



# Solid-state lithium battery electrode materials

Cathode materials used in all-solid-state lithium-ion batteries are similar to those in the traditional lithium-ion batteries (for example, lithium transition metal oxides 136-139 and sulfides ...

Developing safe electrolytes compatible with high-energy-density electrodes is key for the next generation of lithium-based batteries. Stable solid-state rigid-rod polymer composite electrolytes ...

An all-solid-state battery with a lithium metal anode is a strong candidate for surpassing conventional lithium-ion battery capabilities. ... and cost of materials for lithium-based rechargeable ...

The first report describing the feasibility of organic radicals as electrode materials for lithium batteries. ... All-solid-state lithium organic battery with composite polymer electrolyte and ...

Is cobalt needed in Ni-rich positive electrode materials for lithium ion batteries? J. ... Y.-G. et al. High-energy long-cycling all-solid-state lithium metal batteries enabled by silver-carbon ...

In solid-state batteries, carbon-based materials are one of the outstanding anode materials used widely [63], [64]. Graphite is one of the exceptional materials employed for solid-state batteries because of the distinctive layered structure capable of integrating the lithium-ions throughout the Lithiation/delithiation processes.

Recent worldwide efforts to establish solid-state batteries as a potentially safe and stable high-energy and high-rate electrochemical storage technology still face issues with long-term ...

In the past decade, great breakthroughs have been made in the research of electrodes, electrolyte materials and electrode/electrolyte interfaces of high-voltage all-solid-state lithium batteries (ASSLBs). Herein, we summarize the emerging high-voltage cathode materials and their matched solid-state electrolytes; we also analyze the interface ...

1 Introduction. Solid-state batteries (SSBs) are attracting attention for their expected increased energy density and improved safety. [] Compared to conventional lithium-ion batteries that are based on solid ...

All-solid-state lithium batteries (ASSLBs) with nonflammable solid electrolytes (SEs) deliver greatly enhanced safety characteristics. Furthermore, ASSLBs ...

At present, the development of lithium ion battery materials is mainly focused on two aspects: (i)Creating solid electrolytes to improve safety; (ii)Developing innovative high-capacity electrode materials to improve energy density [5]. New glass materials have received a lot of attention recently in the field of energy storage, ...



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Solid-state lithium metal batteries (SSLBs) using inorganic solid-state electrolytes (SSEs) have attracted extensive scientific and commercial interest owing to their potential to provide higher ...

Lithium-based batteries are a class of electrochemical energy storage devices where the potentiality of electrochemical impedance spectroscopy (EIS) for understanding the battery charge storage ...

In recent years, solid-state lithium batteries (SSLBs) using solid electrolytes (SEs) have been widely recognized as the key next-generation energy ...

2 &#0183; Solid-state batteries (SSBs) have gained substantial attention for their potential to surpass lithium-ion batteries as advanced energy storage devices 1,2,3.Major ...

All-solid-state lithium-metal batteries (ASSLBs) with NMC811 cathodes can meet the high-energy-density and safety requirements for electric vehicles and large-scale energy storage systems.

This solid electrolyte/electrode material integrated design can effectively strengthen the solid-solid interface contact, reduce the battery impedance, and achieve the high specific energy and long life of the flexible solid-state battery. ... The solid-state lithium battery is expected to become the leading direction of the next generation of ...

All-solid-state Li-metal batteries. The utilization of SEs allows for using Li metal as the anode, which shows high theoretical specific capacity of 3860 mAh g<sup>-1</sup>, ...

In comparison, solid-state lithium metal batteries (SSLMBs) provide better safety because of the use of non-flammable solid-state electrolyte, ... TCEs consist of a metal-coated textile and electrode materials coated on this porous metallic textile. The 3D metallic textile, acting as the current collector, provides a large contact surface and ...

Solid-state lithium batteries have attracted considerable research attention for their potential advantages over conventional liquid electrolyte lithium batteries. The discovery of lithium solid-state electrolytes (SSEs) is still undergoing to solve the remaining challenges, and machine learning (ML) approaches could potentially ...

The positive electrode|electrolyte interface plays an important role in all-solid-state Li batteries (ASSLBs) based on garnet-type solid-state electrolytes (SSEs) like Li<sub>6.4</sub>La<sub>3</sub>Zr<sub>1.4</sub>Ta<sub>0.6</sub>O<sub>12</sub> (LLZTO).

