Environmental impact assessment report of lithium battery supporting production line

Overview

The purpose of this study is to calculate the characterized, normalized, and weighted factors for the environmental impact of a Li-ion battery (NMC811) throughout its life cycle. To achieve this, open LCA software is employed, utilizing data from product environmental footprint category rules, the Ecoinvent database, and the BatPaC database for a comprehensive Cradle to Grave assessment. The findings of the current study that certain processes h. The purpose of this study is to calculate the characterized, normalized, and weighted factors for the environmental impact of a Li-ion battery (NMC811) throughout its life cycle. To achieve this, open LCA software is employed, utilizing data from product environmental footprint category rules, the Ecoinvent database, and the BatPaC database for a comprehensive Cradle to Grave assessment. The findings of the current study that certain processes have significant environmental implications, including climate change (fossil), resource usage (energy carrier), resource use (minerals and metals), and respiratory inorganic impacts. However, it is noteworthy that water scarcity contributes to 87% of the overall effect, primarily due to the utilization of acids in the hydrometallurgical process. Moreover, the impact categories mentioned above are heavily influenced by the electricity grid mix employed during both the production and consumption phases. Consequently, increasing the proportion of clean energy in the electrical grid mix has been identified as an effective strategy for reducing the Life Cycle Impact Assessment (LCIA) of Li-ion batteries.••Life cycle assessmentLife cycle StagesLi-ion batteryNMC811Electric vehicles (EVs) account for the majority of current and forecast demand, but lithium-ion batteries are also used in consumer devices, essential defense sectors and stati...

Article Content

Environmental Impacts, Pollution Sources and Pathways of spent Lithium ...

There is a growing demand for lithium-ion batteries (LIBs) for electric transportation and to support the application of renewable energies by auxiliary energy storage systems. This surge in ...

Environmental impact analysis of potassium-ion batteries based ...

Request PDF | On Nov 1, 2024, Jiesong Zhu and others published Environmental impact analysis of potassium-ion batteries based on the life cycle assessment: A comparison with lithium iron phosphate ...

Comprehensive evaluation on production and recycling of lithium ...

For environmental impact assessment, many studies adopted life cycle assessment ... Currently, most batteries are cylindrical, whereas prismatic batteries are seldom used. In line with the investigation by Ciez et al. , the cost per kWh of a prismatic battery was less than that of a cylindrical battery. Moreover, the prismatic battery ...

Comparative Study on Environmental Impact of Electric Vehicle Batteries ...

Against the backdrop of the global goal of “carbon neutrality”, the advancement of electric vehicles (EVs) holds substantial importance for diminishing the reliance on fossil fuels, mitigating vehicular emissions, and fostering the transition of the automotive sector towards a sustainable, low-carbon paradigm. The wide application of electric vehicles not only reduces ...

Assessment of environmental impacts and circularity of lithium-ion ...

In this report, three different circularity indicator tools (MCI, Circulytics and CTI) are presented shortly based on their capability to support or complement environmental impact assessment, with a focus on the data requirements for carrying out the assessment.

Environmental impact assessment on production and material ...

This article presents an environmental assessment of a lithium-ion traction battery for plug-in hybrid electric vehicles, characterized by a composite cathode material of lithium ...

Environmental life cycle implications of upscaling lithium-ion battery ...

Purpose Life cycle assessment (LCA) literature evaluating environmental burdens from lithium-ion battery (LIB) production facilities lacks an understanding of how environmental burdens have changed over time due to a transition to large-scale production. The purpose of this study is hence to examine the effect of upscaling LIB production using unique ...

Life Cycle Assessment of Environmental and Health Impacts ...

FINAL PROJECT REPORT Life Cycle Assessment of Environmental and ... life cycle assessment, environmental impact health impact, economic costs. Please use the following citation for this report: Tarroja, Brian, Haoyang He, Shan Tian, Oladele Ogunseitan, Julie Schoenung, and Scott ... 3.3.1 Endpoints Assessment for Flow Battery Production ...

Environmental life cycle implications of upscaling …

Purpose Life cycle assessment (LCA) literature evaluating environmental burdens from lithium-ion battery (LIB) production facilities lacks an understanding of how environmental burdens have changed over time due to a transition to large-scale

Investigating the environmental impacts of lithium-oxygen battery ...

But generally, a reliable and precise LCA study of lithium batteries highlights the need for lab-scale environmental assessments to bridge the gap between laboratory and industrial-scale evaluations, as demonstrated by studies identifying production hotspots in lithium-ion battery manufacturing (Erakca et al., 2023) and environmental ...

