

# Bismuth lithium-ion battery



## Overview

Utilizing carbon materials as 3D lithium (Li) hosts hold a significant interest in constructing high-energy batteries. However, there are ongoing challenges associated with these frameworks owing to their poor L. ••Bi-DPC derived from MOF is synthesized via chemical etching and. The utilization of lithium (Li) metals as anodes in batteries forms the bases of most energy storage devices,,,,. This stems from the outstanding properties of Li as it can sto. 2.1. Synthesis of porous carbon from ZIF-8 (DPC)A 50 ml solution (solution A) was prepared by mixing 2-methylimidazole (10 g, C<sub>4</sub>H<sub>6</sub>N<sub>2</sub>, Sigma-Aldrich, 9. 3.1. Material properties of Bi-DPCThe schematic illustration in Fig. 1 shows the Li plating behaviour on the DPC containing Zn, exhibiting a superficial deposition patter. The challenges associated with using DPC as Li host materials have led to an exploration of innovative solutions. This study demonstrated a promising way to mitigate dendriti.



## Article Content

The lithium intercalation process in the low-voltage lithium ...

low-voltage lithium battery anode  $\text{Li}_{1-x}\text{V}_x\text{O}_2$  A. Robert Armstrong<sup>1</sup>, Christopher Lyness<sup>1</sup>, Pooja M. Panchmatia<sup>2</sup>, M. Saiful Islam<sup>2\*</sup> ... milestone in lithium-ion battery research<sup>1</sup> 4. For almost twenty

Recent progress and challenges on the bismuth-based anode for ...

Bismuth: a new anode for the Na-ion battery. Nanomater. Energy (2015) J. Ni et al. Bismuth chalcogenide compounds  $\text{Bi}_2\text{X}_3$  (X=O, S, Se): applications in electrochemical energy storage. ... The state of understanding of the lithium-ion-battery graphite solid electrolyte interphase (SEI) and its relationship to formation cycling. Carbon (2016)

Implementation of Bismuth Chalcogenides as an Efficient Anode: ...

Bismuth Chalcogenides as the Anode in All-Solid-State Lithium-Ion Batteries It is already mentioned above that all-solid-state batteries attracted great attention as a next-generation Li-ion battery. Along with the non-flammable behavior of solid electrolytes, they can utilize Li-metal anodes and are able to effectively suppress the formation ...

Yolk-Shell-Structured Bismuth@N-Doped Carbon Anode for Lithium-Ion ...

As an anode for lithium-ion batteries, metallic bismuth (Bi) can provide a superb volumetric capacity of  $3800 \text{ mA h cm}^{-3}$ , showing perspective value for application. It is a pity that the severe volume swelling during the lithiation process leads to the dramatic deterioration of the cycling performances. To overcome this issue, Bi nanorods encapsulated in N-doped carbon ...

Multi-walled  $\text{Bi}_2\text{O}_3/\text{Bi}@C$  particles as a high-performance anode ...

In the past few years, some people have witnessed extensive research on bismuth and its compounds as anode materials for lithium-ion batteries, owing to their notable merits, including high specific capacity, environmental friendliness, and facile synthesis methods .Among them, bismuth oxide ( $\text{Bi}_2\text{O}_3$ ) has a relatively high mass-specific capacity (690 ...

Thermal synthesis of conversion-type bismuth fluoride cathodes ...

Bismuth fluoride is a promising cathode material for lithium ion batteries due to its high theoretical capacity and cycling stability, but low-cost production methods are...

Yolk-Shell-Structured Bismuth@N-Doped Carbon Anode for Lithium-Ion ...

The failure mechanism of Bi nanorods and the protective effect of the carbon shell are revealed by ex situ TEM, which illuminates the decreasing tendency in the initial 10-20 cycles and the subsequent stable trend of cyclic performance. As an anode for lithium-ion batteries, metallic bismuth (Bi) can provide a superb volumetric capacity of 3800 mA h cm<sup>-3</sup>, ...

Extended cycling performance of micron-sized bismuth anodes for lithium ...

