Dielectric influences energy storage

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 ...

Bi2Mg2/3Nb4/3O7 (BMN) thin films are prepared on Pt-Si substrates by magnetron sputtering, the influence of oxygen on dielectric and energy storage properties of BMN thin films is systematically studied. Under the optimal oxygen argon ratio, the BMN thin films show an acceptable dielectric constant of 161 and low loss of 0.0032. With the increase in oxygen ...

Electrostatic capacitors are among the most important components in electrical equipment and electronic devices, and they have received increasing attention over the last two decades, especially in the fields of new energy vehicles (NEVs), advanced propulsion weapons, renewable energy storage, high-voltage transmission, and medical defibrillators, as shown in ...

There is still an urgent need for the profound understanding to the role of shell to influence overall energy storage performance although numerous experimental efforts have been made. A model of the core-shell-structured ceramics was developed by finite element method, where the shell is linear dielectric and the core is ferroelectric phase.

c) Energy storage performance up to the maximum field. d) Comparison of QLD behavior MLCCs and "state-of-art" RFE and AFE type MLCCs as the numbers beside the data points are the cited references. Energy storage performance as a function of e) Temperature at 150 MV m -1 and f) Cumulative AC cycles at 150 MV m -1.

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The dielectric capacitor is a widely recognized component in modern electrical and electronic equipment, including pulsed power and power electronics systems utilized in electric vehicles (EVs) [].With the advancement of electronic technology, there is a growing demand for ceramic materials that possess exceptional physical properties such as energy ...

Due to high power density, fast charge/discharge speed, and high reliability, dielectric capacitors are widely used in pulsed power systems and power electronic systems. However, compared with other energy storage

devices such as batteries and supercapacitors, the energy storage density of dielectric capacitors is low, which results in the huge system volume when applied in pulse ...

Finally, the key problems faced by using polyimide as a high-temperature energy storage dielectric material are summarized, and the future development direction is explored. ... we examine and introduce the relationship between the structure and properties of capacitors in detail based on the key factors affecting the energy storage ...

The influences of the dielectric/ferroelectricity, energy storage performance and breakdown behavior of C8/P2-xBT composites were thoroughly investigated. To the best of our knowledge, such a study has not yet been reported, and our results have positive implications for developing innovative, flexible devices with high electrical properties ...

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 ...

This work highlights the influence of dysprosium (Dy) doping on structural, dielectric, ferroelectric, energy storage density (ESD) and the electro-caloric(EC) response of solid state synthesized Ba1-xDyxTiO3 (BDT) ceramics with a composition of x varying from 0 to 0.05. The X-ray diffraction and Raman studies suggest that BDT ceramics exhibited pure perovskite ...

The demand for high-temperature dielectric materials arises from numerous emerging applications such as electric vehicles, wind generators, solar converters, aerospace power conditioning, and downhole oil and gas explorations, in which the power systems and electronic devices have to operate at elevated temperatures. This article presents an overview of recent ...

Theoretical investigations into the factors that influence capacitance of supercapacitors have been well documented. Kornyshev [28] and Bazant et al. [29], [30] made pioneering contribution by using the lattice-gas model incorporated to the modified Poisson-Boltzmann equation to investigate differential capacitance for the case of symmetric ...

As one of the most important energy storage devices, dielectric capacitors have attracted increasing attention because of their ultrahigh power density, which allows them to play a critical role in many high-power electrical systems. To date, four typical dielectric materials have been widely studied, including ferroelectrics, relaxor ferroelectrics, anti-ferroelectrics, and ...

Energy storage density in glass-ceramics depends on dielectric constant and breakdown strength. Recent studies focus on glass composition, crystallization temperature, crystallization time, and glass thickness. Variations in these factors affect dielectric constant and breakdown strength, leading to differences in energy

storage performance.

For 0-3 dielectric composites, there are five critical factors which can determine the film quality, dielectric properties, and the energy storage performance: (i) the selection of the polymer matrix, (ii) the type of the filler, (iii) morphologies and dimensions of the filler [15,16], (iv) interfacial engineering [9,17,18], and (v) the ...

The electric breakdown strength (E b) is an important factor that determines the practical applications of dielectric materials in electrical energy storage and electronics.However, there is a tradeoff between E b and the dielectric constant in the dielectrics, and E b is typically lower than 10 MV/cm. In this work, ferroelectric thin film (Bi 0.2 Na 0.2 K 0.2 La 0.2 Sr 0.2)TiO ...

The energy-storage performance of dielectric capacitors is directly related to their dielectric constant and breakdown strength [].For nonlinear dielectric materials, the polarization P increases to a maximum polarization P max during charging. Different materials have different P max, and a large P max is necessary for high-density energy storage. During ...

discusses the progress of energy storage performances of linear dielectric, relaxor ferroelectric, and antiferro-electric with emphasis on composition modification, macro/microstructural modulation, and electrical property optimization. 2 Key parameters for evaluating energy storage properties 2. 1 Energy storage density

Polyethersulfone (PESU) has distinctive features of great breakdown strength and low dielectric loss. However, some factors limit the practical application of PESU dielectric materials in the field of energy storage, for instance, the low energy storage density, polarization strength and dielectric constant of PESU.

Electrical properties including dielectric properties, volume resistivity, breakdown strength, and especially energy storage performances were systematically investigated. We figured out that higher breakdown strength, glass transition temperature, and lower dielectric loss can be achieved with imidazole containing pyrrole-type nitrogen.

Materials offering high energy density are currently desired to meet the increasing demand for energy storage applications, such as pulsed power devices, electric vehicles, high-frequency inverters, and so on. Particularly, ceramic-based dielectric materials have received significant attention for energy storage capacitor applications due to their ...

The dielectric energy storage application is only the one of incidental production based on excellent multilevel insulation properties. ... The depth of fluorination layer depends on some factors including fluorination time, temperature and fluorine gas concentration. Direct fluorination modification alters surface structure/property of polymer ...

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Ba0.6Sr0.4TiO3 based glass-ceramics were prepared by sol-gel process. Influences of B-Si-O glass content on the microstructure, dielectric, and energy storage properties of the BST based glass-ceramics have been investigated. Perovskite barium strontium titanate phase was found at annealing temperature 800 °C. A secondary phase Ba2TiSi2O8 ...

In this paper, a commercial BOPP film is selected as the dielectric film, and three metal electrode materials of Al, Cu, and Pt are grown on the surface of the BOPP film by vacuum evaporation or magnetron sputtering to explore the influence of metal electrode materials on the dielectric energy storage characteristics of BOPP films.

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