



Energy storage effect of ferroelectric thin films

As a result, a huge energy-storage density of 32 J/cm^3 and a large energy-storage efficiency of 90% were achieved under 3170 kV/cm in the thin film ...

The BNTZ-0.09BFO thin film shows superior energy density of 124 J cm^{-3} and efficiency of 81.9%, excellent fatigue endurance (109 cycles) and thermal stability ($-100 \text{ }^\circ\text{C}$ to $200 \text{ }^\circ\text{C}$). ... Substantially improved energy storage capability of ferroelectric thin films for application in high-temperature capacitors ... The synergistic effect of ...

We investigated the characteristics of the energy storage performance of the BTTO thin film capacitors. When a ferroelectric hysteresis loop is given, the energy density of a ferroelectric capacitor can be induced [43, 44] g. 4 (a) shows a schematic of the energy storage characteristics in the ferroelectric hysteresis loop. The different ...

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 $\text{BiFeO}_3/\text{Al}_2\text{O}_3$ ferroelectricity-insulators heterojunction. The breakdown strength, leakage current ...

Critical Effect of Film-Electrode Interface on Enhanced Energy Storage Performance of $\text{BaTiO}_3\text{-BiScO}_3$ Ferroelectric Thin Films. / Abbas, Waseem; Lin, Weitong; Kai, Ji-Jung et al. In: ACS Applied Electronic Materials, Vol. 3, No. 11, 23.11.2021, p. 4726-4733. Research output: Journal Publications and Reviews > RGC 21 - Publication in refereed ...

The pursuit of low-power/low-voltage operation in devices has prompted a keen interest in the mesoscale effects within ferroelectric thin films. The downsizing of ferroelectrics can significantly influence ...

A high recoverable energy density of 82 J cm^{-3} and optimized efficiency of 81% were realized for the $(1-x)\text{BNT-xBZT}$ thin film with $x = 0.7$. The thin film exhibits excellent stability in energy storage ...

In addition, Xuewen Jiang et al. [25] prepared 3% Mn-doped $0.94 \text{ BT-0.06 Bi}(\text{Zn}_{0.5}\text{Zr}_{0.5})\text{O}_3$ thin films by the sol-gel method and also achieved a good energy density of 85 J/cm^3 at a breakdown ...

Recently, relaxor ferroelectric thin-film capacitors have attracted considerable attention for energy storage applications since their slim-type polarization-electric field hysteresis loops can yield...

Dielectric capacitors have been widely studied for energy storage applications in pulsed power electronic and electrical systems due to their fast charge/discharge rate and high power density. In this work, the lead-free ferroelectric $\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3\text{-0.02 MnO}_2$ (BZT-0.02 Mn) thin films are prepared by a sol-gel method ...



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This study demonstrates an ultra-thin multilayer approach to enhance the energy storage performance of ferroelectric-based materials. The ultra-thin structure in ...

The rapid development of electronic devices has raised the demand for polymer film capacitors with high energy density, low dielectric loss and fast charge/discharge rate for a wide range of applications in hybrid electric vehicles, electric gloves and power supplies [1,2,3]. To store sufficient energy, the conventional film ...

In our previous work (W. Zhang et al., Space-charge dominated epitaxial BaTiO₃ heterostructures, *Acta Mater.* 85 (2015) 207-215), it was demonstrated that a space charge dominated BaTiO₃ thin film can have much improved energy storage characteristics when compared with a regular insulating film of ferroelectric BaTiO₃ ...

It is revealed that nanocrystalline engineering of the BBPT ferroelectric thin films could be controlled via the heat-treatment temperature, which could effectively regulate the breakdown strength ...

suitable candidates for fast energy storage applications.[6] The energy storage density and the energy storage efficiency are the two key factors that evaluate the performance of the energy storage capacitors. The energy storage density (rev) of ferroelectric thin film capacitors can be calculated by the integration of the P-E

Ferroelectric lead lanthanum zirconate titanate (PLZT) films with 8 mol% lanthanum and different Zr/Ti ratios (70/30, 65/35, 58/42, 52/48, 45/55, and 40/60) have been grown on platinized silicon substrates by chemical solution deposition. The effects of the Zr/Ti ratios on the dielectric and ferroelectric properties were investigated for high ...

