A review of current collectors for lithium-ion batteries

Lithium-ion batteries are the state-of-the-art power source for most consumer electronic devices. Current collectors are indispensable components bridging lithium-ion batteries and external circuits, greatly influencing the capacity, rate capability and long-term stability of lithium-ion batteries. Conventional current collectors, Al and Cu foils have been used since the first ...

Realizing fast-charging and energy-dense lithium-ion batteries remains a challenge. Now, a porous current collector has been conceptualized that halves the effective lithium-ion diffusion distance ...

This review summarised the key findings of lithium ion battery current collector degradation and highlighted areas for further study. Although it is evident that significant current collector corrosion is present under both normal and extreme operating conditions, their degradation is generally not considered widely in the context of overall ...

Innovate UK (current collector for improved battery performance, COATED, ref/2021,2022,98297). Innovate UK (thin and lightweight current collector for lithium-ion battery, CONDUCTOR, ref/2023,2024,10047927). Innovate UK (coated current collector for battery performance improvement, CONTACT, ref/2023-2025,10041084).

LMBs consist of several types, including traditional lithium metal battery (TLMB) which use free lithium metal foil as the anode, pre-deposited Li metal battery (PLMB) which do not use lithium foil as the anode directly but use a lithium-deposited porous current collector (e.g., Cu) prior to full battery assembly, and the anode-free lithium ...

This article reviews the impact of the CC on the electrochemical performance and safety of conventional LIBs in four aspects: CC requirements, manufacturing process, surface ...

This review discusses the lithium ion battery as the leading electrochemical storage technology, focusing on its main components, namely electrode (s) as active and electrolyte ...

17, 18 The electrochemical performance of the lithium-ion battery is greatly influenced by the current collector"s thickness, weight, and surface performance. 17,19 As the main bridge of the ...

State-of-the-art lithium-ion batteries inevitably suffer from electrode corrosion over long-term operation, such as corrosion of Al current collectors. However, the understanding of Al corrosion ...

The current collector is one of the important components of a lithium-ion battery. It can not only carry the electrode active material, but also collect the current generated by the electrode active material to form a larger current output, which improves the charge / discharge efficiency of the lithium-ion battery.

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Although the harmful alloying reaction between current collectors and lithium metal can lead to a decrease in available active lithium, but when the alloying reaction is reversible allowing both insertion and extraction of Li + ...

Compared to lithium-ion batteries assembled with the thinnest commercial metal foil current collectors (~6 µm), batteries equipped with our composite current collectors can realize a 16-26% ...

Lithium-sulfur (Li-S) batteries are receiving increasing attention because of their high theoretical energy density and the natural abundance of S. However, their practical applications are impeded by the low areal S loading in the cathode and the fatal Li dendrites in the anode of the Li-S cells, which yield an inferior practical energy density and introduce safety ...

Another important, however, not often discussed factor contributing to the battery ageing is the stability of the current collector-active material interface, where the corrosion of the metal substrate plays the most detrimental role [8] principle, corrosion is a spontaneous process assisted by the environmental conditions that cause degradation of metals, alloys, ...

Current collectors (CCs) are an important and indispensable constituent of lithium-ion batteries (LIBs) and other batteries. CCs serve a vital bridge function in supporting active materials such ...

Energy storage systems as lithium-ion batteries (LIBs) have become an essential part of our lives, powering on-the-go technologies we use every day. ... Changing the battery current collector from planar to three-dimensional (3D) would offer dimensionality to the electrodes meaning short diffusion length for Li-ions, which will boost power ...

Abstract In this work a significant improvement of the performance of LiFePO4 (LFP) composite cathodes, in particular at high rates (up to 12C), is demonstrated by the use of carbon-coated aluminum current collectors. The coating procedure is novel, and allows for application of a thin carbon layer without the use of solvent and binder. The presence of the ...

This paper compares six types of materials and structures for current collectors in lithium-ion batteries, and evaluates their performance, stability, cost and sustainability. It also discusses ...

Calendering is a crucial process in the manufacturing of lithium-ion battery electrodes. However, this process introduces several challenges to the current collector, including uneven stress distribution, stress concentration, and plastic pits, which ultimately impact electrode consistency and safety. It is important to note that the load exerted on the current collector ...

Lithium (Li) metal anodes have become research hotspots due to their high theoretical specific capacity (3860

mAhg -1) and lowest REDOX potential (-3.04 V, based on the standard hydrogen electrode).When the Li metal is deposited/stripped directly on the current collector (i.e., anode-free Li metal batteries (AFLMBs)), the energy density increases ...

With increasing interest in flexible electronic devices and wearable appliances, flexible lithium ion batteries are the most attractive candidates for flexible energy sources. During the last decade, many different kinds of flexible batteries have been reported. Although research of flexible lithium ion batteries is in its earlier stages, we have found that developing components that satisfy ...

In this review, the corrosion failure behavior of the cathode aluminum current collector in lithium-ion batteries with organic electrolytes is comprehensively analyzed, and the corresponding protective strategies are systematically summarized.

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Lithium-ion batteries are the state-of-the-art electrochemical energy storage technology for mobile electronic devices and electric vehicles. Accordingly, they have attracted a continuously increasing interest in academia and industry, which has led to a steady improvement in energy and power density, while the costs have decreased at even faster pace.

Current collectors (CCs) are an important and indispensable constituent of lithium-ion batteries (LIBs) and other batteries. CCs serve a vital bridge function in supporting active materials such ...

A hermetic dense polymer-carbon composite-based current collector foil (PCCF) for lithium-ion battery applications was developed and evaluated in comparison to state-of-the-art aluminum (Al) foil collector.

Then recent advances in the development of advanced metal and carbon-based current collectors are examined for boosting the stability and cycle life of lithium metal batteries (LMBs) in terms of ...

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