Three-dimensional structure of electrochemical energy storage

Can three-dimensional ordered porous materials improve electrochemical storage of energy?
Three-dimensional ordered porous materials can improvethe electrochemical storage of energy. Jing Wang and Yuping Wu from Nanjing Tech University,China and co-workers review the development of these materials for use as electrodes in devices such as batteries and supercapacitors.

What is electrochemical energy storage?
Among various energy storage technologies,electrochemical energy storage devicesare the most promising and common. Currently,research on electrochemical energy storage is mainly focused on supercapacitors and rechargeable batteries.

What are the main focuses of electrochemical energy storage research?
Currently,research on electrochemical energy storage is mainly focused on supercapacitors and rechargeable batteries 1,2,3,4,5. Among various energy storage technologies,electrochemical energy storage devices are the most promising and common devices.

What is interdigital electrochemical energy storage (EES)?
Interdigital electrochemical energy storage (EES) device features small size,high integration,and efficient ion transport,which is an ideal candidate for powering integrated microelectronic systems. However,traditional manufacturing techniques have limited capability in fabricating the microdevices with complex microstructure.

Can 3D printed functional nanomaterials be used for electrochemical energy storage?
Zhu, C. et al. 3D printed functional nanomaterials for electrochemical energy storage. Nano Today 15, 107-120 (2017). This review article summarizes progress in fabricating 3D electrodes via 3D printing techniques. Zhu, C. et al. Supercapacitors based on three-dimensional hierarchical graphene aerogels with periodic macropores.

Are carbon-based materials a good choice for electrochemical energy storage?
Carbon-based materials have attracted considerable attention due to their abundance, environmental friendliness, tunable structure, and excellent chemical stability. Beyond the commercial carbon for batteries and supercapacitors, many studies focused on advanced and multifunctional carbon with various structures for electrochemical energy storage.

Three-dimensional ordered porous electrode materials for electrochemical energy storage ... structure very well even after 1000 and 5000 cycles (Fig. 2c), demonstrating an ...

Porous Graphene Materials for Advanced Electrochemical Energy Storage and Conversion Devices: Feng et al. reviewed different methods to prepare 3D porous graphene ...

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Graphene is an indefinitely extended two-dimensional (2D) carbon crystal, in which carbon atoms are packed in a hexagonal lattice resembling a honeycomb with long-range p ...

Rechargeable batteries and supercapacitors are widely investigated as the most important electrochemical energy storage devices nowadays due to the booming energy ...

Three-Dimensional Co 3 O 4 Nanowires@Amorphous Ni(OH) 2 Ultrathin Nanosheets Hierarchical Structure for Electrochemical Energy Storage. Author links open ...

Since the popularisation of two-dimensional (2D) materials with the isolation of graphene in 2004 [], one of the biggest challenges for their practical application as bulk ...

Abstract Increasing concerns over climate change and energy shortage have driven the development of clean energy devices such as batteries, supercapacitors, fuel cells and solar water splitting in the past decades. And ...

Wood has a natural three-dimensional porous skeleton structure, which can be used in the research of energy storage devices. Shan et al. comprehensively discuss the synthetic methods of various electrochemical ...

Three-dimensional (3D) printing, as an emerging advanced manufacturing technology in rapid prototyping of 3D microstructures, can fabricate interdigital EES devices ...

However, energy storage systems fabricated from organic polymer networks have just emerged as a new prospect. 3D polymer is a category of pure polymer or composites ...

Two-dimensional (2D) MXenes have been extensively investigated for electrochemical energy storage because of their excellent electronic properties. In this work, a ...

The large volume variation and decomposition of pyrite iron sulfide (FeS 2) during the charge/discharge process are still a big issue limiting its application as electrode material ...

Three-dimensional (3D) current collectors provide an increased surface area for deposition, which results in obtaining a thinner layer of electroactive material and improves ...

Recently, a class of 2D early transition metal carbides, nitrides or carbonitrides, also known as MXene, have been prepared by selectively extracting the "A" elements from their ...

Subsequently, recent progresses in electrochemical energy devices (lithium/lithium ion batteries, supercapacitors, fuel cells and solar cells) and hydrogen energy ...

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At the fundamental level, all EES devices involve the shuttling and storage of ions between two electrodes, coupled with the flow of electrons in an external circuit. As a result, ...

This study offers novel insights that can be utilized to achieve consistent lithium deposition, addressing challenges related to dendrite formation within a three-dimensional ...

Graphene-based three-dimensional (3D) macroscopic materials have recently attracted increasing interest by virtue of their exciting potential in electrochemical energy conversion and storage.

Three-dimensional (3D) printing, as an emerging advanced manufacturing technology in rapid prototyping of 3D microstructures, can fabricate interdigital EES devices ...

Graphene as a new type of carbon material has drawn much attention recently. The remarkable properties such as low density, large specific surface area and unique ...

This Review summarizes the commonly used routes to build 3D TMD architectures and highlights their applications in electrochemical energy storage and conversion, including batteries, supercapacitors, and ...

Metal-organic frameworks (MOF) are porous materials, which are considered promising materials to meet the need for advanced electrochemical energy storage devices ...

Three-dimensional (3D) carbon-based materials are emerging as promising electrode candidates for energy storage devices. In comparison to the 1D and 2D structures, ...

Owing to the lack of non-renewable energy and the deterioration of the global environment, the exploration and expansion of cost-effective and environmentally-friendly ...

Constructing three-dimensional ordered porous MoS 2 /C hierarchies for excellent high-rate long-life pseudocapacitive ... These novel structure characteristics endow the as ...

Among different printing techniques, direct ink writing is commonly used to fabricate 3D battery and supercapacitor electrodes. The major advantages of using the direct ...

A novel three-dimensional graphene for remarkable performance of electrochemical energy storage. Author links open overlay panel Zhigang Zhang, Jinping ...

In this Account, we review recent developments in nanocellulose-based energy storage. Due to the limited space, we will mainly focus on structure design and engineering strategies in macrofiber, paper, and three-dimensional ...

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2D carbon nanosheets have high specific surface area, excellent in-plane conductivity, and fully exposed active sites, making them one of the potential electrochemical ...

The commercial carbon black is commonly used as a conductive additive to improve electrical conductivity. 9-11 So far, significant members of the carbon group with different morphologies and structures, like zero-dimensional ...

Dual carbon source method to fabricate hierarchical porous carbon with three-dimensional interconnected network structure toward advanced energy storage device. Author ...

Pore structure properties such as specific surface area, pore volume, and pore size distribution are important considerations when using nanoporous carbons as electrochemical ...

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