

# Ferroelectric and antiferroelectric energy storage

Can antiferroelectrics be used for energy storage and conversion applications?

Herein, we provide perspectives on the development of antiferroelectrics for energy storage and conversion applications, as well as a comprehensive understanding of the structural origin of antiferroelectricity and field-induced phase transitions, followed by design strategies for new lead-free antiferroelectrics.

Is antiferroelectricity a resurgence in energy-efficient applications?

As a close relative of ferroelectricity, antiferroelectricity has received a recent resurgence of interest driven by technological aspirations in energy-efficient applications, such as energy storage capacitors, solid-state cooling devices, explosive energy conversion, and displacement transducers.

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.

Why do polymorphic modulated antiferroelectric ceramics have a good energy storage performance?

The independent evolution of antiferroelectric short-range to ferroelectric short-range and ferroelectric long-range, and their interaction are the key to the excellent energy storage performance of polymorphic modulated antiferroelectric ceramics.

Can antiferroelectric materials store energy in pulsed-power technologies?

The polarization response of antiferroelectrics to electric fields is such that the materials can store large energy densities, which makes them promising candidates for energy storage applications in pulsed-power technologies. However, relatively few materials of this kind are known.

What are the applications of ferroelectric materials?

To date, ferroelectric (FE) materials have found a plethora of applications in FE random access memory (FeRAM), energy storage capacitors, FE tunneling junctions (FTJs), medical ultrasonic imaging transducers, ultrasonic motors, electromechanical sensors, etc.

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