Fan Jianming New Energy Storage Materials

Can nanomaterials improve the performance of energy storage devices?
The development of nanomaterials and their related processing into electrodes and devices can improve the performanceand/or development of the existing energy storage systems. We provide a perspective on recent progress in the application of nanomaterials in energy storage devices,such as supercapacitors and batteries.

How does nanostructuring affect energy storage?
This review takes a holistic approach to energy storage,considering battery materials that exhibit bulk redox reactions and supercapacitor materials that store charge owing to the surface processes together,because nanostructuring often leads to erasing boundaries between these two energy storage solutions.

What are the limitations of nanomaterials in energy storage devices?
The limitations of nanomaterials in energy storage devices are related to their high surface area--which causes parasitic reactions with the electrolyte,especially during the first cycle,known as the first cycle irreversibility--as well as their agglomeration.

Are nanomaterials compatible with advanced manufacturing techniques?
Furthermore,the compatibilityof nanomaterials with advanced manufacturing techniques--such as printing,spray coating,roll-to-roll assembly,and so on--allows for the design and realization of wearable,flexible,and foldable energy storage devices.

Which nanomaterials are used in energy storage?
Although the number of studies of various phenomena related to the performance of nanomaterials in energy storage is increasing year by year,only a few of them--such as graphene sheets,carbon nanotubes (CNTs),carbon black,and silicon nanoparticles--are currently used in commercial devices,primarily as additives (18).

Are nanostructures good for storing a large amount of charge?
A large family of conversion materials--such as oxides,sulfides,and fluorides--offer potential for storing a large amount of charge,but they have poor cyclability coupled with phase transformation and large volume change (90). Benefits of nanostructures have been fully demonstratedon these materials as well (20).

Jianming WEI, Lead Engineer | Cited by 1,023 | of National Institute of Clean-and-Low-Carbon Energy, Beijing, Beijing | Read 35 publications | Contact Jianming WEI

For energy-related applications such as solar cells, catalysts, thermo-electrics, lithium-ion batteries, graphene-based materials, supercapacitors, and hydrogen storage ...

operations. Such cathode materials are still in their early stage of development and much needs to be done on material optimization (i.e., composition, structure) to ensure optimal energy density, lifespan, and reaction kinetics. Nickel (Ni)-based layered oxides (Li[Ni x (MnCo) 1-x]O 2; NMC), such as NMC622 and other Ni-rich NMCs (x >= 0.5 ...

Conceptual art depicts machine learning finding an ideal material for capacitive energy storage. Its carbon framework (black) has functional groups with oxygen (pink) and nitrogen (turquoise).

Integrative Energy Storage Solutions: MXenes offer a platform for integrated energy storage solutions that extend beyond conventional batteries to catalysis, sensors, and electronics. As researchers focus on MXene-based supercapacitors, hybrid systems, and beyond, there is a remarkable opportunity to create versatile devices with high power and ...

Multimodal Analysis of Reaction Pathways of Cathode Materials for Lithium Ion Batteries - Sooyeon Hwang, Xiao Ji, Seong-Min Bak, Jianming Bai, Ke Sun, Xiulin Fan, Hong Gan, Chunsheng Wang, Dong Su ...

Energy Storage Materials is an international multidisciplinary journal for communicating scientific and technological advances in the field of materials and their devices for advanced energy storage and relevant energy conversion (such as in metal-O2 battery). It publishes comprehensive research articles including full papers and short communications, as well as topical feature ...

Jianming Tao, Xinyue Fan and Yanming Yang provided the material characterization data. Jianming Tao and Jiaxin Li wrote the paper. Yang yang Li, Zhigao Huang and Jian Lu reviewed and edited the manuscript. All authors read and approved the manuscript. ... 2023, Energy Storage Materials. Show abstract. High-performance silicon-carbon (Si-C ...

NatureScience?Advanced Materials?Advanced Energy Materials?ACS Catalysis?ACS Nano100SCI,Nature Nanotechnology,Nature Communication, Science Advances,Nature Communication,15?

Safer, environmentally benign, and sustainable aqueous rechargeable batteries are particularly appealing for large-scale energy storage applications. This review aims to ...

Abstract A unique substance or material that releases or absorbs enough energy during a phase shift is known as a phase change material (PCM). Usually, one of the first two fundamental states of matter--solid or liquid--will change into the other. Phase change materials for thermal energy storage (TES) have excellent capability for providing thermal ...

However, the theoretical specific energy of graphite is 372 mA h g -1 (with LiC 6 final product), which leads to a limited specific energy. 69,70 For a higher energy density to cater for smaller devices, intensive efforts have been made in ...

Hence new materials are always in demand for anode and cathode which should not. ... high-performance electrode materials for energy storage devices. J Mater Chem A 3 ... Hu F, Fan L, Zhang X ...

This review takes a holistic approach to energy storage, considering battery materials that exhibit bulk redox reactions and supercapacitor materials that store charge ...

materials, LiNi x Co y Mn z O 2, display high energy densities and are used extensively in industry, and cathode materials with Ni proportions of 0 .5 and 0.6 have been used in commercial

1. Introduction. To accommodate the ever growing demand of high-energy lithium ion batteries (LIBs) for large-scale applications in portable electric devices, electric vehicles and grid-scale energy storage, anode materials with high specific capacities have been extensively investigated [1, 2].Among numerous emerging anode candidates, silicon has been considered ...

Developments in carbon dioxide (CO 2) capture and hydrogen (H 2) storage using tunable structured materials are discussed. Design and characterization of new nanoscaled materials ...

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The studies of Ni-rich cathode materials have been the top priority of research because of the high energy density and fair cycling life. However, suffering from severe crack generations and side reactions, the traditional polycrystal (PC) Ni-rich material displayed structural/electrochemical fade during cycling. Compared with PC, single-crystal (SC) Ni-rich ...

Organic electrode materials (OEMs), with merits of structural diversity, molecular-level controllability, resource abundance, and environmental friendliness, have become a promising electrode candidate for low-carbon renewable batteries. Safer, ...

existing energy storage systems. We provide a perspective on recent progress in the application of nanomaterials in energy storage devices, such as supercapacitors and batteries. The ...

Strategies for developing advanced energy storage materials in electrochemical energy storage systems include nano-structuring, pore-structure control, configuration design, surface modification and composition optimization [153]. An example of surface modification to enhance storage performance in supercapacitors is the use of graphene as ...

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