

When developing flexible electronic devices, trade-offs between desired functional properties and sufficient mechanical flexibility must often be considered. The integration of functional ceramics on flexible materials is a major challenge. However, aerosol deposition (AD), a room-temperature deposition method, has gained a reputation for its ability to combine ceramics with polymers ...

Several emerging energy storage technologies and systems have been demonstrated that feature low cost, high rate capability, and durability for potential use in large-scale grid and high-power applications. Owing to its outstanding ion conductivity, ultrafast Na-ion insertion kinetics, excellent structural stability, and large theoretical capacity, the sodium ...

The rapid development of clean energy provides effective solutions for some major global problems such as resource shortage and environmental pollution, and full utilization of clean energy necessitates overcoming the randomness and intermittence by the integration of advanced energy storage technologies. 1-4 For this end, dielectric energy-storage capacitors ...

Aerogels are 3-D nanostructures of non-fluid colloidal interconnected porous networks consisting of loosely packed bonded particles that are expanded throughout its volume by gas and exhibit ultra-low density and high specific surface area. Aerogels are normally synthesized through a sol-gel method followed by a special drying technique such as ...

It is emphasized that, to further enhance the capability of nanostructured materials for energy conversion and storage, new mechanisms and structures are anticipated. In addition to highlighting ...

New materials hold the key to advances in energy conversion and storage. Nanoscale materials possess nanoscale (1-100 nm) structures externally or internally 1; in particular they offer unique properties that are central for the energy transition in our society from heavily relying on fossil fuels to renewable energy sources. 2 While realizing there are other ...

New materials hold the key to fundamental advances in energy conversion and storage, both of which are vital in order to meet the challenge of global warming and the finite nature of fossil fuels.

In recent decades, the energy crisis and global warming have promoted a growing demand for renewable clean energy [1, 2, 3]. As a clean and sustainable energy resource, hydrogen ( $H_2$ ) has been hailed as a future fuel that holds great promise in replacing ever-being-exhausted fossil fuels and aiding the transition to net-zero emissions [4, 5]. Hydrogen is the ...

In today's world, carbon-based materials research is much wider wherein, it requires a lot of processing

techniques to manufacture or synthesize. Moreover, the processing methods through which the carbon-based materials are derived from synthetic sources are of high cost. Processing of such hierarchical porous carbon materials (PCMs) was slightly complex ...

Polymer nanocomposite-based dielectric capacitors are promising candidates for high- power-density energy storage devices. However, they exhibit poor performance at high temperatures. A polymer ...

Energy Storage Materials. Volume 38, June 2021, Pages 249-254. Ultra-thin free-standing sulfide solid electrolyte film for cell-level high energy density all-solid-state lithium batteries. Author links open overlay panel Gaozhan Liu a b, Jiamin Shi a b, Mengting Zhu a, Wei Weng a b, Lin Shen a b, Jing Yang a, Xiayin Yao a b. Show more.

Corrigendum to "Aqueous alkaline-acid hybrid electrolyte for zinc-bromine battery with 3V voltage window" [Energy Storage Materials Volume 19, May 2019, Pages 56-61] Feng Yu, Le Pang, Xiaoxiang Wang, Eric R. Waclawik, ... Hongxia Wang. Page 228 View PDF; Previous vol/issue.

Compared to pure PI, both the permittivity, dielectric loss and breakdown strength were optimized in the PI-TiO<sub>2</sub> multilayer films. A satisfactory discharge energy ...

Nanomaterials are known to exhibit a number of interesting physical and chemical properties for various applications, including energy conversion and storage, nanoscale electronics, sensors and actuators, photonics devices and even for biomedical purposes. In the past decade, laser as a synthetic technique and laser as a microfabrication technique ...

Along with the rapid development of flexible and wearable electronic devices, there have been a strong demand for flexible power sources, which has in turn triggered considerable efforts on the research and development of flexible batteries. An ideal flexible battery would have not only just high electrochemical performance but also excellent mechanical ...

The development, synthesis, and research of these materials and material-based coatings are key directions in the development of new types of supercapacitors, Li-ion/Na-ion ...

The Review discusses the state-of-the-art polymer nanocomposites from three key aspects: dipole activity, breakdown resistance and heat tolerance for capacitive energy storage applications.

Lithium-ion batteries (LIBs) have helped revolutionize the modern world and are now advancing the alternative energy field. Several technical challenges are associated with LIBs, such as increasing their energy density, improving their safety, and prolonging their lifespan. Pressed by these issues, researchers are striving to find effective solutions and new materials ...

