Black phosphorus electrochemical energy storage mechanism

Can black phosphorus be used for energy storage?
Black phosphorus is a potential candidate material for next-generation energy storage devicesand has attracted tremendous interest because of its advantageous structural and electrochemical properties,including its large theoretical capacity,high carrier mobility,and low redox potential.

What are the applications of black phosphorus?
This review specifically highlights the very recent progress in the synthesis and applications of black phosphorus in the energy process,including secondary battery system,supercapacitor device,and catalysis reaction.

Why is layered black phosphorus a good electrode material?
To this end,it is essential to develop an electrode material simultaneously featuring high theoretical capacity along with the excellent electron conductivity and Li +diffusivity that are necessary for rapid charge (6). Layered black phosphorus (BP) exhibits several attractive features for high-rate,high-capacity Li storage.

What is black phosphorus (BP) rediscovered as a 2D layered material?
His current research focuses on design and synthesis of nanostructured materials for electrochemical energy storage and conversion including batteries, supercapacitors, and fuel cells. Abstract Black phosphorus (BP) is rediscovered as a 2D layered material.

Who provided black phosphorus materials?
H.X. and T.Z.provided black phosphorus materials. He.J.,X.D.,S.X.,Ho.J.,and J.B.G. wrote the paper,and all authors were involved in revising the manuscript. Competing interests: The authors declare that they have no competing interests. Data and materials availability: All data are available in the manuscript or the supplementary materials.

How is black phosphorus synthesized?
Here,the gram-scale black phosphorus is synthesized in the ethylenediamine medium using a 120-200 °C low-temperature recyclable liquid phase method directly from red phosphorus. A crystallization mechanism from red to black phosphorus based on FTIR,XPS,and DFT calculations is proposed.

As a thermodynamically stable semiconductor material, black phosphorus (BP) has potential application in the field of energy storage and conversion. The preparation of black phosphorus ...

The quest for high energy density and rapid charging in potassium ion batteries (PIBs) employing black phosphorus (BP) has been hindered by its inherent challenges, ...

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The black phosphorus (BP) nanostructure, encapsulated within a hollow architecture terminated with VMCA molecules bearing three functional branches, has been ...

Two-dimensional (2D) crystals have emerged as a class of materials that can impact future electronics (Li et al., 2014), with excellent electrochemical properties and a high ...

Herein, we present the first review of recent progress in BP-based electrochemical energy storage device. The preparation and electrochemical ...

Abstract Black phosphorus (BP) is rediscovered as a 2D layered material. Since its first isolation in 2014, 2D BP has triggered tremendous interest in the fields ...

Black phosphorus is potentially very attractive as an anode material for NIBs, as it has a layered structure similar to graphite but a greater interlayer distance. In ...

An in-depth understanding of these aspects is of great importance for the design of black phosphorus as a multifunctional candidate in future energy storage and conversion.

The energy storage performance and conversion efficiency of these devices strongly depend on the morphology and electrical properties of ...

To further improve the electrochemical performance of phosphorus, Qian et al. prepared an amorphous phosphorus/carbon nanocomposite (a-P/C) through ball-milling red ...

Black phosphorus (BP) is rediscovered as a 2D layered material. Since its first isolation in 2014, 2D BP has triggered tremendous interest in the fields of condensed matter physics, chemistry, ...

Black phosphorus electrochemical energy storage mechanism Black phosphorus with a long history of ~100 years has recently attracted extraordinary attention and has become a ...

Two-dimensional black phosphorus (TDBP) is desirable for electrical devices due to its adjustable direct band gap (0.3 to 2.0 eV), high mobility of carriers (~1000 cm 2 V -1 s ...

To unlock the mechanism of phosphorus anode, we chose black and red phosphorus as model examples and investigated their electrochemical reaction processes for ...

In our work, a novel 2D-TiO 2-2D vdW heterostructure was rationally designed to enhance electrochemical properties for Li+ storage. In this design, 2D graphene and black ...

Black phosphorus is a potential candidate material for next-generation energy storage devicesand has attracted

tremendous interest because of its advantageous structural and electrochemical ...

As an emerging energy storage material, phosphorus has been attracting extensive attentions in recent years due to its fascinating ...

To improve charging rate, specific energy, and battery lifetime, anode materials with a high Li storage capacity, high rate capability, and high ...

As a thermodynamically stable semiconductor material, black phosphorus (BP) has potential application in the field of energy storage and conversion. The ...

Black phosphorus (BP) is a unique two-dimensional material with excellent conductivity, and a widely tunable bandgap. In recent years, its ...

Phosphorus-based materials with a high theoretical specific capacity and a fast charge-discharge rate are considered as promising anode materials for high energy density ...

He is currently an Associate Professor at the Institute of Applied Physics and Materials Engineering of the University of Macau. His current research focuses on design and synthesis ...

Black phosphorus with a long history of ~100 years has recently attracted extraordinary attention and has become a promising candidate for energy storage and conversion owing to its unique ...

Low-Temperature Solution Synthesis of Black Phosphorus from Red Phosphorus: Crystallization Mechanism and Lithium ... Two-dimensional black phosphorus (2D-BP) has attracted much ...

This review specifically highlights the very recent progress in the synthesis and applications of black phosphorus in the energy process, including secondary ...

A number of black-phosphorus-based composite materials have been developed and investigated. Herein, we provide an up-to-date account of the recent progress made in ...

o The advances of black phosphorus for energy applications are reviewed and discussed. o This review summarizes the recent trends of black phosphorus in energy ...

Herein, we present the first review of recent progress in BP-based electrochemical energy storage device. The preparation and electrochemical properties of ...

As a new type of single element direct-bandgap semiconductor, black phosphorus (BP) shows many excellent characteristics due to its unique two-dimensional (2D) ...

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Two-Dimensional Black Phosphorus Nanomaterials: Emerging Advances in Electrochemical Energy Storage ... Metal Oxide Nanosheet: Synthesis Approaches and ...

Black phosphorus with a long history of ~100 years has recently attracted extraordinary attention and has become a promising candidate for energy ...

Two-dimensional black phosphorus (2D BP) possesses huge potential in electrochemical energy storage field owing to its unique electronic structure, ...

Black phosphorus is a highly interesting two-dimensional material with a tunable band gap, ultra-high carrier mobility, and excellent optoelectronic properties. Its van der Waals ...

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