LOW-DIMENSIONAL ENERGY STORAGE MATERIALS

This chapter looks at the recent research trends and future development of low-dimensional carbon-based nanomaterials with particular focus on various energy conversion and storage systems.

The unprecedented electron-lattice-polarity correlation opens up a new era for study and design of low-dimensional electronic devices. [40, 41] we reviewed the origin of ferroelectricity and summarized the latest research progress about novel FE materials used for energy harvesting, storage, and conversion. From the typical perovskite

Compared with their three-dimensional counterparts, two-dimensional (2D) van der Waals (vdW) materials exhibit quantum confinement where charge carriers are spatially confined at the physical boundaries. Particularly, when mixing 2D materials with other low-dimensional (LD) materials, they exhibit enormous potential in electrochemical energy a?|

By virtue of the prominent features of low cost, high surface area, wide potential window, high theoretical capacity and rich valence states, manganese (Mn)-based materials and their composites have attracted great interest as electrode materials for electrochemical energy storage (EES). Meanwhile, Mn-based materials with two-dimensional (2D

The Special Issue invites papers that not only provide new fabrication strategies for nanomaterials, especially low-dimensional nanomaterials, but also explore their applications in energy storage and conversion. Papers focusing on addressing key issues in the field of nanoenergy are encouraged.

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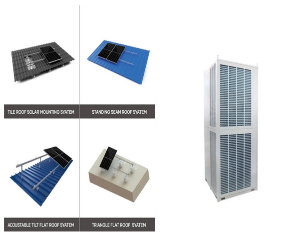

Since graphene was first experimentally isolated in 2004, many other two-dimensional (2D) materials (including nanosheet-like structures), such as transition metal oxides, dichalcogenides, and

3.3 Black Phosphorous. Black phosphorous (BP) is regarded as the most promising 2D material for energy storage due to its low density (2.69 g/cm 3), high theoretical capacity (2596 mAh/g for Li-ion batteries), low environmental impact, and high phosphorous content has a larger specific surface area due to its large lateral size and skeletal a?|

Nanotechnology focuses on the design, preparation, and fabrication of these highly important low-dimensional materials to produce valuable, cheap, smart, effective, sustainable, and green technological devices, and to be used in various applications such as energy production, energy storage, medicine, electronics, environmental safety, data

This Special Issue aims to collect papers on the low dimensional materials which are used in the new energy field (here defined as low dimensional energy related materials), such as photocatalysis and electrocatalytic water decomposition for hydrogen production, lithium and sodium ion batteries, supercapacitors, etc.

The intrinsic high surface area and unique electrical properties of atomically thin sheets of 2D materials are attractive for capacitive energy conversion and storage. 21a??23 2D materials hold high potential for applications in electronic devices, sensors, catalysts, energy conversion, and energy storage due to their excellent electrical

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High electronic and ionic conductivities combined with intrinsic strength and flexibility of low-dimensional materials allow ultrathin, flexible, and structural energy storage solutions. The short diffusion path can enable the use of nonflammable solid electrolytes, a?|

The development of blended low-dimensional heterostructures i.e. 0D/2D and 1D/2D as well as 3D nanoarchitecture in addition to the 2D/2D layered heterojunction is a promising way to build layered

NPG Asia Materials - Three-dimensional ordered porous materials can improve the electrochemical storage of energy. Jing Wang and Yuping Wu from Nanjing Tech University, China and co-workers review

Since the invention of the metala??oxidea??semiconductor field-effect transistor (MOSFET) in late 1959, the impact of electronics on human society has been increasingly pervasive, heavily regulating modern health, transport, finance, entertainment, and social media sectors through "Big Data." However, daily generation of petabytes of data from these sectors, a?|

Owing to their rich structural chemistry and unique electrochemical properties, vanadium-based materials, especially the low-dimensional ones, are showing promising applications in energy storage and conversion. In this invited review, low-dimensional vanadium-based materials (including 0D, 1D, and 2D nanostructures of vanadium-containing oxides, a?|

