

# Uneven energy storage density

What is ultrahigh energy-storage density?

Learn more. Electrostatic capacitors with ultrahigh energy-storage density are crucial for the miniaturization of pulsed power devices. A long-standing challenge is developing dielectric materials that achieve ultrahigh recoverable energy density  $W_{rec} \geq 10 \text{ J cm}^{-3}$  under moderate electric fields ( $30 \leq E \leq 50 \text{ kV mm}^{-1}$ ).

What causes high energy storage density in AgNbO<sub>3</sub> based multilayer capacitors?

Zhu, L. F. et al. Heterovalent-doping-enabled atom-displacement fluctuation leads to ultrahigh energy-storage density in AgNbO<sub>3</sub>-based multilayer capacitors. *Nat. Commun.* 14,1166 (2023). Xiao, W. et al. Free energy regulation and domain engineering of BaTiO<sub>3</sub>-NaNbO<sub>3</sub> ceramics for superior dielectric energy storage performance. *Chem. Eng.*

Can MLCCs have high energy storage density?

To restrict the rise of temperature below 50 °C in MLCCs with an energy density beyond 20 J cm<sup>-3</sup>, the energy efficiency must be greater than 95%. Thus, near-zero energy loss becomes the precondition for MLCCs to enjoy high energy storage density.

Does atom-displacement fluctuation lead to ultrahigh energy-storage density in AgNbO<sub>3</sub>?

*Adv. Funct. Mater.* 28,1803665 (2018). Zhu, L. F. et al. Heterovalent-doping-enabled atom-displacement fluctuation leads to ultrahigh energy-storage density in AgNbO<sub>3</sub>-based multilayer capacitors. *Nat. Commun.* 14,1166 (2023).

What are the challenges faced by thermal energy storage?

However, its utilization faces great challenges such as a gap between demand and supply because of its fluctuating nature. Thermal energy storage by the phase change materials (PCM) is an effective solution to reduce energy consumption and improve energy efficiency.

How does polarization affect energy storage density?

In turn, the drastic increase in local polarization activated via the ultrahigh electric field (80 kV/mm) leads to large polarization and superior energy storage density.

1. Unavoidable defects such as scratches and oxide layers on the surface of Cu foil lead to uneven distribution of local current density, prompting lithium metal to preferentially nucleate ...

4. Anode-free lithium/sodium/potassium batteries have emerged as promising candidates for next-generation energy storage due to their simplified structure, high energy density, low ...

As a result, an ultrahigh  $W_{rec}$  of 10.5 J cm<sup>-3</sup> with a high-efficiency  $\eta$  of 80.3% is obtained in the  $x = 0.1$  sample under a moderate electric field of 45 kV mm<sup>-1</sup> for the first time. ...

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In this paper, the heat storage process of a latent heat thermal energy storage (LHTES) tank is studied numerically. A new type of gradient fin is added to the heat storage process in a latent ...

Abstract The latent heat thermal energy storage system (LHTES) utilizes phase change material (PCM) to store energy. The non-uniformity in heat transfer between heat transfer fluid (HTF) ...

Lithium-metal anodes with high theoretical capacity and ultralow redox potential are regarded as a &quot;holy grail&quot; of the next-generation energy-storage industry. Nevertheless, Li ...

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