We report the preparation of thick electrode all-solid-state lithium-ion cells in which a large geometric capacity of 15.7 mAh cm<sup>-2</sup> was achieved at room temperature using a 600 nm-thick cathode layer. The effect of ionic conductivity on the discharge performance was then examined using two different materials for the solid ...



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In this study, the effect of the active material geometry on the tortuosity in the ion transport path of the electrode composite of an all-solid-state lithium battery was systematically analyzed in terms of the different design and process factors of an electrode. A direct current technique (i.e., chronoamperometry) using an electron-blocking cell was ...

Solid-state lithium metal batteries offer superior energy density, longer lifespan, and enhanced safety compared to traditional liquid-electrolyte batteries. Their development has the potential to revolutionize battery technology, including the creation of electric vehicles with extended ranges and smaller more efficient portable devices. The ...

A crucial element for the successful use of rechargeable SSLBs is solid electrolyte. In general, ideal SEs should possess the properties such as negligible electronic conductivity ( $<10^{-10} \text{ S cm}^{-1}$ ) and high  $\text{Li}^+$  conductivity ( $>1 \text{ mS cm}^{-1}$ ) [6], good chemical compatibility with the electrodes, wide electrochemical stability window, excellent ...

Here, the authors propose a mechanical optimization strategy involving elastic electrolyte to realize solid-state batteries operating without external pressurizing.

In addition to the understanding of the occurring volume changes of electrode materials and resulting pressure changes in solid-state batteries, we propose "mechanical" blending of electrode materials to achieve better cycling performance when aiming at "zero-strain" electrodes.

This review presents a brief scenario regarding the development of cathodes, anodes, and electrolytes for next-generation Li-ion batteries (LIBs) and supercapacitors for future energy technologies. The specific capacity and power density are two prime requirements for energy storage devices, which are mainly Energy Advances Recent Review Articles ...

The current lithium-ion battery (LIB) electrode fabrication process relies heavily on the wet coating process, which uses the environmentally harmful and toxic N-methyl-2-pyrrolidone (NMP) solvent.

Lithium-sulfur all-solid-state batteries using inorganic solid-state electrolytes are considered promising electrochemical energy storage technologies. However, developing positive electrodes with ...

This review presents a brief scenario regarding the development of cathodes, anodes, and electrolytes for next-generation Li-ion batteries (LIBs) and supercapacitors for future energy technologies. The specific ...

Solid-state batteries with lithium metal anodes and ceramic electrolytes are of intense current interest as they could deliver a step change in energy density, as well as improved safety compared ...

2 ‰ Solid-state batteries (SSBs) have gained substantial attention for their potential to surpass



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lithium-ion batteries as advanced energy storage devices 1,2,3. Major advancement is expected by the ...

In this review, the main components of solid-state lithium-ion batteries and the variables that could impact the properties of the anode, cathode and electrolytes ...

The solid-state battery approach, which replaces the liquid electrolyte by a solid-state counterpart, is considered as a major contender to LIBs as it shows a ...

2 &#0183; Asano, T. et al. Solid halide electrolytes with high lithium-ion conductivity for application in 4 V class bulk-type all-solid-state batteries. Adv. Mater. 30, 1803075 ...

solid-state lithium-based batteries ... similar to standard layered oxide positive electrode active materials  $\text{LiCoO}_2$  and  $\text{LiNi}_{0.8}\text{Mn}_{0.1}\text{Co}_{0.1}\text{O}_2$  1-6. Nevertheless, unlike these oxides,

DOI: 10.1016/J.JPOWSOUR.2008.05.031 Corpus ID: 93876836; All-solid-state rechargeable lithium batteries with  $\text{Li}_2\text{S}$  as a positive electrode material @article{Hayashi2008AllsolidstateRL, title={All-solid-state rechargeable lithium batteries with  $\text{Li}_2\text{S}$  as a positive electrode material}, author={Akitoshi Hayashi and Ryoji Ohtsubo ...

Cathodes. The first intercalation oxide cathode to be discovered,  $\text{LiCoO}_2$ , is still in use today in batteries for consumer devices. This compound has the  $\alpha\text{-NaFeO}_2$  layer structure (space group  $R\bar{3}m$ ), consisting of a cubic closepacked oxygen array with transition metal and lithium ions occupying octahedral sites in alternating layers (Figure 3). The potential ...

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