Environmental Impact Assessment of Solid Polymer …

the main impact driver for the laboratory-scale production of the LLZ. Additionally, Latoskie and Dai studied the environmen-tal impacts of solid-state batteries bearing a lithium phosphorus oxynitrite (Li 3.3PO 3.8N 0.24, LiPON) glass-ceramic electrolyte, concluding that solid-state thin-film LIBs may become environ-

Environmental Impact Assessment in the Entire Life Cycle of Lithium…

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 ...

Estimating the environmental impacts of global lithium-ion battery ...

Here, we analyze the cradle-to-gate energy use and greenhouse gas emissions of current and future nickel-manganese-cobalt and lithium-iron-phosphate battery technologies.

Environmental impact assessment of lithium ion battery …

Ensure raw and refined resource availability, as well as alternative sources for essential minerals. Collaborate to generate supplies of critical raw materials for batteries, as well as to enhance the safe and sustainable manufacturing capacity of critical battery materials (lithium, nickel, and cobalt) .The major elements whose world reserve and total …

Exploring the energy and environmental sustainability of …

Clearly, LFP battery production has a lower environmental impact than most NCM batteries, especially in WC and MRS, as shown in Fig. 3 (a). A hot spot analysis of the NCM333 battery pack manufacturing reveals that the primary contributions to WC and MRS stem from the CoSO 4 used in NCM preparation, accounting for 74.1 % and 65.9 %, respectively ...

Environmental life cycle assessment of emerging solid-state batteries ...

Keshavarzmohammadian et al. (2015) analysed environmental impact of lithium pyrite (FeS 2) batteries for electric mobility with a range of 200-miles considering the functional unit of 80 kWh of energy capacity with an estimated battery mass of 440 kg. The assessment has a cradle to gate perspective, considering all steps of battery ...

Life cycle environmental impact assessment for battery

As an important part of electric vehicles, lithium-ion battery packs will have a certain environmental impact in the use stage. To analyze the comprehensive environmental impact, 11 lithium ...

Environmental impact assessment on production and material ...

Battery electric vehicles (BEVs) and hybrid electric vehicles (HEVs) have been expected to reduce greenhouse gas (GHG) emissions and other environmental impacts. However, GHG emissions of lithium ion battery (LiB) production for a vehicle with recycling during its life cycle have not been clarified. Moreover, demands for nickel (Ni), cobalt, lithium, and ...

Environmental Impacts Assessment of NCM Cathode Material Production ...

The nickel cobalt manganese ternary (NCM) cathode material is one of the important parts of power lithium battery. The NCM cathode material production process including the Li 2 CO 3 preparation ...

Environmental Impact Assessment in the Entire Life Cycle of ...

The environmental impact of lithium-ion batteries (LIBs) is assessed with the help of LCA (Arshad et al. 2020). Previous studies have focussed on the environmental impact ...

Lithium-Ion Vehicle Battery Production

No. C 444 November 2019 Lithium-Ion Vehicle Battery Production Status 2019 on Energy Use, CO 2 Emissions, Use of Metals, Products Environmental

Assessing the Lifecycle Environmental Impact of Traction Battery

The production of traction battery packs begins with the extraction of raw materials such as lithium, cobalt, nickel, and manganese. These materials are critical components of lithium-ion batteries, the most widely used battery technology in electric vehicles. However, mining and processing these materials come with significant environmental ...

Environmental Assessment of Lithium-Ion Battery Lifecycle and of ...

The literature mostly investigated batteries, including graphite anodes [9,10] combined with cathodes made of lithium nickel cobalt manganese oxide (NMC), lithium iron phosphate (LFP), lithium nickel cobalt aluminum oxide (NCA), lithium manganese oxide (LMO), and lithium cobalt oxide (LCO) .

Environmental impact of recycling spent lithium-ion batteries

Lithium-ion batteries are used for energy storage and as an energy source in a wide range of applications from small handheld to powering consumer-driven vehicles.

Environmental impact and economic assessment of secondary ...

China is the largest lead-acid battery (LAB) consumer and recycler, but suffering from lead contamination due to the spent-lead recycling problems. This paper describes a comparative study of five typical LAB recycling processes in China by compiling data about the input materials, energy consumptions, pollution emissions, and final products. We compared ...

Environmental impacts of lithium production showing the importance ...

Life cycle assessment (LCA) is a method to evaluate the environmental impact of a product during its life cycle processes. LCA can help to improve the sustainable design of the product by identifying the process with key impact (Guinée, 2001; Finnveden et al., 2009).Thus, it has become an important tool for providing a basis to support policy decisions (Guinée et al., ...

