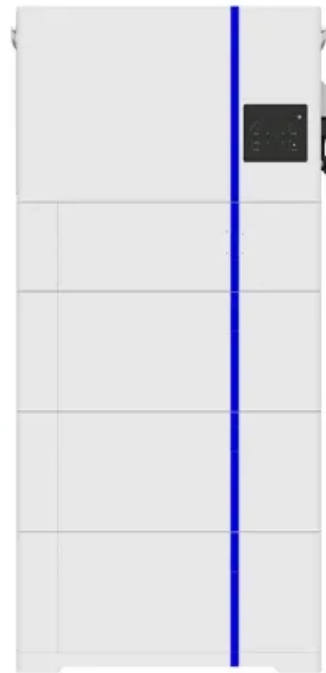


# Ladderphane copolymers for high-temperature capacitive energy storage

## ESS





## Overview

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NMR spectra of  $^1\text{H}$  (500 MHz) and  $^{13}\text{C}$  (125 MHz) were recorded using a Varian Mercury Plus 500.

A solution of 4-methylsulfonylaniline (1.72 g, 10 mmol) in 10 ml toluene was added dropwise to the stirred solution of norbornene-5,6-endo-dicarboxylic anhydride (1.96 g).

A solution of 4-aminophenylsulfone (1.19 g, 4.8 mmol) in 10 ml HAc was added dropwise to the stirred solution of norbornene-5,6-endo-dicarboxylic anhydride (1.64 g).

$\text{Br}_2$  (0.63 g, 4 mmol) was added into a solution of **1** (1.08 g, 2 mmol) in  $\text{CHCl}_3$  (20 ml) under nitrogen atmosphere and the mixture was stirred at room temperature for 6 h. The mixture.

$\text{BH}_3\text{-THF}$  (1.37 g, 16 mmol) in THF (40 ml) was added slowly into a slurry of **2** (1.4 g, 1.6 mmol) in THF (20 ml) under nitrogen atmosphere at  $0\text{ }^\circ\text{C}$  and the mixture was stirred at  $60\text{ }^\circ\text{C}$  fo.





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Jie Chen, Zhantao Pei, Yijie Liu, Kunming Shi, Yingke Zhu, Zhicheng Zhang, Pingkai Jiang, Xingyi Huang\*, Aromatic-Free Polymers Based All-Organic Dielectrics with Breakdown Self-Healing for High-Temperature Capacitive Energy Storage, Advanced Materials



### Anisotropic Semicrystalline Homopolymer Dielectrics for High

Abstract High-temperature dielectric polymers are in high demand for powering applications in extreme environments. This novel approach of enhancing the capacitive energy storage properties by controlled orientation of lamellae in homopolymer offers a new



### Metallized stacked polymer film capacitors for high-temperature

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., and concurrently excellent self-healing ability.





### Positively charged colloidal Nanoparticle/Polymer composites for High

Semantic Scholar extracted view of "Positively charged colloidal Nanoparticle/Polymer composites for High-Temperature capacitive energy Storage: A promising approach" by Hua Wang et al. DOI: 10.1016/j.cej.2024.149300 Corpus ID: ...



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### Polymer Dielectrics Sandwiched by Medium-Dielectric

Request PDF , Polymer Dielectrics Sandwiched by Medium-Dielectric-Constant Nanoscale Deposition Layers for High-Temperature Capacitive Energy Storage , Polymer film capacitors are usually limited



### Ladderphane copolymers for high-temperature capacitive energy ...

For capacitive energy storage at elevated temperatures<sup>1-4</sup>, dielectric polymers are required to integrate low electrical conduction with high thermal ...



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### Ladderphane copolymers for high-temperature capacitive energy storage

Abstract: Abstract For capacitive energy storage at elevated temperatures<sup>1-4</sup>, dielectric polymers are required to integrate low electrical conduction with high thermal conductivity. The coexistence of these seemingly contradictory properties remains a persistent challenge for existing polymers.



