Grain boundary layer capacitor ceramics

What is a grain boundary capacitor?
A grain boundary capacitor is a particulate composite made of discrete conducting grains surrounded by a continuous insulating layer. When an electric field is applied to the grain boundary capacitor, each pair of adjacent conducting grains separated by an insulating layer forms a miniature capacitor.

What is the electric field of multilayer ceramic capacitors (MLCCs)?
For the multilayer ceramic capacitors (MLCCs) used for energy storage,the applied electric field is quite high,in the range of ~20-60 MV m -1,where the induced polarization is greater than 0.6 C m -2.

What is the energy density of dielectric ceramic capacitors?
The energy density of dielectric ceramic capacitors is limited by low breakdown fields. Here,by considering the anisotropy of electrostriction in perovskites,it is shown that <111>-textured Na0.5Bi0.5TiO3-Sr0.7Bi0.2TiO3 ceramics can sustain higher electrical fields and achieve an energy density of 21.5 J cm-3.

Who conceived and designed the capacitors?
The work was conceived and designed by J.L.,S.Z. and F.L.; J.L. fabricated the capacitors and performed microstructure and dielectric experiments; Z.S.,X.C. and Q.L. performed finite-element simulations; and S.Y.,W.Z.,M.W.,L.W.,Y.L.,Q.K. and Y.C. assisted in the fabrication of templates and textured ceramics.

Are 111> oriented grains increased in textured ceramics?
Electron backscatter diffraction (EBSD) experiments further confirm that the <111>-oriented grains are clearly increasedin the textured sample compared to the nontextured counterpart,as shown in Fig. 3e,f. Fig. 3: Texture quality of NBT-SBT multilayer ceramics.

What is the frequency response of the impedance of Gbbl capacitors?
A new model is developed to explain the frequency response of the impedance of grain-boundary barrier layer (GBBL) capacitors. This model takes into consideration the dipole polarization effect and provides a simple and effective approach to evaluate the performance of GBBL capacitors with various dopants and sintering in different atmospheres.

Disclosed is an SrTiO 3 -based grain boundary barrier layer capacitor which is superb in dielectric constant and temperature characteristics. It is prepared by infiltrating a liquid-phase oxide mixture into a donor-doped SrTiO 3 matrix to form second-phase dielectric layers at the grain boundaries of the matrix. The liquid-phase oxide mixture comprises CaO and BaO in a particular molar ratio.

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Reverse boundary layer capacitor (RBLC) configuration model, where the grain boundary has a higher electrical conductivity than the grain, is proposed in glass/ceramic composites for dielectric energy storage applications. By introducing glass

3 ???· [25-28] The accumulation of vacancies leads to the formation of a negatively charged space charge layer (SCL) adjacent to the interface, ... the understanding of this behavior is ...

Donor-doped (Sr, Ca)TiO3 ceramics, either oxidized or infiltrated by Bi2O3 and Bi2O3-PbO molten mixtures, have been studied using a transmission electron microscope equipped with EDX facilities. Grain boundary morphologies of these different materials are investigated. In oxidized samples, grain surfaces exhibit a chemical contrast, interpreted ...

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A new technique to process ceramic/polymer grain boundary capacitors has been developed and demonstrated using BaTiO 3 as the ceramic conducting phase and LaRC-TPI ...

Here, we propose a strategy to increase the breakdown electric field and thus enhance the energy storage density of polycrystalline ceramics by controlling grain orientation.

Grain boundary layer capacitors are processed from Ba (Ti 1 - x Sn x)O 3 solid solutions (0 < × < 0.25), doped simultaneously with donor and acceptor impurities. The starting powders are prepared by the hydrothermal method.

Ceramic capacitors show an attractive potential for application in integrated circuits due to their superior dielectric properties. Herein, CdCu 3 (In 0.5 Ta 0.5) x Ti 4-x O 12 ...

Reverse boundary layer capacitor model in glass/ceramic composites for energy storage applications Xiaoyong Wei,1,2,a) Haixue Yan,1 Tong Wang,2 Qingyuan Hu,2 G. Viola,1,3 Salvatore Grasso,1,3 Qinghui Jiang,1 Li Jin,2 Zhuo Xu,2 and Michael J. Reece1,3 1School of Engineering and Material Science, Queen Mary University of London, London E1 4NS, United ...

Electrical properties of BaTiO 3-based capacitors are investigated. A new model is developed to explain the frequency response of the impedance of grain-boundary barrier layer (GBBL) capacitors. This model takes into consideration the dipole polarization effect and provides a simple and effective approach to evaluate the performance of GBBL ...

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In the insulation process of SrTiO3grain boundary layer capacitor ceramics, the prevalent practice involves the use of insulating oxides predominantly containing PbO.

Hydrogen-induced degradation in SrTiO 3-based grain boundary barrier layer ceramic capacitors was studied through electrochemical hydrogen charging, in which the capacitors were placed in 0.01 M NaOH solution with hydrogen deposited on their electrodes from the electrolysis of water.The properties of the capacitors were greatly degraded after 0.5 h of ...

Concentration of Rare-earth additives around grain boundary is the most important factor for improving HALT result. Design of Grain Boundary Reliability is directly related to the integrity of the grain boundaries in the ceramic layers. 9 APEC 2011: Ceramic Capacitor Update Improved Additive Dispersion Superior dispersion of coating materials in green sheet The traditional ...

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