

Hydrometallurgical lead-acid battery



Overview

Recycling spent lead-acid batteries has always been a research hotspot. Although traditional pyrometallurgical smelting is still the dominant process, it has serious environmental drawbacks, such as the emission of lead and sulfur dioxide. Lead paste was recovered via leaching and electrowinning in. Lead-acid batteries are the oldest type of rechargeable battery and have been widely used in many fields, such as automobiles, electric vehicles, and energy storage due to the features of low cost and high efficiency. 2.1. MaterialsThe dry spent lead paste sample was provided by a spent lead-acid battery recycling plant located in Hubei Province, China. The sample was analyzed by X-ray fluorescence (XRF) and inductively coupled plasma atomic emission spectroscopy (ICP-AES). 3.1. Leaching of leadAs a considerable proportion of lead in lead paste exists in the form of PbO_2 (Fig. 1), reductive leaching is necessary. Five operational variables were studied: temperature, leaching time, solid-to-liquid ratio, leaching agent concentration, and stirring speed. The proposed process is an attractive solution to extracting Pb from spent lead-acid battery paste. The lead in the raw material was recovered via a direct leaching-electrowinning process.



Article Content

A green recycling process of the spent lead paste from discarded lead ...

Ma Y, Qiu K (2015) Recovery of lead from lead paste in spent lead acid battery by hydrometallurgical desulfurization and vacuum thermal reduction. Waste Management 40: 151–156. Crossref. PubMed. ISI. Google Scholar. Pan J, Sun Y, Li W, et al. (2013) A green lead hydrometallurgical process based on a hydrogen-lead oxide fuel cell.

The Recovery of Lead from Spent Lead Acid Battery Paste by ...

Hydrometallurgical lead recycling involves acidic solution reduction and wet processing techniques to recover Pb salt in the lead paste . Conversely, a new family of liquids known as deep ...

Green Chemistry RSCPublishing

Using lead citrate from hydrometallurgical leaching of lead paste as a precursor, electrochemically active carbon materials were produced as a new product with hierarchical open sponge-like porosity. ... lead acid battery paste, while simultaneously fixing lead in lead citrate crystals⁶. Lead citrate crystal is a versatile raw material

Recovery of lead from lead paste in spent lead acid battery by ...

This paper reports a recovery of lead contained in spent lead acid battery using hydrometallurgical desulfurization and vacuum thermal reduction. The spent lead pastes are converting sulfur (PbSO_4) to soluble sulfates (Na_2SO_4) by reacting with alkaline reagents Na_2CO_3 . As both of the conversion of lead sulfate into carbonate and the ...

Lead Acid Battery Recycling

In fact, the lead acid battery industry recycled >99% of the available lead scrap from spent lead acid batteries from 1999 to 2003, according to a report issued by the Battery Council International (BCI) in June 2005, ranking the lead recycling rate higher than that of any other recyclable material [Gabby, 2006]. However, emerging technologies such as lithium ion batteries, nickel ...

A green recycling process of the spent lead paste from discarded lead ...

In this study, a green recycling process of discarded lead-acid battery paste, which could avoid both the smelting and electro-winning route has been developed. ... A green recycling process of the spent lead paste from discarded lead-acid battery by a hydrometallurgical process Show all authors. Xinfeng Zhu 1 # Xinfeng Zhu . Department of ...

The Recovery of Lead from Spent Lead Acid Battery Paste by ...

The recovery of lead from spent lead acid battery paste (SLP) is not only related to the sustainable development of the lead industry, but also to the sustainable evolution environment. ... Pan JQ, Sun YZ, Li W, Knight J, Manthiram A (2013) A green lead hydrometallurgical process based on a hydrogen-lead oxide fuel cell. *Nat Commun* 4:2178

Recovery of Lead Metal from Lead Acid Battery by ...

Abstract—This work aims at recovering lead metal from used lead acid batteries, by the hydrometallurgical method. The treatment of used batteries for recovering lead is important ...

Hydrometallurgical recovery of lead from spent lead-acid battery ...

This study presents a clean process for recycling spent lead-acid battery paste. The lead in paste was recovered via hydrometallurgical leaching and electrowinning in chloride solution. The ...

