Interface and energy storage breakdown

Can Multi-Interface regulation improve energy storage properties of polymers?
By implementing a multi-interface regulation strategy,the energy storage properties of polymers can be effectively improvedacross a broad spectrum of temperatures,making it highly important to the exploration of dielectric capacitors. 2. Experimental section 2.1. Materials

What is interface engineering?
Interface engineering offers an innovative solution to address interfacial issues arising from the incorporation of reinforcing fillers, providing an additional strategy for fabricating dielectric films for high-temperate energy storage applications. Xiang Yu: Writing - original draft, Data curation, Conceptualization.

What is the discharge energy density at the hierarchical interface?
The division of labour effects at the hierarchical interface yields a discharge energy density of 8.12 J cm -3at 640 MV m -1 under room temperature and 5.2 J cm -3 at 520 MV m -1 when subjected to a temperature of 150 ? for the polymer composites.

Do BNNS-F/Pei composite films have high-temperature energy storage capabilities?
In summary,we present BNNS-F/PEI composite films with high-temperature energy storage capabilitiesachieved through fluorinated interface engineering. The composite films demonstrate a remarkable Ue of 5.73 J/cm 3,coupled with an ultrahigh i of 91.22 % at 150 °C. This high Ue value is attributed to the enhanced Eb,reaching up to 589 kV/mm.

Why is BNNS a good dielectric film for high-temperature energy storage?
The preparation process ensures that the PEI matrix remains intact and undamaged,while the crystalline structure of BNNS fillers is also preserved. As a dielectric film for high-temperature energy storage,its glass transition temperature(Tg) is considered as a decisive factor.

Does the multi-layer structure interface suppress the migration of space charges?
The multi-layer structure interface suppresses the migration of space charges. The authors declare no conflict of interest. Data available on request due to privacy and ethical restrictions. Table S1.

There is also the phenomenon of interface polarization, which is conducive to improving the polarization strength and energy storage density of the composite medium ...

Capacitor is widely used as energy storage equipment in modern society because of its excellent energy storage performance [1], [2] pared to chemical batteries and super ...

Polymer dielectric energy storage capacitors play a vital role in modern electronic and electrical power systems, particularly in high-voltage environments. However, achieving both high energy density and ...

Optimizing nanostructures to achieve enhanced breakdown strength and improved energy storage performances in dipolar polymers. Nanoscale 2022, 14 (38), 14135-14145.

MXenes, a class of two-dimensional (2D) transition metal carbides, and covalent organic frameworks (COFs) deliver unique structural and electrochemical properties, making them ...

Similarly, as an important parameter of influencing energy storage properties, the breakdown strength will be also investigated. The characteristic breakdown strength of the ...

By implementing a multi-interface regulation strategy, the energy storage properties of polymers can be effectively improved across a broad spectrum of temperatures, making it ...

Bidirectional matched (bm) aluminum oxide interfacial transition region is firstly constructed between calcium niobate nanosheets (CNO) and polyimide (PI).The bm-interface ...

The high energy storage performance results from the regulation of the interface engineering, that is, the joint effects of the electrical field amplifying, interlayer coupling, and block layer at the ...

Polymer dielectric capacitors have emerged as attractive energy storage solutions for pulsed power applications, attributed to their exceptional breakdown strength and superior ...

Currently, dielectric materials, including of ceramics, glasses, and polymers, have been explored for applications in high energy storage capacitors [7].Polymer dielectrics offer ...

The optimum energy storage properties, i.e. ultrahigh energy efficiency (95.9%), high energy-storage density (2.09 J cm?³) and good temperature stability (the fluctuations in energy-storage

As a result of the periodic interface modification, the leakage current was decreased 2 orders of magnitude and the breakdown strength was enhanced from 144.13 to ...

The design strategies based on multilayer interfaces are sorted out. The energy storage performances of different structures are summarized. Based on the review, some ...

We demonstrate that introduction of heterostructure nanoparticles into a polymer matrix is an effective strategy to substantially enhance dielectric breakdown strength (E b) and ...

The effects of three fillers on dielectric and energy storage properties were systematically studied in PI-based composite films. It was found that the interface bonding ...

To achieve high energy storage densities, a high electrical breakdown strength is also desired in addition to the improved dielectric constant and energy efficiency. The ...

Breakdown strength and energy storage performance of multilayer BiFeO 3 /SrTiO 3 films. (a) Two-parameter Weibull distribution analysis of the breakdown strength of multilayer ...

The smart engineering of energy transfer processes, especially at material interfaces and device heterojunctions, is a key part of their progress. Based on our analysis of the PeLEDs issue, we believe that the core is the ...

Polymer-based flexible dielectrics have been widely used in capacitor energy storage due to their advantages of ultrahigh power density, flexibility, and scalability. To ...

For linear dielectrics, U e can be deduced by (2) U e = 1 2 e 0 e r E b 2 where e 0 is the vacuum permittivity, e r is the relative permittivity, and E b is the breakdown strength which ...

Ba0.6Sr0.4TiO3 based glass-ceramics were prepared by sol-gel process. Influences of B-Si-O glass content on the microstructure, dielectric, and energy storage ...

For example, Pei et al. inserted polymethylmethacrylate (PMMA) nanolayer at the interface between an electrode and original dielectric to improve surface defects and Young"s modulus. On the premise of ... the breakdown ...

The achieved high electric breakdown strength is owing to the reduced local electric field at the interface between film surface and electrode according to the simulation ...

To achieve the concomitant enhancement of e r and E b, introducing ceramic nanometric fillers with high dielectric constant into polymer matrices with high breakdown ...

Introducing high dielectric constant (high-k) ceramic fillers into dielectric polymers is a widely adopted strategy for improving the energy storage density of nanocomposites. However, the mismatch in electrical properties ...

The layer-structured composites were built by the dielectric and insulating layers composed of polyvinylidene fluoride (PVDF) and low-density polyethylene (LDPE) composites ...

For linear dielectrics, the energy density (U e) equation is described as follows: (Equation 1) U e = 0.5 e 0 e r E b 2 where e 0 is the vacuum dielectric constant, e r is the ...

In this review article, the application of computational simulation technologies is summarized in energy-storage polymer dielectrics and the effect of control variables and design structures on ...

High-energy-density ferroelectric polymer nanocomposites for capacitive energy storage: enhanced

breakdown strength and improved discharge efficiency. Mater. Today, 29 ...

The development of renewable energy technologies puts forward high requirements for the energy storage capabilities of dielectric capacitors at elevated temperatures (>= 150 °C) ...

Here, a brief introduction of the three most important energy storage devices, namely batteries, supercapacitors and capacitors, is provided, with a focus on the latter and ...

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