

(A) Energy-storage performance of the films at an electric field of 2.5 MV cm^{-1} with respect to charge-discharge cycling numbers. (B) Temperature-dependent energy-storage performance of the films at an electric field of 2.5 MV cm^{-1} . (C) Thickness distribution curve of the eight selected sample points across the large-area film. The inset ...

We investigated the energy storage and ferroelectric properties of flexible $1-x(\text{Na}_{0.5}\text{Bi}_{0.5}\text{TiO}_3)\text{-xBaTiO}_3$ (NBT) thin films with BaTiO_3 (BT) concentrations ranging from 0 to 6 mol% on Pt/mica substrates depending on the BT concentration. The NBT thin films exhibiting preferentially a-oriented crystallinity on the (111) Pt/mica substrates showed ...

Yong et al. reported that $\text{Sr}_{0.925}\text{Bi}_{0.05}\text{TiO}_3$ films modified by Zr exhibited excellent leakage current properties and energy storage density [10]. Ye et al. [11] introduced an Al_2O_3 insulating layer into bismuth titanate films to improve their breakdown field strength and energy storage density.

In addition, all the samples had a low leakage current density of below 10^{-6} A/cm^2 at room temperature. These results indicated that our PBLZT AFE thick films could be a promising candidate for applications in high energy-storage density capacitors and solid-cooling devices by properly controlling their grain size.

The energy storage density of the metadielectric film capacitors can achieve to 85 joules per cubic centimeter with energy efficiency exceeding 81% in the temperature range from 25°C to 400°C .

Based on the results of the leakage current, appropriate hot-pressing can effectively reduce the internal leakage and conduction loss performance of PVDF films, which ...

The improvement in ferroelectric response in the tetra-layer film is well correlated to the low leakage current density ($\sim 10^{-7} \text{ A/cm}^2$ at 177.500 kV/cm) owing to reduced defects in the film. The reduced oxygen vacancies and dielectric loss tangent of order 10^{-3} ...

As discussed above, high energy storage density is mainly originated from the high breakdown strength in thin film. Thus, small leakage current density is critical in order to reduce the possibility of thermal breakdown, and a detailed investigation on the leakage currents mechanisms in BNT-BT-Mn x films is desired for the sake of better ...

The leakage current density of the sandwich structure nanodielectric film gradually increases with the applied voltage and with the content of P(VDF-HFP). The trend in the leakage current also supports the breakdown strength results. ... Yang S, Zhou Z, Liu MJ (2022) 2-2 type PVDF-based composites interlayered by epitaxial (111)-oriented BTO ...

Abstract. For dielectric energy storage films, high leakage current always results in larger loss of energy, heating breakdown, and poor stability. This work designs an interfacial ...

Along with the excellent dielectric response, leakage current characteristics are critical for understanding the material's reliability. This manuscript aims to study the leakage current properties with the number of alternate stacking layers associated with evaluating the energy storage performance of multi-layered thin films.

In this paper, the leakage current performance and energy storage of $\text{Sr}_{0.925}\text{Bi}_{0.05}\text{Ti}_{1-x}\text{Zr}_x\text{O}_3$ ($x = 0, 0.05, 0.07$ and 0.1) thin films with perovskite structure were investigated. With the increases of x , the leakage current performance and breakdown strength were optimized remarkably, resulting the recoverable energy density of 26.9 J/cm^3 at $x = 0.1$, ...

Ceramic capacitors require promising energy storage properties to meet the demands of electronic industry which can be tailored by ferroelectric polarization and electrical breakdown strength. Electrical breakdown exhibits close relation to leakage current in advanced dielectric materials when stimulated by high levels of electric field. The suppression of leakage ...

Superior dielectric energy storage performance for high-temperature film capacitors through molecular structure design. Author links open overlay panel Song Ding a 1 ... Introducing deep traps into the matrix to capture carriers is also beneficial for reducing the leakage current and improving the energy storage performance of polymer ...

The highest E_b at room temperature and $150 \text{ }^\circ\text{C}$ determines its most outstanding energy storage performance. The leakage currents reflect the transport behavior of mobile charge carriers before breakdown of the polymer dielectrics. Therefore, leakage current density of P(EI-Cl) films is measured at $150 \text{ }^\circ\text{C}$.

Meanwhile, it is possible to utilize ferroelectric capacitors composed of ferroelectric thin films as energy storage media [[15], [16], [17]]. ... All LBFO thin films show leakage currents by Ohmic current with a slope of about 1 in an electric field smaller than 1000 kV/cm . In electric fields higher than 1000 kV/cm , leakage currents due to ...

The leakage current of $\text{HZO}_{0.10}$ continuous and superlattice films were fit to ... G. et al. Plasma-enhanced atomic layer-deposited Ti,Si-doped ZrO_2 antiferroelectric films for energy storage ...

However, the low dielectric constant of polymer films limits the maximal discharge energy density, and the energy storage property may deteriorate under extreme conditions of high temperature and high electric field [10], [11], [12]. For instance, commercially available biaxially oriented polypropylene (BOPP) films can withstand electric fields ...

Sol-gel-derived (100)-textured $\text{Pb}_{0.8}\text{La}_{0.1}\text{Ca}_{0.1}\text{Ti}_{0.975}\text{O}_3$ (PLCT) thin films were prepared on

Pt/Ti/SiO₂/Si(100) substrates at a low temperature of 450 °C. Modification of annealing atmospheres, i.e., O₂, air, and N₂, on the electrical properties of PLCT thin films was focused on in this work, especially the energy storage and leakage current characteristics. In ...

