Relaxation antiferroelectric energy storage

Do relaxor anti-ferroelectrics improve energy-storage performance?
Conclusion We have developed novel relaxor anti-ferroelectrics,which integrate the advantages of relaxor ferroelectrics (small hysteresis),antiferroelectrics (large D P),and strengthened polarization (large Pmax),giving comprehensive improvementof the energy-storage performance.

Are relaxor ferroelectrics good for energy storage?
So far, relaxor ferroelectrics (RFEs) have been among the mainstream materials for high energy storage performance owing to their desirable polarization traits, including a small Pr and a large Pm (refs. 5, 6, 7).

Can high entropy relaxor ferroelectric materials be used for energy storage?
This study provides evidence that developing high-entropy relaxor ferroelectric material via equimolar-ratio element design is an effective strategy for achieving ultrahigh energy storage characteristics. Our results also uncover the immense potential of tetragonal tungsten bronze-type materials for advanced energy storage applications.

Can antiferroelectric ceramics improve energy storage properties?
The development of environmentally friendly energy storage dielectrics with high energy storage density has attracted increasing attention in power electronics. The combination of antiferroelectric ceramics with relaxor characteristics proves to be an efficient way to greatly improve energy storage properties.

Are relaxor ferroelectrics suitable for high-performance energy storage dielectric capacitors?
Relaxor ferroelectrics are the primary candidatesfor high-performance energy storage dielectric capacitors. A common approach to tuning the relaxor properties is to regulate the local compositional inhomogeneity,but there is a lack of a quantitative evaluation way for compositional fluctuation in relaxors.

What are relaxor antiferroelectrics (Rafe) dielectrics?
With this purpose, the relaxor anti-ferroelectrics (RAFE) dielectrics have been developed recently by introducing a relaxor compound into antiferroelectrics . For instance, Li obtained giant Wrec (~7.01 J/cm 3) and i (~77 %) in RAFE ceramics by introducing La 2 O 3 into the ant-ferroelectric AgNbO 3.

These factors result in a strongly enhanced recoverable energy-storage density (increased by a factor of 4 to ?128.4 J cm -3) with high efficiency (?81.2%). Moreover, the multilayer films show almost fatigue-free energy-storage performance after 10 10 switching cycles, even at elevated temperatures up to 220 °C, demonstrating their ...

Realizing Stable Relaxor Antiferroelectric and Superior Energy Storage Properties in (Na 1-x/2 La x/2)(Nb 1-x Ti x)O 3 Lead-Free Ceramics through A/B-Site Complex Substitution. Cite. Citation; Citation and

abstract; ... Enhanced relaxation behavior and energy storage properties in (Al0.5Nb0.5)4+ complex ions modified Na0.5Bi0.5TiO3-based ...

Compared to polymers or films, ceramic-based dielectric capacitors with perovskite structure are the promising candidates for energy storage application due to their superior thermal stability, large absolute energy storage and distinctive mechanical performance [[1], [2], [3], [4]].Among various dielectric ceramics, the antiferroelectric (AFE) ceramics exhibit ...

<p>Antiferroelectric (AFE) materials are promising for the applications in advanced high-power electric and electronic devices. Among them, AgNbO₃ (AN)-based ceramics have gained considerable attention due to their excellent energy storage performance. Herein, multiscale synergistic modulation is proposed to improve the energy storage performance of ...

Remarkable energy storage properties in ... Possessing the antiferroelectric-ferroelectric ... To better comprehend the mechanism of linear relaxation characteristics, the temperature-dependent dielectric properties were studied to determine whether SmFeO 3 achieved the superparaelectric state. Further, the electric field sensitivity of ...

Antiferroelectric materials represented by PbZrO 3 (PZO) have excellent energy storage performance and are expected to be candidates for dielectric capacitors. It remains a challenge to further enhance the effective energy storage density and efficiency of PZO-based antiferroelectric films through domain engineering.

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In recent years, antiferroelectric materials have attracted significant attention as energy storage materials in pulsed power systems. In this study, (1-x)PbZrO 3-xSrTiO 3 (PZO-STO) antiferroelectric films were prepared, and the effects of the STO content on the microstructure and energy storage performance of the thin films were investigated in detail.

