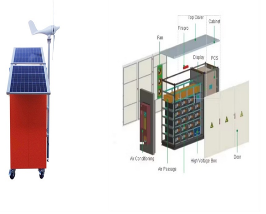
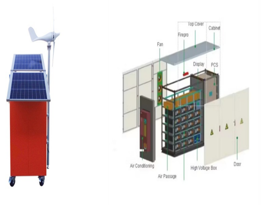
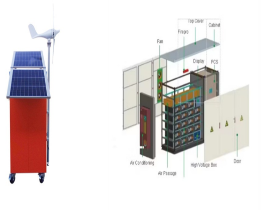
HIGH ENERGY STORAGE DENSITY CERAMICS



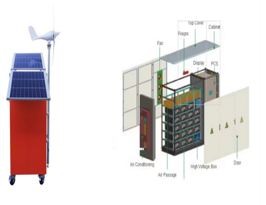
Are dielectric ceramics good for energy storage? Learn more. Dielectric ceramics with high energy storage performanceare crucial for the development of advanced high-power capacitors. However,achieving ultrahigh recoverable energy storage density and efficiency remains challenging,limiting the progress of leading-edge energy storage applications.



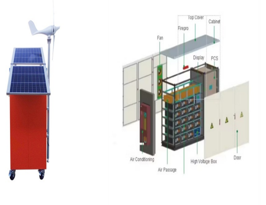
Can ceramics achieve high energy density under low electric fields? The development of ceramics with superior energy storage performance and transparency holds the potential to broaden their applications in various fields,including optoelectronics,energy storage devices,and transparent displays. However,designing a material that can achieve high energy density under low electric fields remains a challenge.



Can lead-free ceramics achieve ultrahigh energy storage density 10 J cm 3? Recently,high Wrec and high ?? have been reported in some Bi 0.5 Na 0.5 TiO 3 (BNT)-based lead-free ceramics 19,20,21. However,the great challenge of realizing ultrahigh energy storage density (Wrec ???10???J???cm ???3) with simultaneous ultrahigh efficiency (?? ??????90%) still exists in lead-free ceramics and has not been overcome.



Do dielectric ceramics have a high entropy strategy? Dielectric ceramics are widely used in advanced high/pulsed power capacitors. Here,the authors propose a high-entropy strategyto design ???local polymorphic distortion??? in lead-free ceramics,achieving high energy storage performance.



What are the characteristics of Er 3+ ceramic? Especially, 0.9BNT???0.1BZT:0.6%Er 3+ ceramic exhibits an ultra-high maximum polarization (Pmax = 66.3 uC/cm 2), large recoverable energy storage density (Wrec = 2.95 J/cm 3), total energy storage density (W = 5.75 J/cm 3), and energy storage efficiency (?? = 51.3%) under 190 kV/cm.

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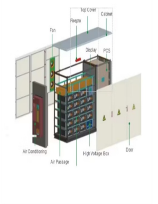
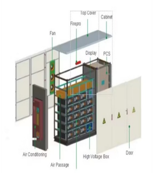
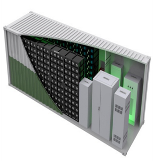


Are BNT-based ceramics good for energy storage? J. Eur. Ceram. Soc. 43,6875???6882 (2023). He,B. et al. Realization of superior thermal stability and high-power density in BNT-based ceramics with excellent energy storage performance. J. Eur. Ceram. Soc. 44,5022???5030 (2024).

The development of ceramics with superior energy storage performance and transparency holds the potential to broaden their applications in various fields, including optoelectronics, energy storage devices, and ???


Homogeneous (Na0.5Bi0.5)(1???x)BaxTi(1???y)SnyO3 ceramics were densified by a combination of cold isostatic pressing and microwave sintering (CIP& MS strategy), and their phase transition and ferroelectric properties ???

The maximum energy storage density can be obtained for the sample with x = 0.10 at room temperature (RT), with an energy storage density of 2.04 J/cm 3 at 178 kV/cm, the performance of which is outstanding in lead ???


The low breakdown strength of BNT-based dielectric ceramics limits the increase in energy-storage density. In this study, we successfully reduced the sintering temperature of ???

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The energy storage dielectric capacitor materials are commonly classified into four broad categories: linear dielectrics, ferroelectrics, antiferroelectrics, and relaxor ferroelectrics ???

Dielectric capacitors with high power density and excellent temperature stability are highly demanded in pulsed power systems. AgNbO 3-based lead-free antiferroelectric ceramics have ???

High recoverable energy density (Wrec ?? 1/4 2.1 J/cm3) was obtained in (0.7 ??? x)BiFeO3-0.3BaTiO3-xBi(Zn2/3Nb1/3)O3 + 0.1 wt % Mn2O3 (BF-BT-xBZN, x = 0.05) lead-free ceramics at <200 kV/cm. Fast discharge speeds ???

Developing materials with enhanced energy-storage performance (ESP) is the key to addressing the global energy crisis [1], [2]. Thanks to their features like rapid discharge speed, significant ???

Bi 0 ?. 5 Na 0 ?. 5 TiO 3 (BNT)-based lead-free dielectric materials have attracted extensive research in environment-friendly ferroelectrics due to their high dielectric constant ???

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The development of ceramics with superior energy storage performance and transparency holds the potential to broaden their applications in various fields, including optoelectronics, energy storage devices, and ???

Dielectric ceramics with high energy storage performance are crucial for the development of advanced high-power capacitors. However, achieving ultrahigh recoverable energy storage density and efficiency remains ???

BNT ($Bi_{0.5}Na_{0.5}TiO_3$)-based ferroelectric ceramics have drawn much attention in energy storage applications due to the high saturation polarization and good temperature stability. However, the reduction of Ti^{4+} ???

Thus, high energy density and ultrahigh energy efficiency are realized in both monolithic ceramics and MLCCs. Guided by the principles of combining PRP structures and appropriate high-entropy composition with ???

High energy storage density and ultrafast discharge in lead lutetium niobate based ceramics (PLN)-based ceramic, which is an alternative AFE material due to its significantly enhanced energy storage density (6.43 J cm ???

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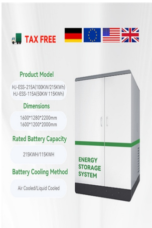
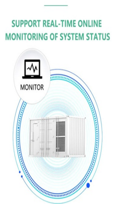


However, high residual polarization, high coercive field, and large leakage current of BNT at room temperature make energy storage density and energy storage efficiency very low ???

a Comparisons of the energy storage properties between the studied ceramics (x ??? 0.14) in this work and other recently reported KNN-based ceramics.b Comparisons of the W ???



K 0.5 Na 0.5 NbO 3 (KNN)-based ceramics, as promising candidate materials that could replace lead-based ceramics, exhibit outstanding potential in pulsed power systems due to their large ???