

Recently, miniaturized systems with multiple functionalities, such as flexibility, self-powering and sensing capability are urgently desired for the practical applications. In this work, we reported the fabrication of novel reduced graphene oxide and carbon nanotube based composite electrode on the flexible polyimide substrate and explored its physical and electrochemical ...

system. When Compared to the super-capacitor energy storage with the similar capacity, the proposed hybrid energy storage unit reduces the leakage power by approximately 45% whilst maintains a similar ( $\sim 100$  m) ESR. 1. Introduction In recent years, energy harvesting (EH) techniques have been frequently used for wireless sensor networks (WSN ...

Thin-film batteries are solid-state batteries comprising the anode, the cathode, the electrolyte and the separator. They are nano-millimeter-sized batteries made of solid electrodes and solid electrolytes. The need for lightweight, higher energy density and long-lasting batteries has made research in this area inevitable. This battery finds application in consumer ...

MXene-based composite thin films have also been used in different applications, including energy storage and sensors, which require foldability, flexibility, and scalability. ... and the  $\text{Ti}_3\text{C}_2\text{T}_x/\text{BiVO}_4$  thin film-based sensor has shown excellent selectivity toward  $\text{Hg}^{2+}$  in the presence of other ions (Figure 15E).

With the development of new sensor technology, flexible piezoelectric materials possessing exceptional mechanical-to-electrical energy conversion capabilities hold great promise for application in a variety of sectors, including biomedicine, flexible robotics, and wearable electronic devices. This work reports the successful growth of an all-inorganic transparent ...

based self-powered sensors that require energy harvesters and energy storage devices, i.e. "thin film energy devices", as key components. The first section of this thesis introduces the working principle of a new type of thermal energy harvester, a "Multi-cell Thermogalvanic System" (MTS), that provides an

In addition, it is worth noting that a few nonconventional energy storage devices with freestanding thin-film, wire-shaped, paper-based microelectrodes [33-36] and promising metal-air and metal-organic batteries with potential integration applications [37-39] are also included in this general definition. In our review, the term MESD mainly ...

This leads to an enhanced energy storage performance of ultra-thin multilayer BF/ST films at both low and high electric fields. Download: Download high-res image (316KB) ... 4-inch ternary  $\text{BiFeO}_3\text{-BaTiO}_3\text{-SrTiO}_3$  thin film capacitor with high energy storage performance. ACS Energy Lett., 6 (2021), pp. 3873-3881.

MXenes are a class of two-dimensional (2D) nanomaterials known for their diverse chemical structures and tunable properties. MXene-based films are typically produced by spray assembly, drop-casting, or vacuum filtration. Unfortunately, these methods typically result in coatings with poor surface adhesion or are limited to certain substrate types and geometries. ...

Thin film devices, include thin film transistors, data storage memory, thin film solar cells, organic light-emitting diodes (OLEDs), thermoelectric devices, smart materials, (thin film shape memory materials) thin film sensors and ...

General Electric (GE) Global Research is developing low-cost, thin-film sensors that enable real-time mapping of temperature and surface pressure for each cell within a battery pack, which could help predict how and when batteries begin to fail. The thermal sensors within today's best battery packs are thick, expensive, and incapable of precisely assessing important ...

Dielectric materials find wide usages in microelectronics, power electronics, power grids, medical devices, and the military. Due to the vast demand, the development of advanced dielectrics with high energy storage capability has received extensive attention [1], [2], [3], [4]. Tantalum and aluminum-based electrolytic capacitors, ceramic capacitors, and film ...

In recent years, researchers used to enhance the energy storage performance of dielectrics mainly by increasing the dielectric constant. [22, 43] As the research progressed, the bottleneck of this method was revealed. [ ] Due to the different surface energies, the nanoceramic particles are difficult to be evenly dispersed in the polymer matrix, which is a challenge for large-scale ...

We show that high-energy ion bombardment improves the energy storage performance of relaxor ferroelec. thin films. Intrinsic point defects created by ion bombardment reduce leakage, delay low-field polarization satn., enhance high ...

The  $(\text{Na}_{0.5}\text{Bi}_{0.5})\text{TiO}_3$  relaxor ferroelectric materials have great potential in high energy storage capacitors due to their small hysteresis, low remanent polarization and high breakdown electric field. In this work,  $(\text{Na}_{0.5}\text{Bi}_{0.5})\text{TiO}_3$  thin films with ~400 nm were prepared on (001)  $\text{SrTiO}_3$  substrate by pulsed laser deposition technology. The  $(\text{Na}_{0.5}\text{Bi}_{0.5})\text{TiO}_3$  films ...

The results show that the Mica-Pt-LNO-PZO (M-LNO-PZO) thin film has an improved energy storage density ( $W_{\text{rec}}$ ) of 16.6 J/cm<sup>3</sup> with a charge and discharge efficiency ( $\eta$ ) of 50.4%. Furthermore, the flexible thin films exhibit good stability under a wide working temperature range of 25-140 °C and an electric fatigue endurance of 10<sup>7</sup> cycles.

In the end, a nanocomposite temperature-sensitive passive polymer thin film patch was designed and fabricated with high energy storage efficiency and temperature regulation properties, which could be served as a promising wearable passive temperature sensor used in breast cancer thermal imaging and other selected

practical healthcare or ...

Thermal safety is of prime importance for any energy-storage system. For lithium-ion batteries (LIBs), numerous safety incidences have been roadblocks on the path toward realizing high-energy-density next-generation batteries. Solutions, ...

This review provides a comprehensive overview of the progress in light-material interactions (LMIs), focusing on lasers and flash lights for energy conversion and storage applications. We discuss intricate LMI parameters such as light sources, interaction time, and fluence to elucidate their importance in material processing. In addition, this study covers ...

By integrating films with high energy-storage performance on flexible substrates, one could meet the energy conversion needs for numerous flexible applications like electronic textiles, wearable and implantable medical electronics, easily ...

Compared to the flexible sensors in single and 2-in-1, the 3-in-1 flexible thin film sensor not only further miniaturized in size, but also optimized related performance. The optimized performance of the sensor includes monitoring accuracy (reaching  $0.5\text{ }^{\circ}\text{C}$ ), response speed ( $<1\text{ ms}$ ) and temperature resistance (reaching  $100\text{ }^{\circ}\text{C}$ ).

Technical Accomplishments/Progress - Tested optical sensor configurations that meet most DOE criteria for safety sensors. - Extended sensor lifetimes by an additional year (now have sensors that have been operable for a total of 3 years). - Analyzed subtle compositional differences in protective coatings that result in dramatic changes in performance.

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