This study investigates the potential of micron-sized Bi as an alloy-type anode material for lithium-ion batteries (LIBs). Compared to the limited capacity of conventional anode materials, Bi offers a high theoretical volumetric capacity of 3800 mA h cm<sup>-3</sup>. We utilized commercial micron-sized Bi powder and a conventional method to prepare Bi electrodes.

Alkaline Earth Bismuth Fluorides as Fluoride-Ion Battery Electrolytes

Alkaline Earth Bismuth Fluorides as Fluoride-Ion Battery Electrolytes. ... and fluoride-ion batteries are predicted to have higher energy densities than lithium-ion batteries. 4 A battery based on fluoride ions was first reported in 2011. 5 A major limitation today for fluoride-ion batteries is the development of electrolytes with sufficient ...

Implementation of Bismuth Chalcogenides as an Efficient Anode: ...

In this review paper, we discussed the recent progress of bismuth chalcogenide materials for conventional Li-ion batteries using liquid electrolyte as well as all-solid-state Li-ion batteries. The reaction mechanism of lithium storage in these materials has been well established.

Prospect of bismuth and its compounds in sodium-ion

Mature cathode materials suitable for lithium-ion battery (LIBs) have been applied in SIBs. ... Wang's group reported for the first time that a sodium-ion half-cell, consisting of a bismuth electrode made of bulk bismuth, carbon black and sodium carboxymethyl cellulose (CMC) and a 1.0 M of NaPF<sub>6</sub> in diglyme ...

Bismuth-based mixed-anion compounds for anode materials ...

Here, we present a facile synthesis of bismuth-based materials and demonstrate their applications as electrodes in LIBs. Our obvious choices of these ternary mixed-anion materials ...

Li<sub>3</sub>PO<sub>4</sub> Matrix Enables a Long Cycle Life and High Energy ...

Bismuth is a lithium-ion battery anode material that can operate at an equilibrium potential higher than graphite and provide a capacity twice as high as that of Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub>, making it intrinsically free from lithium plating that may cause catastrophic battery failure. However, the potential of bismuth is hampered by its inferior cyclability (limited to tens of cycles).

Graphene-like ultrathin bismuth selenide nanosheets as highly ...

Metallic bismuth (Bi) can be utilized as a promising anode in sodium and potassium ion batteries due to the following merits such as good electronic conductivity, large interlayer spacing and cheap price that can store bigger ions  $\text{Na}^+$  and  $\text{K}^+$ , toxic free and, environmental friendly green metal. Bismuth exhibits the higher theoretical volumetric capacity ...

#### Alkaline Earth Bismuth Fluorides as Fluoride-Ion Battery Electrolytes

Fluoride-ion batteries have several potential advantages over lithium-ion batteries. Materials development is still needed, however, to realize electrolytes with sufficiently high anion conductivity and compatibility with anode and cathode layers. Fluoride compounds are difficult to synthesize directly as single crystals but can be realized from oxide film precursors ...

#### Bismuth ion battery – A new member in trivalent battery technology

In this work, we report bismuth ion battery (BIB) as a promising trivalent metal ion battery, next to the only known aluminum ion battery. Our BIB successfully demonstrates ...

#### Bulk bismuth anodes for wide-temperature sodium-ion batteries ...

In recent years, sodium-ion batteries (SIBs), have become prospective alternatives to lithium-ion batteries, drawing increasing attention as the next generation of rechargeable battery systems owing to their resource abundance and ...

#### Bismuth oxychloride nanosheets anchored aramid separator with ...

Functional modification of inorganic particles is an effective approach to tackle the issue of  $\text{Li}^+$  transport and the lithium dendrites formation in lithium-ion batteries (LIBs). In this study, PMIA/BiOCl composite separators are prepared by nonsolvent induce phase separation (NIPS) method using P-type semiconductor bismuth oxychloride (BiOCl) functionalized poly (m ...

