Antiferroelectric energy storage density

What is a high energy storage density (uesd)?
Energy storage devices with high energy storage density (UESD), fast operating speed, and high output power are indispensable for modern energy needs. This study presents a wafer-scale epitaxial antiferroelectric ZrO2/TiN heterostructure with a state-of-the-art high UESD of ~118.6 J cm-3. This significant UE

Are antiferroelectrics suitable for high-performance energy storage?
Antiferroelectrics with antiparallel dipole configurations have been of significant interest for high-performance energy storage due to their negligible remanent polarization and high maximum polarization in the field-induced ferroelectric state 6, 7, 8.

Can polarization profiles improve energy storage performance in antiferroelectrics?
This strategy presents new opportunities to manipulate polarization profiles and enhance energy storage performances in antiferroelectrics. Electric energy storage devices with both high energy density and power density are highly desired for advanced electronics and electrical power systems.

Can non-polar nanodomains improve energy storage performance in antiferroelectrics?
This strategy presents new opportunities to manipulate polarization profiles and enhance energy storage performances in antiferroelectrics. This study reports that incorporating non-polar nanodomains into antiferroelectrics greatly enhanced the energy density and efficiency.

Why do ant50 MLCCs have a high energy storage density?
Because the decrease of off-center cations displacementcontributes to the high breakdown strength and low energy loss,ultrahigh energy storage density Urec = 12.6 J·cm-3and efficiency ? > 94 % were achieved in the ANT50 MLCCs.

What happens if antiferroelectric film reaches a wide voltage window?
In the normal antiferroelectric state,the onset of the desirable super-linear regime II (Fig. 1c,d) is delayed,so the film cannot reap the enhanced energy storage benefits across as wide a voltage window as the squeezed antiferroelectric state before breakdown.

Dielectric energy-storage capacitors have received increasing attention in recent years due to the advantages of high voltage, high power density, and fast charge/discharge ...

Antiferroelectric materials have attracted growing attention for their potential applications in high energy storage capacitors, digital displacement transducers, pyroelectric ...

This study reports that incorporating non-polar nanodomains into antiferroelectrics greatly enhanced the energy density and efficiency.

Abstract Antiferroelectric (AFE) ceramic materials possess ultrahigh energy storage density due to their unique double hysteresis characteristics, and PbZrO 3 is one of the ...

PbZrO3-based antiferroelectric (AFE) ceramic materials have emerged as potential candidates for the next generation of high-energy ...

Reversible field-induced phase transitions define antiferroelectric perovskite oxides and lay the foundation for high-energy storage density materials, required for future ...

Record-high energy-storage density of 128.4 J cm -3 and energy efficiency of 81.2% are simultaneously achieved in [PL/PZ] N = 8 multilayer films based on alternating ...

That is, enhances electrical homogeneity, increases energy gap (Eg) and refines grain size (from 1.05 to 0.75 µm). Through domain engineering, antiferroelectric-like ...

Among various dielectric materials, antiferroelectric (AFE) materials are the ones that have edges over ferroelectric (FE) and paraelectric materials regarding the energy storage ...

2D Antiferroelectric Hybrid Perovskite with a Large Breakdown Electric Field And Energy Storage Density State Key Laboratory of Structural Chemistry, Fujian Institute of ...

One of the limiting factors in the miniaturization of present-day electronics is the relatively large size of their capacitors, due to their somewhat ...

Abstract Lead-free dielectric capacitors with high energy storage density and temperature-insensitive performance are pivotal to pulsed power ...

Abstract Dielectric energy storage has gained considerable significance owing to the high energy requirements of human society. Lead zirconate-based (PZ) antiferroelectric ...

Ultrahigh energy storage density and superior discharge power density in a novel antiferroelectric lead hafnate Peng-Zu Ge a, Xin-Gui Tang a, Ke Meng a, Xian-Xiong Huang ...

1. Introduction In the face of climate change and energy crisis, renewable energy sources have become the focus of research [1, 2], thereby significantly increasing the ...

However, the recoverable energy storage density (Wrec) for dielectric ceramics is relatively low up to now, which largely restricts their actual application. Herein, the domain ...

Superior recoverable energy density (Wrec) and efficiency (?) are crucial parameters for capacitors used in

pulse-power devices. Here, we achieved an ...

Dielectric capacitors have attracted extensive attention due to their high power density along with fast charge/discharge rate. Despite the high energy storage performance ...

However, the well-known NaNbO3 lead-free antiferroelectric (AFE) ceramic usually exhibits square-like P - E loop related to the irreversible AFE P phase to ferroelectric ...

Ultra-high energy-storage density in antiferroelectric ceramics with field-induced multiphase transitions Hongsheng Wanga, Yucheng Liua, Tongqing Yang*a, and Shujun Zhang*b

The utilization of antiferroelectric (AFE) materials is commonly believed as an effective strategy to improve the energy-storage density of multilayer ceramic capacitors ...

Lead-free dielectric capacitors have tremendous potential for energy storage applications due to their stable and fast charge-discharge performances in comparison to supercapacitors and ...

W ith the rapid development of electronics in-dustry, the demand for dielectric energy storage devices is becoming more and more urgent, such as hybrid electric vehicles, laser weapons, ...

The Yb 3+ doping at A-site reduces the oxygen vacancy and increases the silver vacancy after reaching saturation, which improves the antiferroelectric stability, leading to ...

Cai et al. found that La-doped antiferroelectric films showed high energy storage, high efficiency and good cycling stability [7]. By replacing Pb 2+ with La 3+ at A site, the long ...

Antiferroelectrics (AFE), characterized by anti-polar internal displacements in a unit cell and exhibiting dou-ble P-E hysteresis loop, hold great promise for energy storage since it can have ...

Lead-based antiferroelectric (AFE) material with high power density has received extensive attention for potential applications in the energy storage ...

Dielectric capacitors with high power density and excellent temperature stability are highly demanded in pulsed power systems. AgNbO3-based lead-free antiferroelectric ceramics have ...

Here, an integrated strategy for enhancing energy storage density by using the designed composition of antiferroelectric materials is proposed. By doping Pb (Zr 0.87 Sn 0.12 ...

As global energy demand increases and environmental concerns grow, there is a growing need for sustainable energy storage solutions across all industries [1], [2], [3]. Solid ...

Linear-like lead-free relaxor antiferroelectric (Bi 0.5 Na 0.5)TiO 3 -NaNbO 3 with giant energy-storage density/efficiency and super stability against temperature and frequency.

The present study demonstrates the tunability of performance in orthorhombic PLZST AFE ceramics, thereby introducing a ceramic material ...

Novel lead-free NaNbO3-based relaxor antiferroelectric ceramics with ultrahigh energy storage density and high efficiency

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