The unique antiferroelectric behavior of AgNbO 3 ceramics has great potential for energy storage applications, which have attracted increasing attention. However, the relatively low recoverable energy storage density, energy efficiency and breakdown strength of AgNbO 3 ceramics severely limit their application in practice. In the present work, (Bi 0.2 Sr 0.7)TiO 3 ...

NaNbO 3-based lead-free energy-storage ceramics have been extensively investigated owing to their large bandgap and antiferroelectric characteristics, which are important candidates for next-generation pulse power capacitors.However, the low energy-storage efficiency caused by antiferroelectric-ferroelectric phase transition strongly restricts their development.

Relaxation antiferroelectric energy storage

Bi(Mg0.5Hf0.5)O3 (BMH) has been frequently exploited to engineer the material"s phase structure, micromorphology, dielectric, piezoelectric, and energy storage performance of BaTiO3 (BT)-based ceramics for the optimization of multifunctional dielectrics. Herein, combined with the Ba(Ti0.8Sn0.2)O3 relaxor, (1 - ...

This work provides a novel strategy to stabilize the AFE R phase and enhance the ESPs of dielectric materials. NaNbO3 (NN)-based lead-free antiferroelectric (AFE) ceramics have ...

To meet the great demands for energy storage devices, dielectric materials are urgently expected in recent years, owing to their promising properties such as high working voltage, large power density, fast charge-discharge rate, and long lifespan [1,2,3].Among the dielectric materials, lead-free ceramics with good energy storage properties have attracted ...

A multiscale regulation strategy has been demonstrated for synthetic energy storage enhancement in a tetragonal tungsten bronze structure ferroelectric. Grain refining and second-phase ...

Semantic Scholar extracted view of "Tailoring ferroelectric polarization and relaxation of BNT-based lead-free relaxors for superior energy storage properties" by Peng Shi et al. ... Relaxor antiferroelectric (AFE) ceramic capacitors have drawn growing attention in future advanced pulsed power devices for their superior energy storage ...

Request PDF | Relaxation behavior of PbZrO3-SrTiO3 thin film for enhancing energy storage performances | In recent years, antiferroelectric materials have attracted significant attention as ...

The enhancement of the energy-storage performance and electrocaloric effect (ECE) was achieved via orientation control. The 1.5-mm-(Pb 0.97 La 0.02)(Zr 0.73 Sn 0.22 Ti 0.05)O 3 (PLZST) antiferroelectric (AFE) thick films with (111), (110), and (100) crystallographic orientations were successfully prepared via a sol-gel method. It was found that both the ...

The achievement of simultaneous high energy-storage density and efficiency is a long-standing challenge for dielectric ceramics. Herein, a wide band-gap lead-free ceramic of NaNbO 3 -BaZrO 3 featuring polar nanoregions with a rhombohedral local symmetry, as evidenced by piezoresponse force microscopy and transmission electron microscopy, were ...

Ferroelectrics are considered as the most promising energy-storage materials applied in advance power electronic devices due to excellent charge-discharge properties. However, the unsatisfactory energy-storage density is the paramount issue that limits their practical applications. In this work, the excellent energy-storage properties are achieved in (1 ...

This study provides evidence that developing high-entropy relaxor ferroelectric material via equimolar-ratio

element design is an effective strategy for achieving ultrahigh ...

Antiferroelectric NaNbO3 ceramics are potential candidates for pulsed power applications, but their energy efficiency and energy densities are low owing to the irreversible transition of NaNbO3 from antiferroelectric to electric field-induced ferroelectric phases. (Sr0.55Bi0.3)(Ni1/3Nb2/3)O3 was doped into NaNbO3 ceramics to modify their dielectric and ...

Enhancing the efficiency in energy storage capacitors minimizes energy dissipation and improves device durability. A new efficiency-enhancement strategy for antiferroelectric ceramics, imposing relaxor characteristics through forming solid solutions with relaxor compounds, is demonstrated in the present work.