Can ferroelectric thin films store electricity

How can flexible ferroelectric thin films improve energy storage properties?
Moreover,the energy storage properties of flexible ferroelectric thin films can be further fine-tuned by adjusting bending angles and defect dipole concentrations,offering a versatile platform for control and performance optimization.

What are ferroelectric thin films used for?
Ferroelectric thin films have been widely investigated for use in micromachining and memory devicessuch as ferroelectric random-access memory units. Interest in the energy harvesting applications of ferroelectric films has also expanded rapidly in recent years.

Are flexible ferroelectric films suitable for energy storage and electrocaloric refrigeration?
Flexible ferroelectric films with high polarization hold great promisefor energy storage and electrocaloric (EC) refrigeration. Herein,we fabricate a lead-free Mn-modified 0.75 Bi (Mg 0.5 Ti 0.5)O 3 -0.25 BaTiO 3 (BMT-BTO) thin film based on a flexible mica substrate.

What is the energy storage density of ferroelectric film?
Meanwhile,a good energy storage density of ~70.6 J cm -3and a quite high efficiency of ~82% are realized in the same ferroelectric film,accompanied by excellent stability of frequency and electric fatigue (500-10 kHz and 10 8 cycles). Furthermore,there is no apparent variation in performance under different bending strains.

How to control the performance of ferroelectric films?
Composition control and various types of straincan effectively regulate the performance of ferroelectric films,including ferroelectric hysteresis loop,Curie temperature,leakage current,etc.,to meet the application requirements of ferroelectric devices in various fields.

Can ferroelectrics be used for energy storage?
A brief overview on ferroelectrics for energy storage applications has been given in the previous sections. Great progresses have been made in ferroelectric polymer capacitors, ferroelectric oxide capacitors, and antiferroelectric thin film capacitors.

Ferroelectric (FE) thin films can be widely used in many applications, including sensors, actuators, and memories. In recent years to meet the demand of miniaturization in microelectronics, ...

The combined effects of the atomic-layer-deposition (ALD) temperature (220-280 °C) and metal electrodes (TiN and Mo) on the ferroelectric properties of Hf 0.5 Zr 0.5 O 2 (HZO) films were studied.

The energy storage performance of freestanding ferroelectric thin films can be significantly enhanced through

innovative strategies, including bilayer film mechanical bending design and the introduction of defect dipole engineering. To further amplify the enhancement effect, the synergistic impact of these two strategies is comprehensively ...

In ferroelectric tunnel junctions, data can be written by sending a voltage to electrodes alongside an ultra-thin ferroelectric, and it can be read by determining the tunnelling current. Theoretically, this kind of memory ought to have an incredibly high density, quick reading-and-writing speeds, and a low degree of power usage. It could become a non-volatile ...

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Strain engineering can be used to control the properties of thin-film ferroelectric materials, which are promising for electronic, thermal, photovoltaic and transduction applications. This...

Conventional thin-film strain effects By the early 2000s, there were already numerous obser - vations of intriguing phenomena in ferroelectric films originating from lattice-mismatch-based strain5,6. The study of thin films provides information about the funda - mental size limits for ferroelectricity. First-principles cal -

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Flexible ferroelectric thin film devices with excellent ductility and resilience have amazing application potential in intelligent robots, wearable electronic devices and the Internet of ...

By introducing super tetragonal nanostructures into glassy ferroelectric with MPB composition, a giant energy storage density of ?86 J cm -3 with a high energy efficiency ...

Flexible thin film with both good ferroelectric and ferromagnetic properties has more extensive applications in the field of flexible and/or wearable devices and sensors. In this experiment, the flexible Bi0.9Gd0.1Fe0.98Mn0.02O3 (BGFMO) thin film is successfully deposited on fluorophlogopite (F-Mica) single-crystalline substrate by sol-gel method. The flexible ...

By introducing Sm 2 O 3 into ferroelectric BTO thin films, Sm 2 O 3 nanopillars were embedded into a BTO matrix as shown in Fig. 2.5A and B, for cross-sectional and plan-view transmission electron microscopy (TEM) images. 61 The size of the Sm 2 O 3 nanocolumns is around 10 nm, and these introduce 2.35% tensile strain into BTO in the OP direction. The ...

In the last two decades ferroelectric thin films (FTFs) have been one of the major fields of research in

functional-ceramic materials. Both scientific and technological interests have been driven by the potential applications for these materials, in particular in microelectronics and micro-electromechanical systems (MEMS).

This ferroelectric Pnm21 phase can account for the recently observed ferroelectricity in (111)-oriented HfO2-based thin films on a SrTiO3 (STO) (001) substrate [Nat. Mater. 17, 1095 (2018 ...

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)O 3 -0.25 BaTiO 3 (BMT-BTO) thin film based on a flexible mica substrate.

Optimizing dielectric energy storage often involves increasing ferroelectric polarization and breakdown strength while delaying polarization saturation. Here, we ...

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