

With the vigorous development and huge demand for portable wearable devices, wearable electronics based on functional fibers continue to emerge in a wide range of energy storage, motion monitoring, disease prevention, electromagnetic interference (EMI) shielding, etc. MXene, as an emerging two-dimensional inorganic compound, has shown great potential in ...

Also, the effect of intercalating cations on the MXene interlayer distance in various energy storage devices is reviewed. Finally, an outlook on future scope of MXene as an electrode material in ...

The electrochemical activity of MXene is augmented by its oxide-like surface, contributing to the storage of charge. Reports are available representing the integration of MXenes for the fabrication of autonomous hybrid electrodes for charge storage.

The high capacitive performance of MXenes in acidic electrolytes has made them potential electrode materials for supercapacitors. In this study, we conducted a structural analysis of MXene surface functionalizations by identifying the surface group distribution pattern and revealed the energy storage process of MXene surface chemistry by combining a complete ...

MXene is rising as a versatile two-dimensional material (2DM) for electrochemical energy storage devices. MXene has boosted the performance of supercapacitors thanks to its ...

The tungstate/MXene fiber demonstrated an impressive tensile strength of approximately 220 Mpa (Figure 13H), which exceeds those of the tungstate and the MXene fiber. 39 When compared with the initial undeformed state, ... SCs can be classified into two types according to their energy storage mechanism: electric double-layer capacitors ...

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Piezoelectric nanofibers have received extensive attention in the field of electronic devices, but they are still restricted for further development, due to their limited dipole arrangement. Herein, we propose spatially confined MXene/polyvinylidene fluoride (PVDF) nanofibers for piezoelectric application, with dual functions of pressure sensing and energy ...

The LC MXenes enabled us to study for the first time the relationship between structure and properties of pure MXenes in a one-dimensional fiber format. Additionally, LC MXene fibers provide a novel platform to investigate their potential applications as energy storage electrodes in functional fabrics and heating elements in thermal comfort ...

Mxene fiber energy storage mechanism

Two-dimensional Ti_3C_2Tx MXenes have been extensively studied as pseudocapacitive electrode materials. This Letter aims at providing further insights into the charge storage mechanism of the Ti_3C_2Tx MXene electrode in the acidic electrolyte by combining experimental and simulation approaches. Our results show that the presence of H_2O ...

At last, the applications of MXene fiber-based textiles in energy storing, sensing and other fields were demonstrated, enabling more advanced and multifunctional textiles, and would be playing an important role in future wearable electronics. Keywords Fiber; Smart textiles; MXene; Sensing; Energy storing

1 Introduction

The 2D MXenes have contributed in various ways to energy conversion & storage since the initial discovery of Ti_3C_2 nanosheets in 2011 because of their excellent electrical conductivity which allows for faster electron transfer, while the unique layered structure provides a low diffusion energy barrier for rapid ion diffusion. MXene's flexible interlayer spacing and richer functional ...

Abstract As interest in smart textiles grows, fiber-based supercapacitors are gaining attention as promising devices for powering wearable electronics. Herein, we have demonstrated a two-step manufactured hybrid fiber with excellent energy storage properties. Anhydrous MXene (Ti_3C_2Tx) sheets are primarily spun in synergy with liquid crystal carbon ...

Thanks to its adjustable interlayer distance, large specific surface area, abundant active sites, and diverse surface functional groups, MXene has always been regarded as an excellent candidate for energy storage materials, ...

The high reactivity of exposed MXene metal atoms promotes oxidation of the surface and edges, which reduces the conductivity and affects the performance of MXene-based materials in energy storage applications.

When X-ray absorption spectroscopy was used to examine the Li^+ charge storage mechanism in Ti_3C_2Tx MXene, an incessant variation in the oxidation state of transition metal (i.e., Ti ...

It is proven that the energy storage capacity of MXene is powerfully dependent on surface terminal functional groups. F and OH surface terminals decrease energy storage ...

The interfacial energy is defined as $G = (E_{AB} - E_A - E_B)/S$, where E_{AB} is the total energy of rGO/rGO, MXene/MXene, or MXene/rGO systems, and E_A and E_B are the energy for single-layer ...

Based on the above study, MXene@MoS₂, which possesses a hybrid energy storage mechanism, was used as an anode material with a specific capacity of 682.1 mA h g⁻¹ at 0.2 A/g and a reversible capacity of 494.4 mA h g⁻¹ after 1000 cycles at 5 A/g.

Mxene fiber energy storage mechanism

In the past decade, MXenes, a new class of advanced functional 2D nanomaterials, have emerged among numerous types of electrode materials for electrochemical energy storage devices. MXene and their composites have opened up an interesting new opportunity in the field of functional materials, owing to their transition metal nitrides/carbides ...

The surface functional groups of MXene have a great influence on the electrochemical performance of the MXene-based electrodes [11]. For example, the presence of -F functional groups make the electrode material form a stable solid electrolyte interface (SEI) film during charge and discharge progress, which is beneficial for enhancing the cycling stability ...

MXene is a bright new star in the field of energy storage, and the application of MXene in supercapacitors has received special attention. ... Depending on the energy storage mechanism, ... and integrated) can be created. 75, 118 The integration of these fiber sensors into the textile makes the garment "smart"-capable of storing charge ...

Recent studies have also shown that MXene can serve as an efficient hydrogen storage catalyst. This review aims to summarize the latest research achievements in the field of MXene, especially its performance and application in energy storage. Different synthesis techniques have different effects on the energy storage performance of MXene.

From the above discussion, a mechanism for the improved energy storage performance of MXene/MoO_{3-x} fiber is proposed as follows: (1) The unique crystal structure and various oxidation states of Mo within MoO_{3-x} provide an impressive capacitive contribution to the fiber electrode.

(Reproduced with permission from Ref. .) This report shows that GPE modified with Ti₃C₂T_x MXene is an available electrolyte for energy storage batteries . 4.7. Application in Zn batteries

The fracture mechanism of MXene fiber can be found in the Supporting Information. ... Fig. 5 d illustrates the energy storage mechanism of fiber-based SCs. Due to the restacking structure, MXene fiber-based SC has the poor ion storage and lower energy density. However, through a surface engineered covalent bridging strategy, MX@PA-4 core-sheath ...

Cellulose nanocrystals (CNC) possess a large aspect ratio, high crystallinity, good mechanical performance, and environmental friendliness. It can be used as a frame and spacer of two-dimensional conductive materials, which reduces the stacking effect and is conducive to enhancing the mechanical and electrochemical properties of two-dimensional ...

A critical understanding of energy storage mechanism with respect to types of ions has also been elaborated. Finally, the advances in some wearable electronic devices based on MXene flexible supercapacitors are discussed. This review highlights the potential of MXenes to offer effective and adaptable energy storage

solutions that can completely ...

Different synthesis techniques have different effects on the energy storage performance of MXene. In this review, various common synthesis methods and the latest innovations in synthesis methods are discussed. MXene is prone to oxidation, and how to resist oxidation is also an important topic in MXene research.

Because of the similar device structure and working mechanism between supercapacitors and electrochromic devices, an integrated electrochromic energy storage dual-functional device is possible and ...

The soaring consumption of fossil fuels on a large scale has caused serious energy shortages and environmental problems. Researchers carry the important social responsibility to construct a sustainable-energy society [[1], [2], [3], [4]]. Among them, energy storage technology, as the most promising forward-looking technology in the energy industry, ...

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