Recovery of lead from lead paste in spent lead acid battery by ...

Download Citation | Recovery of lead from lead paste in spent lead acid battery by hydrometallurgical desulfurization and vacuum thermal reduction | Lead sulfate, lead oxides and lead metal are ...

Lead recovery from spent lead acid battery paste by ...

In this study, a novel approach involving hydrometallurgical desulphurisation and thermal degradation is developed to recover lead as PbO products from spent lead acid batteries. First, ...

Leaching properties of lead paste in spent lead-acid battery with a ...

Background Lead citrate is an attractive precursor in the preparation of ultrafine leady oxide from the paste in spent lead-acid battery through a novel hydrometallurgical process, since the ...

Emerging Electrochemical Techniques for Recycling Spent Lead ...

Spent lead paste (SLP) obtained from end-of-life lead-acid batteries is regarded as an essential secondary lead resource. Recycling lead from spent lead-acid batteries has been demonstrated to be of paramount significance for both economic expansion and environmental preservation. Pyrometallurgical and hydrometallurgical approaches are proposed to recover ...

Pyrometallurgical Processing of Secondary Lead Material: An

Lead from spent batteries can be recovered via pyrometallurgical or hydrometallurgical routes. The most common route worldwide for lead recovery from secondary materials is pyrometallurgy. ... Millotte D (2005) The Interests of a tilting rotary furnace in the industry for lead/acid battery recycling. s.l.: B.J. Industries. Google Scholar ...

Emerging Electrochemical Techniques for Recycling Spent Lead ...

Spent lead paste (SLP) obtained from end-of-life lead-acid batteries is regarded as an essential secondary lead resource. Recycling lead from spent lead-acid batteries has ...

Lead acid battery recycling for the twenty-first century

used lead-acid battery recycling: 2 000 000–4 800 000: 2: mining and ore processing: 450 000–2 600 000: 3: lead smelting: 1 000 000–2 500 000: 4: ... In hydrometallurgical lead recycling, the reduction of the salts in lead paste occurs though a solution-based methodology.

Novel Lead Battery Recycling Process Combining ...

Lead acid batteries are processed mainly by using pyrometallurgical operations with problems related to SO₂ evolution. Many efforts have been devoted to solving this concern. In this work, where only the anode preparation was a pyrometallurgical process, this problem has been overcome by limiting the process temperature. Several tests have been carried out in ...

Progress in Waste Lead Paste Recycling Technology from Spent Lead-Acid ...

This non-standard recycling method results in relatively high lead exposure in China (Ye and Wong, 2006). This will not only contaminate the surrounding water and soil (Nodeh et al., 2023; Jie et ...

Hydrometallurgical recovery of lead from spent lead-acid battery ...

Recycling spent lead-acid batteries has always been a research hotspot. Although traditional pyrometallurgical smelting is still the dominant process, it has serious environmental drawbacks, such as the emission of lead dust and SO₂, and high energy consumption. This study presents a clean process for recycling spent lead-acid battery paste.

US4769116A

The invention relates to a hydrometallurgical process for the overall recovery of the components of exhausted lead-acid batteries, in a re-useable form, said components being mainly constituted by such materials as polypropylene, ebanite, PVC; by paste comprising lead sulphatized compounds; and by pure or alloyed metal lead, characterized in that it comprises the following steps: (a) ...

A green lead hydrometallurgical process based on a ...

Nature Communications - Lead-acid batteries are used worldwide, but their recycling remains challenging because of lead pollution and high energy consumption. Pan et al. solve these problems in...

Recovery of lead from lead paste in spent lead acid battery by ...

DOI: 10.1016/j.wasman.2015.03.010 Corpus ID: 19616211; Recovery of lead from lead paste in spent lead acid battery by hydrometallurgical desulfurization and vacuum thermal reduction.

Review on clean recovery of discarded/spent lead-acid battery ...

A hydrometallurgical recovery route can eliminate the smelting procedure for lead ingot production and the following steps of Ball-milling or Barton liquid lead atomizing for lead oxide production in conventional lead mass flow ...

Role of Iron Impurity in Hydrometallurgical Recovery Process of ...