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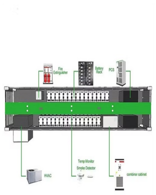
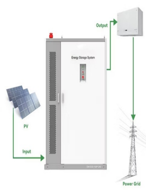
Therefore many 0-dimensional, 1-dimensional, 2-dimensional low-dimensional chalcogenide materials have emerged [86]. The extensive salt system opens up a new angle of synthesis. The major goal of these materials is to replace rare precious metal catalysts for HER and OER and serve as high-energy storage materials for supercapacitors and




Over the past few decades, the design and development of advanced materials based on two-dimensional (2D) ultra-thin materials for efficient energy catalysis and storage have aroused much attention. 2D ultra-thin materials have emerged as the most promising candidates for energy catalysis and storage because of their unique physical, chemical, and electronic a?|




In order to achieve a paradigm shift in electrochemical energy storage, the surface of nvdW 2D materials have to be densely populated with active sites for catalysis, metal nucleation, organic or metal-ion accommodation and transport, and redox a?? charge storage (from both metals cations and anions), and endowed with pronounced chemical and


High-entropy strategy has emerged as an effective method for improving energy storage performance, however, discovering new high-entropy systems within a high-dimensional composition space is a


materials for sustainable energy conversion and storage Siva Karuturi1,a, Chennupati Jagadish2, and Sudip Chakraborty3 b 1 School of Engineering, The Australian National University, ments in low-dimensional and nanostructured materials for energy applications, with an emphasis on reporting new knowledge at the interface of physics and chem-

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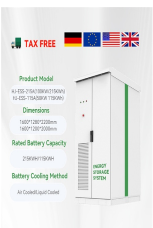
Low-dimensional nanomaterials (LDMs) have unique structures and interesting properties, and have broad application prospects in many fields such as energy storage and conversion, gas sensing, optics, and electronics. The low cost and controllable preparation of LDMs is an important prerequisite for their application in various fields. And the growth a?|


Recently, low-dimensional nanoarchitectured materials, such as the emerging two-dimensional (2D) graphene, black phosphorus, metal dichalcogenides and oxides, have been expected for developing cutting-edge energy conversion and storage devices for supporting a sustainable future. Low-dimensional nanomaterials have been verified to exhibit


There is a growing demand for energy consumption in society due to the increasing application of emerging technologies. Therefore, the need for the development of advanced energy storage technologies to cope with the rising energy demand is rising. Carbon materials play significant roles in energy storage technologies. In this review, the research progress and applications of a?|


This chapter looks at the recent research trends and future development of low-dimensional carbon-based nanomaterials with particular focus on various energy conversion and storage systems. Nanostructured materials for energy devices will markedly increase, as will insights for our everyday life in the near future.



Moreover, low-dimensional materials are also emerging as the functional building blocks for advanced devices, including energy storage and conversion systems and nanomechanical and nanoelectromechanical systems. Particularly, graphene-like 2D nanomaterials are constructed by unique planar crystals with atomic scale thickness, resulting a?|


Next, various significant applications of low-dimensional nanomaterials are discussed, such as photonics, sensors, catalysis, energy storage, diverse coatings, and various bioapplications. This article would serve as a quick and facile guide for scientists and engineers working in the field of nanotechnology and nanomaterials.


It has been shown that low dimensional materials (LDMs) such as graphene, black phosphorus, MXenes, covalent organic frameworks (COFs), two dimensional (2D) oxides, 2D chalcogenides, etc. are promising candidates as energy storage materials. Motivated by the great progress achieved in LDMs in energy storage and conversion, more researchers are


So far, two-dimensional (2D) materials have been widely applied in electronics and optoelectronics, 1,2 gas sensing, 3-7 energy storage, 8, 9 catalysis, 10,11 and spintronics, 12,13 among others