#### Bismuth oxide: a new lithium-ion battery anode

Bismuth oxide directly grown on nickel foam ( $\text{p-Bi}_2\text{O}_3/\text{Ni}$ ) was prepared by a facile polymer-assisted solution approach and was used directly as a lithium-ion battery anode for the first time. The  $\text{Bi}_2\text{O}_3$  particles were covered with thin carbon

#### Bismuth ion battery – A new member in trivalent battery technology

In this work, we report bismuth ion battery (BIB) as a promising trivalent metal ion battery, next to the only known aluminum ion battery. Our BIB successfully demonstrates battery behavior with discharge plateaus at 0.5 and 0.2 V. Gravimetric capacity of 300 mAh g<sup>-1</sup> at current density of 0.2 A g<sup>-1</sup> was obtained with ca. 98% coulombic efficiency.

#### Extended cycling performance of micron-sized ...

This study investigates the potential of micron-sized Bi as an alloy-type anode material for lithium-ion batteries (LIBs). Compared to the limited capacity of conventional anode materials, Bi offers a high theoretical ...

Implementation of Bismuth Chalcogenides as an Efficient Anode: ...

Bismuth chalcogenide ( $\text{Bi}_2\text{X}_3$ ; X = sulfur (S), selenium (Se), and tellurium (Te)) materials are considered as promising materials for diverse applications due to their unique properties. Their narrow bandgap, good thermal conductivity, and environmental friendliness make them suitable candidates for thermoelectric applications, photodetector, sensors along ...

Microstructure modulation improving stability performance of Bi ...

Microstructure modulation improving stability performance of Bi anode for lithium-ion batteries ... In this work, to suppress the volume expansion of bismuth and enhance battery performance and stability, Bi-metal-organic-framework (Bi-MOF) is utilized as a precursor and combined with an organic polymerization coating process, followed by ...

Bismuth-based mixed-anion compounds for anode materials ...

bismuth-based ternary mixed-anion compounds as high capacity anode materials in rechargeable batteries. Cells utilising  $\text{Bi}_{13}\text{S}_{18}\text{I}_2$  achieved an initial capacity value of 807 mA h g<sup>-1</sup>, while those with  $\text{BiSI}/\text{Bi}_{13}\text{S}_{18}\text{I}_2$  a value of 1087 mA h g<sup>-1</sup> in lithium-ion battery systems. Mixed-anion compounds are subjects of immense interdisci-

Difference of rate performance between discharge and charge ...

For instance, bismuth fluoride ( $\text{BiF}_3$ ) is a particularly attractive owing to its high theoretical specific capacity (302 mAh g<sup>-1</sup>); however, the high reactivity of Bi (discharged state) with electrolytes, and the low electronic conductivity of  $\text{BiF}_3$  (charged state), inhibit the charge-discharge reactions in lithium-ion ...

High rate and ultralong cyclelife fiber-shaped sodium dual-ion battery ...

High rate and ultralong cyclelife fiber-shaped sodium dual-ion battery based on bismuth anodes and polytriphenylamine cathodes. Yongpeng Li, Yongpeng Li. ... and knittability. 1-13 Among the aforementioned devices, fiber-shaped lithium-ion batteries have been widely studied. 14-19 However, because of the scarcity of lithium resources, there is ...

Carbon Quantum Dot-Anchored Bismuth Oxide Composites as ...

We have currently reported that the metal-oxide-embedded carbon matrix could facilitate charge and ion transports, leading to improved electrochemical performance for lithium-ion battery and supercapacitor applications. 25 Recently, carbon quantum dots (CQDs) and graphene quantum dots have found their uses in several energy-storage applications ...

(PDF) Difference of rate performance between discharge and ...

The rate performance of the discharge reaction was higher than that of the charge reaction, especially after cycling. Keywords Lithium-ion battery; Conversion; Bismuth fluoride; Rate performance; Cathode 3 Journal of Electroanalytical Chemistry, 806, 82-87 (2017). 1. Introduction Lithium-ion batteries are utilized in many electronic devices.