Investment Report: Developments in the Lithium Industry

l Jiangxi Xinlong Lithium Industry Co., Ltd.''s environmental impact assessment report for the annual production of 10,000 tons of lithium carbonate project was proposed for acceptance disclosure ...

Estimating the environmental impacts of global lithium-ion battery ...

A sustainable low-carbon transition via electric vehicles will require a comprehensive understanding of lithium-ion batteries'' global supply chain environmental impacts.

A Comprehensive Evaluation Framework for Lithium Iron ...

1 Introduction. Lithium-ion batteries (LIBs) play a critical role in the transition to a sustainable energy future. By 2025, with a market capacity of 439.32 GWh, global demand for LIBs will reach $99.98 billion, [1, 2] which, coupled with the growing number of end-of-life (EOL) batteries, poses significant resource and environmental challenges. Spent LIBs contain ...

A Comprehensive Evaluation Framework for Lithium Iron ...

The framework includes three main sets of criteria: direct production cost, electrochemical performance, and environmental impact. Each criterion is scored on a scale of 0–100, with higher ...

Bayesian Monte Carlo-assisted life cycle assessment of lithium ...

The environmental performance of electric vehicles (EVs) largely depends on their batteries. However, the extraction and production of materials for these batteries present considerable environmental and social challenges. Traditional environmental assessments of EV batteries often lack comprehensive uncertainty analysis, resulting in evaluations that may not ...

Environmental assessment of an innovative lithium production ...

The Li extraction process from brines comprises consecutive stages, starting with concentration by evaporation, impurity removal and precipitation by 29th CIRP Life Cycle Engineering Conference Environmental assessment of an innovative lithium production process Andrea Di Maria*a, Zienab Elghoula, Karel Van Ackera,b a Department of Materials ...

Environmental Assessment of Lithium-Ion Battery Lifecycle and of ...

This review analyzed the literature data about the global warming potential (GWP) of the lithium-ion battery (LIB) lifecycle, e.g., raw material mining, production, use, and end of life. The literature data were associated with three macro-areas—Asia, Europe, and the USA—considering common LIBs (nickel manganese cobalt (NMC) and lithium iron phosphate ...

Environmental impact of Li-ion battery production

This bachelor''s thesis is a literature review of the environmental impact Li-ion battery production. With the increase in battery electric vehicles (BEV) around the world, it is important to know ...

Environmental impact assessment of battery boxes based on

Regarding energy: The energy consumption, mainly electrical energy, associated with the battery pack production stage in the environmental impact assessment report lacks detailed information ...

Energy Use and Environmental Impact of Three Lithium-Ion ...

In this paper, we assess and report on the main environmental impacts of three battery factories in Hungary, with a total annual capacity of approximately 100 GWh, based on ...

Contribution of Li-Ion Batteries to the Environmental Impact of ...

Battery-powered electric cars (BEVs) play a key role in future mobility scenarios. However, little is known about the environmental impacts of the production, use and disposal of the lithium ion (Li-ion) battery. This makes it difficult to compare the environmental impacts of BEVs with those of internal combustion engine cars (ICEVs). Consequently, a detailed lifecycle ...

Costs, carbon footprint, and environmental impacts of lithium-ion ...

Rapidly growing demand for lithium-ion batteries, cost pressure, and environmental concerns with increased production of batteries require comprehensive tools to ...

Environmental life cycle assessment on the recycling processes ...

According to statistics, the amount of retired power batteries in China is projected to reach 530,000 t in 2022. It is expected to surpass 2.6 million t/a by 2028 (Table S1) (Adhikari et al., 2023).While being commonly known as "green batteries," lithium-ion batteries still contain toxic electrolytes, organic compounds, and polymers, that poses safety and ...

Life cycle environmental impact assessment for battery-powered ...

By introducing the life cycle assessment method and entropy weight method to quantify environmental load, a multilevel index evaluation system was established based on...

(PDF) Recycling Lithium-Ion Batteries—Technologies, Environmental ...

the 82,000 t of lithium from production repo rted in 2020 did not cover the lithium needs g i v e n b y gl o ba l ma r ke t de m an d [3] . L i is k no w n a s a m e ta l li c e le m en t wi t h ...

Life-cycle assessment of the laser sintered-silicon anode for lithium ...

2. Materials and methods Life cycle analysis or life cycle assessment is used as a tool to quantify the environmental impact of the battery production process and according to the ISO 14040/14044 it should at least contain following parts: goal and scope definition, life cycle inventory, impact assessment and interpretation .

Environmental Assessment of Lithium-Ion Battery ...

This review analyzed the literature data about the global warming potential (GWP) of the lithium-ion battery (LIB) lifecycle, e.g., raw material mining, production, use, and end of life. The literature data were ...

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