batteries techniques for battery performance and life-cycle assessment . Nat Rev Electr Eng



### Life cycle assessment of lithium-ion battery recycling using

Among existing and emerging technologies to recycle spent lithium-ion batteries (LIBs) from electric vehicles, pyrometallurgical processes are commercially used. However, very little is known about their environmental and energy impacts. In this study, three



### Life cycle assessment of an innovative lithium-ion battery ...

Life cycle assessment of lithium-ion battery recycling using pyrometallurgical technologies J. Ind. Ecol., 25 ( 6 ) ( 2021 ), pp. 1560 - 1571, 10.1111/JIEC.13157 View in Scopus Google Scholar



### Life Cycle Assessment of Lithium-ion Batteries: A Critical Review

Recent projections suggest that the global production of lithium-ion batteries will skyrocket to 2,857 GWh by 2030. The frequent use of lithium-ion batteries in various systems has necessitated an in-depth understanding of their environmental impacts. Life Cycle



LFP 48V 100Ah

### Comparative Life-Cycle Assessment of Li-Ion Batteries through ...

This paper analyzes and compares the life cycle environmental impacts of two major types of Li-ion batteries using process-based and integrated hybrid life-cycle assessment ...





### Comparison of three typical lithium-ion batteries for pure electric

In the previous study, environmental impacts of lithium-ion batteries (LIBs) have become a concern due the large-scale production and application. The present paper aims to quantify the potential environmental impacts of LIBs in terms of life cycle assessment. Three different batteries are compared in this study: lithium iron phosphate (LFP) batteries, lithium ...



### Life-Cycle Assessment Considerations for Batteries and Battery

His work focuses on the life-cycle assessment and technoeconomic analysis of lithium-ion battery systems, with an emphasis on evaluating the potential for utility-scale lithium-ion battery energy storage systems to achieve higher renewable energy penetrations

### Toward a cell-chemistry specific life cycle assessment ...

On the basis of a review of existing life cycle assessment studies on lithium-ion battery recycling, we parametrize process models of state-of-the-art pyrometallurgical and hydrometallurgical recycling, enabling their ...



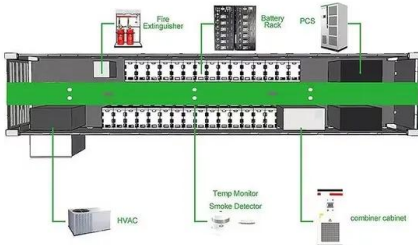
### Use of life cycle assessment to evaluate circular economy ...

Purpose The purpose of this study is to advance and illustrate how life cycle assessment (LCA) can assess circular economy business models for lithium-ion batteries to verify potential environmental benefits compared to linear business models. Scenarios for battery repurpose are assessed to support future decision-makers regarding the choice of new versus ...



### Life cycle assessment of lithium-ion batteries for greenhouse gas

Recently, there has been many researches on the carbon footprint calculation and the environmental impact assessment of lithium ion battery. Yajun Ge (2008) proposed the LCA method for wasted secondary battery, in which Shenzhen city was used as an example, mainly conducted quantitative assessment on chronic public health impact of nickel cadmium battery, ...

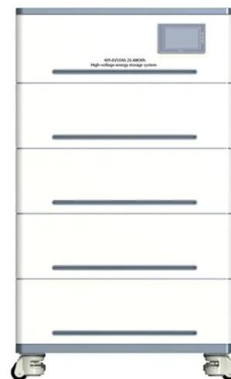


### Rapid Test and Assessment of Lithium-ion Battery Cycle Life ...

The cycle life test provides crucial support for using and maintenance of lithium-ion batteries. The mainstream way to obtain the battery life is uninterrupted charge-discharge ...

### Life-cycle assessment and life-cycle cost assessment of lithium-ion

The main targets of this study are to analyse the environmental impacts of different types of lithium-ion (Li-ion) batteries using Life Cycle Assessment (LCA) and to examine their economic analysis using Life Cycle Cost Assessment (LCCA). Regarding both



### Life Cycle Assessment of Lithium-ion Batteries: A Critical Review

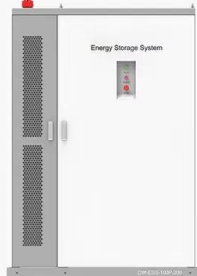
Request PDF , Life Cycle Assessment of Lithium-ion Batteries: A Critical Review , Evolving technological advances are predictable to promote environmentally sustainable development. Regardless the



### Life Cycle of Lithium (Life Cycle Assessment of Lithium)

The Life Cycle Energy Consumption and Greenhouse Gas Emissions from Lithium-Ion Batteries - A Study with Focus on Current Technology and Batteries for Light-duty Vehicles. IVL Swedish Environmental Research Institute 2017 Grant A, Deak D, Pell R. The

**PRODUCT INFORMATION**



- BATTERY CAPACITY**  
50kWh-500kWh
- DC VOLTAGE RANGE**  
400V-1000V
- DEGREE OF PROTECTION**  
IP54
- OPERATING TEMPERATURE RANGE**  
-10-50°C



### An In-Depth Life Cycle Assessment (LCA) of Lithium-Ion Battery ...

An In-Depth Life Cycle Assessment (LCA) of Lithium-Ion Battery for Climate Impact Mitigation Strategies September 2021 Energies 14(17):5555 14(17):5555 DOI:

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