Enhanced electrochemical performance of Bi<sub>2</sub>O<sub>3</sub> via facile ...

Bismuth-based materials have demonstrated distinctive properties, including high specific capacity and volumetric density, as anode materials for lithium-ion batteries. Metallic ...

Bismuth Oxide: A New Lithium-Ion Battery Anode.

The binder-free p-Bi<sub>2</sub>O<sub>3</sub>/Ni shows superior electrochemical properties and was used directly as a lithium-ion battery anode for the first time and was attributed to higher volumetric utilization efficiency, better connection of active materials to the current collector, and shorter lithium ion diffusion path. Bismuth oxide directly grown on nickel foam (p-Bi<sub>2</sub>O<sub>3</sub>/Ni) was ...

Bismuth Oxide: A New Lithium-Ion Battery Anode

Abstract. Bismuth oxide directly grown on nickel foam (p-Bi<sub>2</sub>O<sub>3</sub>/Ni) was prepared by a facile polymer-assisted solution approach and was used directly as a lithium-ion battery anode for the first time. The Bi<sub>2</sub>O<sub>3</sub> particles were covered with thin carbon layers, forming network-like sheets on the surface of the Ni foam. The binder-free p-Bi<sub>2</sub>O<sub>3</sub>/Ni shows superior electrochemical ...

Li<sub>3</sub>PO<sub>4</sub> Matrix Enables a Long Cycle Life and High Energy ...

Bismuth is a lithium-ion battery anode material that can operate at an equilibrium potential higher than graphite and provide a capacity twice as high as that of Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub>, making it ...

Self-Charging Power System Empowered by Bismuth Halide ...

In this study, a lead-free methylammonium bismuth iodide (MA<sub>3</sub>Bi<sub>2</sub>I<sub>9</sub>) perovskite is used to create a self-charging power unit (SPU). This involves constructing a hybrid piezoelectric-triboelectric nanogenerator (Hybrid-TENG) and utilizing MA<sub>3</sub>Bi<sub>2</sub>I<sub>9</sub> for energy storage as an anode in a lithium-ion battery (LIB).

Engineering Bi<sub>2</sub>O<sub>3</sub>-Bi<sub>2</sub>S<sub>3</sub> heterostructure for superior lithium ...

Bismuth oxide may be a promising battery material due to the high gravimetric (690 mAh g<sup>-1</sup>) and volumetric capacities (6280 mAh cm<sup>-3</sup>).

Alkaline Earth Bismuth Fluorides as Fluoride-Ion ...

Fluoride-ion batteries have several potential advantages over lithium-ion batteries. Materials development is still needed, however, to realize electrolytes with sufficiently high anion conductivity and compatibility with ...

Facile synthesis of amorphous carbon-coated bismuth phosphate ...

Herein, we report a novel BiPO<sub>4</sub>@Ketjen Black nanocomposite as long cycle life lithium-ion battery anode. The BiPO<sub>4</sub>@Ketjen Black nanocomposite is obtained via a simple and mild molten salt preparation followed by post-milling. When assembled with metal lithium sheets for half battery, BiPO<sub>4</sub>@Ketjen Black nanocomposite delivers a high capacity and rate ...

Highly stable nanostructured Bi<sub>2</sub>Se<sub>3</sub> anode material for all solid ...

The electrochemical reaction mechanism of lithium (Li)-ion with Bi<sub>2</sub>Se<sub>3</sub> anode material in all solid-state lithium-ion batteries (LIBs) has been successfully established in this work. Firstly, commercial bulk Bi<sub>2</sub>Se<sub>3</sub> was directly used as anode in LIB and then hydrothermally synthesized Bi<sub>2</sub>Se<sub>3</sub> nanostructures were used as anode material in order to ...

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For more information, pricing, or custom solutions, please contact us:

Website: <https://www.tommiemeyer.co.za>

Email: [sales@tommiemeyer.co.za](mailto:sales@tommiemeyer.co.za)

Phone: +49 176 8342 5619

Address: Kurfürstendamm 21, 10719 Berlin, Germany

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