Abstract. Ba_{1-x}Sr_xZr_{0.35}Ti_{0.65}O₃ (x = 0, 0.025, 0.05, 0.075, 0.1) ferroelectric thin films were fabricated on Pt/Ti/SiO₂/Si substrates by the sol-gel ...

To reduce system complexity and bridge the interface between electronic and photonic circuits, there is a high demand for a non-volatile memory that can be accessed both electrically and optically.

The present work reports for the first time, the employment of ferroelectric ZrO₂ films as energy storage capacitors utilized in pulsed power systems. Furthermore, the effect of insertion of a low permittivity dielectric HfO₂:Al₂O₃ (HAO) layer, with a thickness ranging from 2 to 8 nm, on the tunability of ferroelectric and energy storage characteristics of ...

Flexible ferroelectric films with high polarization hold great promise for energy storage and electrocaloric (EC) refrigeration. Herein, we fabricate a lead-free Mn-modified 0.75 Bi(Mg_{0.5}Ti_{0.5})O₃-0.25 BaTiO₃ ...

Relaxor ferroelectric thin films, that demonstrate high energy storage performances due to their slim



Energy storage effect of ferroelectric thin films

polarization-electric field hysteresis loops, have attracted extensive attentions in the application of miniaturized advanced pulsed power electronic systems. However, the ubiquitous defects induced in the thin films, for example, due to ...

By introducing super tetragonal nanostructures into glassy ferroelectric with MPB composition, a giant energy storage density of 786 J cm^{-3} with a high energy efficiency of 81% was obtained under a ...

Flexible ferroelectric films with high polarization hold great promise for energy storage and electrocaloric (EC) refrigeration. Herein, we fabricate a lead-free Mn-modified $0.75 \text{ Bi}(\text{Mg}_{0.5}\text{Ti}_{0.5})\text{O}_3\text{-}0.25 \text{ BaTiO}_3$ (BMT-BTO) thin film based on a flexible mica substrate. Excellent EC performance with maximum adiabatic temperature change ...

The pursuit of low-power/low-voltage operation in devices has prompted a keen interest in the mesoscale effects within ferroelectric thin films. The downsizing of ferroelectrics can significantly influence performance; for instance, the remanent polarization and coercive field are susceptible to alterations based on thickness. In this study, ...

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

Dielectric materials with high energy-storage density and efficiency have great potential applications in modern electric and electronic devices. In this work, a series of $0.9(0.94\text{Bi } 0.5 \text{ Na } 0.5 \text{ TiO}_3\text{-}0.06\text{BaTiO}_3)\text{-}0.1\text{NaNbO}_3$ (BNT-BT-NN) ferroelectric thin films were deposited on LaNiO_3 (LNO) bottom electrodes by radio-frequency (RF) ...

However, this lead-free ferroelectric capacitor is still inferior to lead zirconate titanate (PZT)-based capacitors in terms of energy storage density. ...

Flexible ferroelectric films with high polarization hold great promise for energy storage and electrocaloric (EC) refrigeration. Herein, we fabricate a lead-free Mn-modified $0.75 \text{ Bi}(\text{Mg}_{0.5}\text{Ti}_{0.5})\text{O}_3\text{-}0.25 \text{ BaTiO}_3$ (BMT-BTO) thin film based on a flexible mica substrate. Excellent EC performance with maximum adiabatic temperature change ($\Delta T \sim 23.5 \text{ K}$) ...

Thickness is an important parameter of ferroelectric thin films, which could have a strong influence on device performance based on them. In this paper, we demonstrate the mechanism of the thickness dependence of the ferroelectric performance of a $\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$ (PZT52/48) film prepared with a sol-gel method. It is observed ...

The present work reports for the first time, the employment of ferroelectric ZrO_2 films as energy storage capacitors utilized in pulsed power systems.



Energy storage effect of ferroelectric thin films

Advances in flexible electronics are driving the development of ferroelectric thin-film capacitors toward flexibility and high energy storage ...

1. Introduction. The development of new materials with high energy density is viewed as a critical enabling step for the realization of compact, low-cost and high-performance energy storage devices for applications in portable electronics, electric power systems and next-generation vehicles [1], [2]. Extensive studies have been carried out on ...

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