Recently, many hydrometallurgical alternative routes for the re-recovery of spent lead-acid battery (LAB) paste have been developed due to the high energy consumption and sulfur oxides emission of the traditional pyrometallurgical recycling method.¹ Owing to the high content of impurities including iron oxides, barium sulfate, etc. in the

Lead recovery from spent lead acid battery paste by hydrometallurgical ...

Zhu XF, Zhang W, Zhang LY, et al. (2019) A green recycling process of the spent lead paste from discarded lead-acid battery by a hydrometallurgical process. Waste Management & Research 37: 508–515. Crossref. PubMed. ISI. Google Scholar. Cite article Cite article. Cite article COPY CITATION OR. Download to reference manager ...

Lead recovery from spent lead acid battery paste by hydrometallurgical ...

In this study, a novel approach involving hydrometallurgical desulphurisation and thermal degradation is developed to recover lead as PbO products from spent lead acid batteries. First, the desulphurisation effects and phase compositions of products with different transforming agents were compared, and the optimum conditions using (NH₄)₂CO₃ ...

A Review on Recycling of Waste Lead-Acid Batteries

Liu W. et al 2020 Lead recovery from spent lead acid battery paste by hydrometallurgical conversion and thermal degradation. Waste Management & Research 38 263-270. Google Scholar Hu Y.J et al 2015 Reductive smelting of spent lead-acid battery colloid sludge in a molten Na₂CO₃ salt. International Journal of Minerals Metallurgy and ...

Hydrometallurgical recovery of lead from spent lead-acid battery ...

DOI: 10.1016/J.HYDROMET.2019.105134 Corpus ID: 202035435; Hydrometallurgical recovery of lead from spent lead-acid battery paste via leaching and electrowinning in chloride solution

Progress in Waste Lead Paste Recycling Technology from Spent Lead-Acid ...

Considering the extremely dispersed lead-acid battery industry in China, hydrometallurgical technology is a good choice for small- and medium-sized recycling enterprises. In recent years, battery material preparation based on the short-process conversion of waste lead paste has become a research hotspot.

A green recycling process of the spent lead paste from discarded lead ...

Lead citrate was $\text{Pb}_3(\text{C}_6\text{H}_5\text{O}_7)_2 \cdot 3\text{H}_2\text{O}$ in a column-shaped morphology with a length of 20–50 μm and a diameter of 10–50 μm . This study contributes to the application of the new green hydrometallurgical process of recovery from a spent acid battery of lead-acid battery paste.

Lead recovery from spent lead acid battery paste by hydrometallurgical ...

A green recycling process of the spent lead paste from discarded lead-acid battery by a hydrometallurgical process. Jan 2019; 508-515; X F Zhu; W Zhang; Zhang; Ly;

Recovery of lead from lead paste in spent lead acid battery by ...

This paper reports a recovery of lead contained in spent lead acid battery using hydrometallurgical desulfurization and vacuum thermal reduction. The spent lead pastes are ...

Leaching of spent lead acid battery paste components by sodium ...

In this paper, as shown in Process (II) in Fig. 1, acetic acid in conjunction with sodium citrate was used in the hydrometallurgical process for recovery of spent lead paste. Acetic acid is the simplest carboxylic acid and is a lower cost carboxylic acid in comparison with citric acid which has been suggested in previous studies, this process, spent lead paste ...

Review on clean recovery of discarded/spent lead-acid battery ...

Bibliometric analysis of recovery of spent lead-acid battery based on recent publications from 1987 to 2018 shows that the organic acid leaching-calcination process is the most frequently published technology in hydrometallurgical processes, meanwhile leady oxide and lead oxide are the most recovered products.

Revolutionary hydrometallurgical process for the regeneration of ...

(see figure 2) has been produced with the hydro-metallurgical Lead Oxide Regeneration technology proposed by STC. After several tests, it has been proved that the obtained batteries ...

Revolutionary hydrometallurgical process for the regeneration of lead ...

Revolutionary hydrometallurgical process for the regeneration of lead oxide from exhausted lead acid batteries It is common knowledge that all traditional lead recycling processes contemplate smelting, which is a highly polluting, expensive and inefficient process. This is due to the use of furnaces which work at very high

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