### Polyimide composites crosslinked by aromatic molecules for high

Ladderphane copolymers for high-temperature capacitive energy storage Nature, 615 ( 7950 ) ( 2023 ), pp. 62 - 66,  
10.1038/s41586-022-05671-4 Google Scholar



### Scalable all polymer dielectrics with self-assembled nanoscale

Zhu, Y. et al. Ladderphane copolymers for high-temperature capacitive energy storage. Nature 615, 62-66 (2023). Article ADS PubMed Google Scholar



### Enhanced high-temperature energy storage performances in ...

Chen, J. et al. Ladderphane copolymers for high-temperature capacitive energy storage. Nature 615, 62-66 (2023). Article ADS CAS PubMed Google Scholar

### Physical mechanism on ladderphane copolymers with ...

In this article, the properties of trapezoidal polymer PSBNP-co-PTNI for capacitive energy storage are investigated theoretically, stimulated by the recent expe Yuqiang Wu, Mengtao Sun; Physical mechanism on ...



### Metadielectrics for high-temperature energy storage capacitors

Chen, J. et al. Ladderphane copolymers for high-temperature capacitive energy storage. Nature 615, 62-66 (2023). Article ADS CAS PubMed Google Scholar



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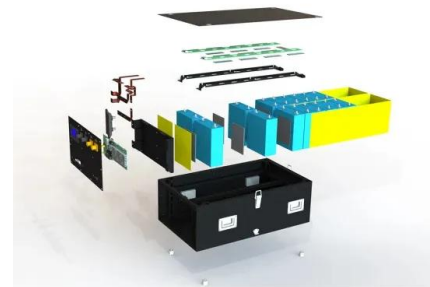


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**Ladderphane copolymers for high-temperature capacitive energy ...**

The upsurge of electrical energy storage for high-temperature applications such as electric vehicles, underground oil/gas exploration and aerospace systems calls for dielectric polymers



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### Designing tailored combinations of structural units in

Ladderphane copolymers for high-temperature capacitive energy storage Article 01 March 2023  
Introduction Dielectric capacitors are characteristic of ultrafast charging and discharging



### Ladderphane copolymers for high-temperature capacitive energy storage

For capacitive energy storage at elevated temperatures 1-4, dielectric polymers are required to integrate low electrical conduction with high thermal conductivity. The coexistence of these seemingly contradictory properties remains a persistent challenge for existing

### Metallized Stacked Polymer Film Capacitors for High-Temperature

DOI: 10.1016/j.ensm.2023.103095 Corpus ID: 265561193 Metallized Stacked Polymer Film Capacitors for High-Temperature Capacitive Energy Storage @article{Ren2023MetallizedSP, title={Metallized Stacked Polymer Film Capacitors for High-Temperature Capacitive Energy Storage}, author={Weibin Ren and Minzheng Yang and Mengfan Guo and Le Zhou and Jiayu ...

### Highvoltage Battery



### [Ladderphane copolymers for high](#)

For capacitive energy storage at elevated temperatures, dielectric polymers are required to integrate low electrical conduction with high thermal conductivity. The coexistence of these seemingly contradictory properties remains a persistent challenge for existing polymers.



### Ladderphane copolymers for high-temperature capacitive energy ...

A class of dielectric copolymers called ladderphanes is shown to outperform existing dielectric polymers and composites, with high discharged energy density and ...



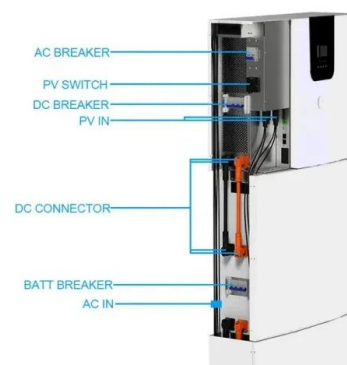
### Ladderphane copolymers for high-temperature capacitive energy ...

Wang, Qing. For capacitive energy storage at elevated temperatures 1-4, dielectric polymers are required to integrate low electrical conduction with high thermal conductivity. The coexistence ...



### Ladderphane copolymers for high-temperature capacitive energy storage

Ladderphane copolymers for high-temperature capacitive energy storage Nature ( IF 50.5) Pub Date : 2023-03-01, DOI: 10.1038/s41586-022-05671-4





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### High temperature electrical breakdown and energy storage ...

Ladderphane copolymers for high-temperature capacitive energy storage Article Full-text available Mar 2023 NATURE Chen Jie Yao Zhou Xingyi Huang Qing Wang For capacitive energy storage at elevated



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