

# THIN FILM DIELECTRIC ENERGY STORAGE

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Are flexible dielectric film capacitors suitable for energy storage? Cite this: ACS Appl. Mater. Interfaces 2019, 11, 5, 5247-5255 As passive components in flexible electronics, the dielectric capacitors for energy storage are facing the challenges of flexibility and capability for integration and miniaturization. In this work, the all-inorganic flexible dielectric film capacitors have been obtained.



Do film dielectrics improve energy storage performance? Film dielectrics possess larger breakdown strength and higher energy density than their bulk counterparts, holding great promise for compact and efficient power systems. In this article, we review the very recent advances in dielectric films, in the framework of engineering at multiple scales to improve energy storage performance.



Are dielectric energy storage films a domain engineering strategy? In this Perspective, we focus on the most state-of-the-art dielectric energy storage films in the framework of domain engineering. Generally applicable domain engineering strategies are overviewed, followed by articulative examples of their implementation in modulating domain sizes and symmetries that enhance the energy storage.



Can domain engineering improve dielectric thin films? Generally applicable domain engineering strategies are overviewed, followed by articulative examples of their implementation in modulating domain sizes and symmetries that enhance the energy storage. Finally, we envision prospects of further improvements of dielectric thin films within domain engineering and beyond. 1. Prog. Mater.



Are all-inorganic flexible dielectric film capacitors effective? In this work, the all-inorganic flexible dielectric film capacitors have been obtained. The flexible capacitors show a desirable recoverable energy density ( $W_{rec}$ ) of  $40.6 \text{ J/cm}^3$  and a good energy efficiency ( $\eta$ ) of 68.9%.

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What are the different types of energy storage dielectrics? The energy storage dielectrics include ceramics, thin films, polymers, organic???, inorganic composites, etc. Ceramic capacitors have the advantages of high dielectric constant, wide operating temperature, good mechanical stability, etc., such as barium titanate  $\text{BaTiO}_3$  (BT), strontium titanate  $\text{SrTiO}_3$  (ST), etc.



Yang et al. investigated a flexible  $\text{Na}_{0.5}\text{Bi}_{0.5}\text{TiO}_3\text{-BaTiO}_3\text{-BiFeO}_3$  thin film and obtained high energy storage density ( $81.9 \text{ J/cm}^3$ ) and high efficiency (64.4%) [17]. In ???



Electrostatic dielectric capacitors with ultrahigh power densities are sought after for advanced electronic and electrical systems owing to their ultrafast charge-discharge capability. However, low energy density resulting from low ???



Ultimately, a recoverable energy density of  $38.3 \text{ J/cm}^3$  and an energy storage efficiency of about 89.4% can be realized at 1.5% tensile strain and 2% defect dipole concentration. Our work ???



where  $\epsilon_0$  is the vacuum dielectric constant;  $\epsilon_r$  is the relative dielectric constant. In this case,  $P_{\text{max}}$  represents the greatest polarization. Frequently, the polarization (P)-electric field (E) ???

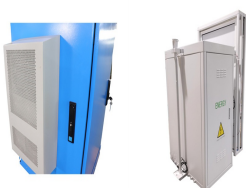
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$P_{max}$ , the dielectric constant, the thermal stability of dielectric constant and energy storage density of the BFO25-BTO75 film are comparable to the best results of any other lead ???



1 Introduction. Nowadays, dielectric thin-film capacitors, which can store and release ultralarge energy densities in an extremely short time, are extensively investigated for applications in pulsed-power electronic systems.



The recoverable energy storage density ( $W_r$ ) of dielectric capacitors is determined by the dielectric constant, Figure 4 shows the recoverable energy storage density and energy efficiency for 5 nm thin films of ???



The SL 0.02 M 0.01 thin film exhibits excellent frequency stability and low dielectric loss ( $<0.01$ ) with an energy storage density of  $29.5 \text{ J/cm}^3$  and an efficiency of 83.7 % at 2600 ???



According to the types of dielectrics, dielectric energy storage materials include ceramics, thin films, organic polymers, and filler???polymer composites. The research status overviews of ???



Antiferroelectric film capacitors have attracted increasing attention due to their excellent energy storage properties. In this work,  $\text{PbZrO}_3$  (PZO) antiferroelectric films have ???

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Besides, the energy storage performances are almost unchanged after 10 4 bending cycles, demonstrating an excellent mechanical bending endurance. This work sheds light on the preparation technology and ???



Recent progress in polymer dielectric energy storage: From film fabrication and modification to capacitor performance and application. Progress in Materials Science 2023, 140, 101207.  $\text{Ti}_{0.99}\text{Mn}_{0.01}\text{O}_3$  thin films ???



Dielectric energy storage capacitors as emerging and imperative components require both high energy density and efficiency. Ferroelectric-based dielectric thin films with large polarizability, high breakdown strength, and ???



Compared with batteries and supercapacitors, dielectric capacitors have the advantages of fast charging/discharging, high power density, and long lifetime, which makes ???