

What are metallized film capacitors?

Metallized film capacitors towards capacitive energy storage at elevated temperatures and electric field extremes call for high-temperature polymer dielectrics with high glass transition temperature ( $T_g$ ), large bandgap ( $E_g$ ), and concurrently excellent self-healing ability.

How can film capacitors improve energy storage performance?

Recently, film capacitors have achieved excellent energy storage performance through a variety of methods and the preparation of multilayer films has become the main way to improve its energy storage performance.

Are polymer dielectrics suitable for high-temperature film capacitors?

Film capacitors based on polymer dielectrics face substantial challenges in meeting the requirements of developing harsh environment ( $\geq 150^\circ\text{C}$ ) applications. Polyimides have garnered attention as promising dielectric materials for high-temperature film capacitors due to their exceptional heat resistance.

Are metallized stacked polymer film capacitors suitable for high-temperature applications?

2.5. Prototypical metallized stacked polymer film capacitors for high-temperature applications To explore the applications of the high-performance Al-2 PI in electrostatic capacitors, we utilize Al-2 PI to construct prototypes of metallized stacked polymer film capacitors (m-MLPC) for applications at elevated temperatures.

What is the cyclability of film capacitors based on polymer dielectrics?

A record-high energy density of  $\sim 4.9 \text{ J/cm}^3$  with  $> 95\%$  is obtained at  $150^\circ\text{C}$ . Stable cyclability over 100,000 cycles under  $400 \text{ MV/m}$  at  $150^\circ\text{C}$  is achieved. Film capacitors based on polymer dielectrics face substantial challenges in meeting the requirements of developing harsh environment ( $\geq 150^\circ\text{C}$ ) applications.

Are film capacitors better than dielectric capacitors?

Dielectric capacitors, which have the characteristics of greater power density, have received extensive research attention due to their application prospects in pulsed power devices. Film capacitors are easier to integrate into circuits due to their smaller size and higher energy storage density compared to other dielectric capacitor devices.

Flexible film capacitor with high energy storage density ( $W_{\text{rec}}$ ) and charge-discharge efficiency (?) is a cutting-edge research topic in the current field of energy storage. In this work, flexible ...

The development of advanced dielectric film materials with high energy storage performance is of critical significance for pulsed power capacitor applications. Nevertheless, the low discharged energy density ... dielectric film capacitors also simultaneously possess the advantages of flexibility, lightweight and facile fabrication.<sup>7-9</sup>

Flexible antiferroelectric (AFE)  $\text{Pb}_{0.94}\text{La}_{0.04}\text{Zr}_{0.97}\text{Ti}_{0.03}\text{O}_3$  (PLZT) thick-film capacitors were fabricated on nickel foil substrates using sol-gel method. The thick PLZT film shows pure perovskite phase with dense ...

The discharge energy density ( $U_d$ ) of a dielectric capacitor is equal to the integral  $U_d = \int E dP$ , where  $P$  represents polarization and  $E$  is the applied electric field. Compared with batteries and electrochemical capacitors, the relatively low energy density of dielectric capacitors ( $2 \text{ J/cm}^3$  for commercial polymer or ceramic capacitors) has become a ...

An average maximum recoverable energy storage density,  $88 \pm 17 \text{ J cm}^{-3}$  with an efficiency of 85%  $\pm 17\%$ ; 6% at 1 kHz and  $80 \pm 17 \text{ J cm}^{-3}$  with an efficiency of 91%  $\pm 17\%$ ; 4% at ...

Here, we report a high-entropy stabilized  $\text{Bi}_2\text{Ti}_2\text{O}_7$ -based dielectric film that exhibits an energy density as high as  $182 \text{ J cm}^{-3}$  with an efficiency of 78% at an electric field ...

Our results show that the optimal BT-BMZ film achieved by tuning growth pressure can significantly improve the breakdown strength and polarization switching behavior ...

In the case of dielectric energy storage devices, excessive pursuit of giant electric fields means greater exposure to high temperatures and insulation damage risk. Ferroelectric thin film devices offer opportunities for energy storage needs under finite electric fields due to their intrinsically large polarization and the advantage of small size. Herein, we designed the capacitor's ...

At  $x = 0.32$ , the film demonstrates exceptional energy storage properties at ambient temperature, boasting an energy storage density of  $103 \text{ J cm}^{-3}$  and energy storage efficiency of 79 % under an electric field of  $4143 \text{ kV cm}^{-1}$ . Notably, the film capacitor exhibits outstanding high-temperature energy storage capabilities and remarkable stability over a wide temperature ...

$\text{BiFeO}_3$ -doped  $(\text{K}_{0.5}\text{Na}_{0.5})(\text{Mn}_{0.005}\text{Nb}_{0.995})\text{O}_3$  ferroelectric thin film capacitors for high energy density storage applications. Appl Phys Lett 2017, 110: 152901 ... ZHAI X, OUYANG J, et al. Achieving a high energy storage density in  $\text{Ag}(\text{Nb,Ta})\text{O}_3$  antiferroelectric films via nanograin engineering. Journal of Advanced Ceramics, 2023, 12(1 ...

Remarkably, our  $\text{Bi}_{0.5}\text{Na}_{0.5}\text{TiO}_3$ -based high-entropy thin film capacitor not only showcases industry-leading energy storage properties at room temperature, with a recoverable energy ...

Film capacitors possess the advantages of high breakdown strength, low power loss and processing flexibility compared with their counterparts in competition such as electrolytic capacitors and ceramic capacitors [4], meaning they can sustain high voltage, have great efficiency in electrical energy storage and can be manufactured in low-cost and efficient methods.

There is a consensus that the energy storage performance of capacitors is determined by the polarization-electric field (P-E) loop of dielectric materials, and the realization of high  $W_{rec}$  ...

**High Energy Density:** Stacked film capacitors boast impressive energy density, allowing them to store more energy in a smaller space compared to traditional batteries. **Fast Charge/Discharge Rates:** These capacitors can ...

Metallized film capacitors towards capacitive energy storage at elevated temperatures and electric field extremes call for high-temperature polymer dielectrics with high glass transition temperature ( $T_g$ ), large bandgap ( $E_g$ ), and concurrently excellent self-healing ability. However, traditional high-temperature polymers possess conjugate nature and high  $S$  ...

Film capacitors with high energy storage are becoming particularly important with the development of advanced electronic and electrical power systems. Polymer-based materials have stood out from other materials and have become the main dielectrics in film capacitors because of their flexibility, cost-effectiveness, and tailorable functional properties.

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