



Environmental impact assessment requirements for lead-acid battery production

Based on aforementioned battery degradation mechanisms, impacts (i.e. emission of greenhouse gases, the energy consumed during production, and raw material depletion) (McManus, 2012) during production, use and end of battery's life stages are considered which require the attention of researchers and decision-makers. These mechanisms are not ...

Although this paper is aimed at the power lead-acid battery, the research method is also of significance for the power lithium-ion battery, and we will conduct relevant research on the ...

Demand for high capacity lithium-ion batteries (LIBs), used in stationary storage systems as part of energy systems [1, 2] and battery electric vehicles (BEVs), reached 340 GWh in 2021 [3]. Estimates see annual LIB demand grow to between 1200 and 3500 GWh by 2030 [3, 4]. To meet a growing demand, companies have outlined plans to ramp up global battery ...

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 ...

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The first LCA including a vanadium redox flow battery was conducted by Rydh in 1999, which compared the life cycle environmental impact of the VRFB with a lead-acid battery and found that the VRFB exhibited lower environmental impact (using an aggregated environmental impact score) than lead-acid batteries.

The use of LCA can therefore help to quantify the environmental impact over the production, use and disposal of batteries. ... and so were omitted for the production of the lead acid battery. Further research is required to ensure the accurate modelling of these materials. ... life cycle assessment - requirements and guidelines, International ...

Overview Approximately 86 per cent of the total global consumption of lead is for the production of lead-acid batteries, mainly used in motorized vehicles, storage of energy generated by photovoltaic cells and wind turbines, and for back-up power supplies (ILA, 2019). The increasing demand for motor vehicles as countries undergo economic development and ...



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First, the study finds that the lead-acid battery has approximate environmental impact values (per kWh energy delivered): 2 kg CO₂ eq for climate change, 33 MJ for resource use - fossil, 0.02 mol H⁺ eq For acidification potential, 10⁻⁷ disease incidence for particulate emission, and 8 × 10⁻⁴ kg Sb eq for resource use - minerals and ...

He is an expert in environmental and analytical chemistry with a particular interest in environmental fate assessment and removal of anthropogenic pollutants. ... The main aim of this study is to provide an up-to ...

Several studies have analyzed the environmental impact of lead refining (Sullivan and Gaines 2010; Davidson et al. 2016; Liu et al. 2015). Sullivan and Gaines reviewed and compared lead-acid, nickel-cadmium, nickel-metal hydride, sodium-sulfur, and lithium-ion battery production technologies via LCA in the European Union (EU). The ...

The environmental risk assessment was required to be studied further in view of the diversity, emergency, and the serious consequences of the environmental accidents that may caused by lead-acid ...

Compare lifecycle assessment of LIBs and lead acid batteries: Usage phase contributes to high climate change and fossil resource depletion at 30%. Increasing renewable mix decreases environmental impact of use phase in battery production. NCA battery more environmentally friendly than lead acid batteries. (Han et al., 2023) 2023

Despite China's leaded gasoline phase out in 2000, the continued high rates of lead poisoning found in children's blood lead levels reflect the need for identifying and controlling other sources of lead pollution. From 2001 to 2007, 24% of children in China studied (N = 94,778) were lead poisoned with levels exceeding 100 mg/L. These levels stand well above the global ...

The study demonstrates that the technological capabilities of innovative advanced lead batteries used in start-stop vehicles significantly offset the environmental impact of their...

The results showed that the overall impact of LIPB production on environment is the smallest. The key substances that cause the environmental impact of LAB production process are refined lead and tin. ... "Lead acid battery industry access conditions" (MIIT and MEP, 2015), "Notice on the consumption of the battery paint" (MOF, 2015 ...

The material requirements for the lead-acid battery are shown in Table 2. Over 20 years, 200 cells will be replaced four times and approximately 25 000 l of water will be added intermittently. ... the environmental impact of the lead-acid battery has to be classified as a low impact scenario in comparison to a lead-acid battery life cycle in ...



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The goal of this study is to conduct a detailed environmental impact assessment of flow battery production and to evaluate the sensitivity of the results to materials selection and system design choices. The battery production phase is comprised of raw materials extraction, materials processing, component manufacturing,

Lead Acid Materials Cathode: Lead Oxide Anode: Refined Lead Electrolyte: Sulfuric Acid Separator: Polyethylene Hexafluorophosphate Execute a hybrid input-output life cycle assessment to calculate the environmental impact of lithium-ion versus lead-acid batteries. This should inform the public how battery selection is coupled with environmental ...

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

Every step in the life cycle of lead-acid batteries may have negative impact on the environment, and the assessment of the impact on the environment from production to ...

The cradle-to-grave life cycle study shows that the environmental impacts of the lead-acid battery measured in per "kWh energy delivered" are: 2 kg CO₂eq (climate change), ...

Electric vehicle batteries use energy and generate environmental residuals when they are produced and recycled. This study estimates, for 4 selected battery types (advanced lead-acid, sodium-sulfur, nickel-cadmium, and nickel-metal hydride), the impacts of production and recycling of the materials used in electric vehicle batteries. These impacts are ...

Further analysis specific to grid-connected LIB systems - encompassing use phase (battery operation) and EOL, in addition to production phase - is required for a robust assessment of ...

Lead-acid batteries (LABs), a widely used energy storage equipment in cars and electric vehicles, are becoming serious problems due to their high environmental impact. In this study, an integrated method, combining material flow analysis with life cycle assessment, was developed to analyze the environmental emissions and burdens of lead in LABs. The environmental burdens ...

2.2 Conclusion-lead production LCI The results of the study show that the mining and concentration for the production of 1 kg of refined lead is one of the Fig. 1 Process flows for lead production LCI Table 2 Impact category analyses in lead production LCI and associated values for 1 kg of lead Impact category (unit) Value Primary energy ...

The growth of e-waste streams brought by accelerated consumption trends and shortened device lifespans is poised to become a global-scale environmental issue at a short-term [1], i.e., the electromotive vehicle industry with its projected 6 million sales for 2020 [[2], [66]]. Efforts for the regulation and proper management of



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electronic residues have had limited ...

Methods The lead industry, through the International Lead Association (ILA), has recently completed three life cycle studies to assess the environmental impact of lead metal production and two of ...

Life cycle assessment is applied to analyze and compare the environmental impact of lead acid battery (LAB), lithium manganese battery (LMB) and lithium iron phosphate battery (LIPB) within the system boundary of "cradle-to-gate". ... the impact of the battery production process on the environment mainly focuses on the 5 environmental ...

When constructing a microgrid system, the battery system is crucial. When the generated power exceeds the local energy need, many situations develop. Storage devices can be used to store the extra power. In a power outage, energy from a battery may be used to power the region. A lead-acid battery was utilized to represent the microgrid system.

Purpose Nowadays, the electric vehicle is one of the most promising alternatives for sustainable transportation. However, the battery, which is one of the most important components, is the main contributor to environmental impact and faces recycling issues. In order to reduce the carbon footprint and to minimize the overall recycling processes, this paper ...

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