Lca of lithium ion battery

A lithium-ion or Li-ion battery is a type of rechargeable battery that uses the reversible intercalation of Li + ions into electronically conducting solids to store energy. In comparison with other commercial rechargeable batteries, Li-ion batteries are characterized by higher specific energy, higher energy density, higher energy efficiency, a longer cycle life, and a longer ...

Reported Global Warming Potentials (GWPs) of LCA studies focusing on NMC battery recycling, alongside the respective battery production GWP, are shown in Table 1. Cusenza et al. (2019) performed a cradle-to-grave assessment of a LIB pack for hybrid electric vehicles utilising a lithium manganese oxide (LMO)-NMC333 composite cathode material, ...

Lithium-ion batteries (LIBs) deployed in battery energy storage systems (BESS) can reduce the carbon intensity of the electricity-generating sector and improve environmental sustainability. The aim of this study is to use life cycle assessment (LCA) modeling, using data from peer-reviewed literature and public and private sources, to quantify environmental ...

This study presents the life cycle assessment (LCA) of three batteries for plug-in hybrid and full performance battery electric vehicles. A transparent life cycle inventory (LCI) was compiled in a component-wise manner for nickel metal hydride (NiMH), nickel cobalt manganese lithium-ion (NCM), and iron phosphate lithium-ion (LFP) batteries. The battery systems were ...

This section presents a cradle-to-gate LCA of three anodes and their related processes and three battery packs. Figure 2 explains the cradle-to-gate environmental impacts of three different anodes per kg. To understand the contributions to different anode materials, an LCA of anode-related background processes is conducted (Fig. 3) gure 4 shows the cradle ...

Life cycle assessment of a lithium-ion battery with a silicon anode for electric vehicles. J Energy Storage., 60 (2023), ... Life cycle assessment of an innovative lithium-ion battery recycling route: a feasibility study. J. Clean. Prod., 368 (2022), 10.1016/j.jclepro.2022.133130. Google Scholar

Lithium-ion batteries (LIBs) are a key technological component of EVs, and as such a lot of attention has understandably been paid to their environmental performance (Ellingsen et al., 2014; Harper et al., 2019; ...

The lithium ion battery used in IT market accounted for 81.1% of the lithium-ion battery market, new energy vehicles and electric bicycles with power lithium ion batteries accounted for 16.8%, and communication and new energy storage with lithium ion batteries took 2.1% of the lithium ion battery market (2015).

In light of the increasing penetration of electric vehicles (EVs) in the global vehicle market, understanding the

environmental impacts of lithium-ion batteries (LIBs) that characterize the EVs is key to sustainable EV deployment. This study analyzes the cradle-to-gate total energy use, greenhouse gas emissions, SOx, NOx, PM10 emissions, and water consumption ...

Note: Tables 2, 3 and 4 indicate general aging trends of common cobalt-based Li-ion batteries on depth-of-discharge, temperature and charge levels, Table 6 further looks at capacity loss when operating within given and discharge bandwidths. The tables do not address ultra-fast charging and high load discharges that will shorten battery life. No all batteries ...

Finding scalable lithium-ion battery recycling processes is important as gigawatt hours of batteries are deployed in electric vehicles. Governing bodies have taken notice and have begun to enact ...

LCA of Li beyond batteries: (a) Characterization results for the production of 1 kW h of Na-ion battery storage capacity and contribution of the principal battery components to the ...

Life Cycle Assessment of a Lithium-Ion Battery pack for Energy storage Systems. Lollo Liu. This thesis assessed the life-cycle environmental impact of a lithium-ion battery pack intended for ...

Life cycle assessment of lithium ion battery from water-based manufacturing for electric vehicles. Resour Conserv Recycl, 198 (2023) Google Scholar [30] Y. Deng, J. Li, T. Li, X. Gao, C. Yuan. Life cycle assessment of lithium sulfur battery for electric vehicles. J Power Sources, 343 (2017), pp. 284-295.

These functional units were 1 kg of battery, 1 pack, 1 kWh, 1 kW, and 1 km driven in an electric vehicle. 76 Some researchers recommended the use of 1 kWh in all LCAs as means of facilitating the ...

It is expected that the global market size of lithium-ion batteries (LIBs) will increase from USD 44.2 billion in 2020 to 94.4 billion by 2025 (MARKETSANDMARKETS 2020).The rapidly growing lithium-ion battery (LIB) market is attributed to the urgent need of mitigating and eventually eliminating carbon emissions, especially for European countries, who have agreed ...

Lithium-ion batteries (LIBs) are the ideal energy storage device for electric vehicles, and their environmental, economic, and resource risks assessment are urgent issues. ...

Life cycle assessment of a lithium-ion battery vehicle pack: LCA of a Li-ion battery vehicle pack J. Ind. Ecol., 18 (2014), pp. 113 - 124, 10.1111/jiec.12072 View in Scopus Google Scholar

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 ...

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.

This study presents a review of how the end-of-life (EOL) stage is modelled in life cycle assessment (LCA) studies of lithium-ion batteries (LIBs). Twenty-five peer-reviewed journal and conference papers that consider the ...

This thesis assessed the life-cycle environmental impact of a lithium-ion battery pack intended for energy storage applications. A model of the battery pack was made in the life-cycle assessment-tool, openLCA. The environmental impact assessment was conducted with the life-cycle impact assessment methods recommended in the Batteries Product

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 ...

Dunn JB, Gaines L, Barnes M, et al. (2012a) Material and energy flows in the materials production, assembly, and end-of-life stages of the automotive lithium-ion battery life cycle. No. ANL/ESD/12-3 Rev. Argonne, IL: Argonne National Lab (ANL).

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 ...

This study conducts a rigorous and comprehensive LCA of lithium-ion batteries to demonstrate the life cycle environmental impact hotspots and ways to improve the hotspots for the sustainable development of BESS and thus, renewable electricity infrastructure.

Life cycle assessment (LCA) literature evaluating environmental burdens from lithium-ion battery (LIB) production facilities lacks an understanding of how environmental ...

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 recycling. In short, the results indicate that the ReLion process:

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-ion ...

Life cycle assessment of lithium-ion batteries and vanadium redox flow batteries-based renewable energy storage systems: Da Silva Lima L., Quartier M., Buchmayr A., Sanjuan-Delmás D., Laget H., Corbisier D., Mertens J., Dewulf J. ... Comparative life cycle assessment of battery storage systems for stationary

applications. Environ Sci Technol ...

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