Suppression of leakage current in t-BPB composite films at high temperature is the key to improve the energy storage performance. Under the applied electric field, the charges have three routes for travelling as displayed in Fig. 4 (c). Firstly, the increased barrier height of the BNNS inorganic layer hinders the part of the injection of carriers.

This study reports the fabrication of manganese (Mn) doped antiferroelectric (AFE) thick films (thickness of ~ 2 mm) of (Pb_{0.93}La_{0.07})(Zr_{0.82}Ti_{0.18})O₃ (PLZT 7/82/18) at room temperature using aerosol deposition (AD) technique without any additional thermal treatment. The Mn-doped PLZT 7/82/18 AD thick films demonstrate excellent energy storage ...

The electric breakdown strength (E_b) is an important factor that determines the practical applications of dielectric materials in electrical energy storage and electronics. However, there is a tradeoff between E_b and the dielectric constant in the dielectrics, and E_b is typically lower than 10 MV/cm. In this work, ferroelectric thin film (Bi_{0.2}Na_{0.2}K_{0.2}La_{0.2}Sr_{0.2})TiO ...

The leakage current of these films correlates with their breakdown strength, ... Other ceramic energy storage films are constrained by inherent polarization characteristics and insulation strength, complicating efforts to simultaneously enhance energy storage density and efficiency. Overall, the results presented in this study are considered to ...

The energy storage density of ferroelectric thin film capacitors is mainly limited by the breakdown strength. Here we demonstrate that the high breakdown strength and high energy storage density can be achieved by constructing BiFeO₃/Al₂O₃ ferroelectricity-insulators heterojunction. The breakdown strength, leakage current density and energy storage ...

The research on thin-film energy storage has increased significantly in recent years for the miniaturization and integration of the devices. ... The leakage current of BNT films originates from the volatilization of Na⁺ and Bi³⁺ and the oxygen vacancies formed from Ti⁴⁺ to Ti³⁺ ions during the heat treatment.

The important application potential of flexible energy storage materials in new portable and wearable electronic devices has aroused a research upsurge in performance optimization. Here, the flexible (1-x)Na_{0.5}Bi_{0.5}TiO₃-xBi(Mg_{0.5}Zr_{0.5})O₃ (NBT-xBMZ) film capacitors were obtained via a simple sol-gel method based on a nickel foil substrate. The ...

Electrical performances can be enhanced through Ni²⁺ substitution in Na_{0.5}Bi_{0.5}TiO₃ (NBT) ceramic thin film. The microstructure, leakage, ferroelectric and energy-storage performances as well as dielectric properties of Ni²⁺-doped NBT were investigated and discussed. The perovskite structure can be maintained

well in spite of various compositions. ...

The enhancement of the comprehensive properties of the film in energy storage achieved by adjusting the annealing duration. 2. Experimental procedures ... Fig. 5 displays the leakage current density of films with various annealing durations at 1 MV/cm. The densities of leakage current are 7.70×10^{-4} , ...

The growing attention towards dielectric film capacitors is due to their ability to achieve high power density with ultra-fast charge and discharge rates, making them potential candidates for use in consumer electronics and advanced pulse power supplies [1], [2]. However, achieving both high energy density (U_{re}) and energy efficiency (η) simultaneously in dielectric ...

Here, we provide an overview of the state-of-the-art lead-free Nb-based films for energy storage applications, which include $K_{0.5}Na_{0.5}NbO_3$ -based, $K_{0.5}Na_{0.5}Bi_4NbTi_3O_{15}$ -based, $AgNbO_3$ -based and $NaNbO_3$ -based films. ... 2D sheet-like KNN platelets in the center of the PVDF layer may prevent the formation of electrical trees, reduce the leakage ...

The energy storage density in HZO thin films was optimized through a three-pronged approach: (i) field-driven NC optimization through ferroic phase engineering in ~ 10 ...

The coated film achieved outstanding energy storage performance at high temperatures, with discharge energy densities of 2.94 J/cm³ and 2.59 J/cm³ at 150 °C and 200 °C, respectively. In summary, the surface self-assembly approach can be directly applied to modify commercial polymer films, offering a simpler preparation process compared to ...

The leakage current, ferroelectric, and ferromagnetic characteristics of the BFO and BCFO thin films were also investigated. The leakage current is a conduction current characteristic that is required in various electronic device applications [43, 44] Figure 2a shows the current density (J) as a function of the electric field (E) of the BFO and BCFO capacitors.

The films of $(Bi_{0.5}Na_{0.5})(Ti_{1-x}Mn_x)O_3$ (BNTM_x) were deposited on the substrates via the sol-gel method. The influence of the doping content of Mn on the microstructures and ferroelectric properties of the films were investigated. In addition, the valence states of Mn ions were analyzed. The results show that Mn ions have dissolved into the lattice ...

At 125 °C and 100 MV m⁻¹, the leakage current density of A-B-A-1 sandwich-structured films is only 1.10×10^{-8} A cm⁻², which is 88% lower than that of pristine BOPP ...

In addition, a significant influence of the annealing atmosphere on the leakage current characteristics of PLCT films was revealed and the distinct current density-electric ...

Energy storage properties, stability, and charge/discharge performance. Directed by the phase field simulation

outcomes, we designed and fabricated (Sr 0.2 Ba 0.2 Pb 0.2 La 0.2 Na 0.2)Nb₂O₆ ...

Leakage current measurements were obtained under varying applied electric field strengths, and the leakage current density was calculated by dividing the total area of a single electrode. Breakdown strength data was acquired using the breakdown test system. ... As a dielectric film for high-temperature energy storage, its glass transition ...

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