This quantity could be considerably reduced through the addition of advanced thermal energy storage systems.

One emerging pathway for thermal energy storage is through nano-engineered phase change materials, which have very high energy densities and enable several degrees of design freedom in selecting their composition and morphology.

With the development of advanced electronic devices and electric power systems, polymer-based dielectric film capacitors with high energy storage capability have become particularly important. Compared with polymer nanocomposites with widespread attention, all-organic polymers are fundamental and have been proven to be more effective ...

In the context of the global call to reduce carbon emissions, renewable energy sources such as wind and solar will replace fossil fuels as the main source of energy supply in the future [1, 2]. However, the inherent discontinuity and volatility of renewable energy sources limit their ability to make a steady supply of energy [3]. Thermal energy storage (TES) emerges as ...

nanomaterials in energy storage devices, such as supercapacitors and batteries. The versatility of nanomaterials can lead to power sources for portable, flexible, foldable, and distributable ...

The book *Materials for Sustainable Energy Storage Devices at the Nanoscale* anticipates covering all electrochemical energy storage devices such as supercapacitors, lithium-ion batteries (LIBs), and fuel cells, transformation and enhancement materials for solar cells, photocatalysis, etc. The focal objective of the book is to deliver stunning and current information to the materials ...

Single-walled carbon nanotubes (SWCNTs) offer unique possibilities to produce high-performance energy-conversion and energy storage devices, such as solar cells, batteries or supercapacitors 1 ...

In recent years, the design of polymer-based multilayer composites has become an effective way to obtain high energy storage density. It was reported that both the dielectric constant and breakdown strength can be enhanced in the P(VDF-HFP)-BaTiO<sub>3</sub> multilayer composites [7]. And the maximum energy storage density in the multilayer samples ...

Addressing microstructure-property relations of polymer nanocomposites is vital for designing advanced dielectrics for electrostatic energy storage. Here, we develop an integrated phase-field ...

Electrostatic capacitors are among the most important components in electrical equipment and electronic devices, and they have received increasing attention over the last two decades, especially in the fields of new energy vehicles (NEVs), advanced propulsion weapons, renewable energy storage, high-voltage transmission, and medical defibrillators, as shown in ...

Composite materials comprising polymers and inorganic nanoparticles (NPs) are promising for energy storage applications, though challenges in controlling NP dispersion often result in performance bottlenecks.

Electrostatic capacitors with the fastest charge-discharge rates and the highest power densities among the electrical energy storage devices are essential for advanced pulsed power systems and electrical propulsions [1,2,3,4,5]. Polymers are preferred dielectrics for high-energy-density capacitors because of their inherent advantages including high ...

His research interests focus on the discovery of new solids including sustainable energy materials (e.g. Li batteries, fuel storage, thermoelectrics), inorganic nanomaterials and the solid state chemistry of non-oxides. His research also embraces the sustainable production of materials including the microwave synthesis and processing of solids.

During the last few decades, great effort has been dedicated to the study of poly (vinylidene fluoride) (PVDF), a highly polarizable ferroelectric polymer with a large dipole (pointing from the fluorine atoms to the hydrogen atoms), for dielectric energy storage applications [8, 9]. PVDF exhibits a high relative permittivity  $\epsilon_r$  of  $\sim 10$ - $12$  (1 kHz) and high field-induced ...

Electrochemical energy storage (EES) devices such as batteries and supercapacitors play a key role in our society [1], [2], [3], [4] the past two decades, the development of energy storage devices has attracted increasing interests among industry and ...

To meet the growing energy demands in a low-carbon economy, the development of new materials that improve the efficiency of energy conversion and storage systems is essential. Mesoporous materials ...

Compared to other dielectric materials like polymers, oxide-based ferroelectric materials typically exhibit higher  $P_{max}$  and  $P_r$  due to their larger spontaneous polarization, promising for energy storage [2], [6], [7]. A classic approach to promote energy storage performance involves combining ferroelectrics with materials of a different structure to reduce ...

To date, nanostructured materials have been investigated for advanced energy conversion, including thermoelectric devices, photovoltaic devices, and water splitting [19,20], and for electrochemical energy storage devices [21,22], such as supercapacitors [23,24], batteries [25,26], and fuel cells [27,28], as well as for various sensors like ...

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