

Super graphene capacitor success



Overview

Supercapacitors offer faster charging and discharging, longer lifetimes, and improved safety compared to lithium-ion batteries (LIBs), but their fundamentally lower energy density — driven by surface-only charge storage rather than electrochemical intercalation — means they are unlikely to replace. Engineers have unlocked a new class of supercapacitor material that could rival traditional batteries in energy while charging dramatically faster. By redesigning carbon structures into highly curved, accessible graphene networks, the team achieved record energy and power densities—enough to store as much energy as traditional batteries while delivering power far more rapidly. Credit: Engineers have unveiled a breakthrough carbon-based material that enables supercapacitors to store as much energy as traditional batteries while delivering power far more rapidly. Shutterstock A new graphene supercapacitor stores battery-level energy and recharges instantly, redefining fast. Recent advancements in supercapacitor technology have garnered significant attention due to their possible applications in next-generation energy-storage systems. Supercapacitors also work in very low temperatures, where conventional batteries often struggle. Supercapacitors. Researchers at Empa, the Swiss Federal Laboratory for Material Science and Technology, are developing industrial-scale graphene-based supercapacitors with higher energy density and conductivity than current carbon-based designs. The goal is to offer roll-to-roll printable electrode technology.

Article Content

Supercapacitors Challenge Batteries: Powerful

The basis of the energy storage device is a novel, powerful, and also sustainable graphene hybrid material that has comparable performance data to

A graphene breakthrough hints at the future of battery

From laptops that charge in 15 minutes to electric scooters, the first round of graphene-based products could finally deliver on the promise of the

Enhancing supercapacitor performance through design optimization of ...

The field of supercapacitors consistently focuses on research and challenges to improve energy efficiency, capacitance, flexibility, and stability. Low-cost laser-induced graphene (LIG) offers

Innovative scalable fabrication approaches for high-performance ...

Graphene-based supercapacitors have emerged as promising candidates for next-generation energy storage due to their exceptional electrical conductivity, large surface area, and

Graphene supercapacitor breakthrough could boost

When incorporated into energy storage devices called supercapacitors, this new form of graphene could be the key to high-capacity,

Recent Advances in Graphene and Conductive Polymer Composites

Supercapacitors (SCs) have generated a great deal of interest regarding their prospects for application in energy storage due to their advantages such as long life cycles and high-power

New Graphene Tech Powers Supercapacitors To Rival ...

In a paper recently published in Nature Communications, the research team introduced a new type of carbon-based material that enables supercapacitors to store as much energy as

Empa develops scalable graphene supercapacitors for

Empa researchers are advancing supercapacitor technology by developing graphene-based electrodes tailored for industrial-scale

Supercapacitor Graphene Discovery Closes Gap With Batteries

Monash University researchers have engineered a novel graphene-based material that allows supercapacitors to rival batteries in energy storage, while outperforming them in power delivery.

New graphene material makes supercapacitors rival

New graphene material from Monash enables supercapacitors with battery-level energy and lightning-fast charging.

New Graphene Breakthrough Supercharges Energy

New graphene breakthrough supercharges energy storage Date: December 1, 2025
Source: Monash University Summary: Engineers have

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Graphene Supercapacitors | High Capacity, Efficiency

Uncover the potential of graphene supercapacitors, which utilize graphene's extraordinary properties to enhance energy storage with high

Advances in graphene-based supercapacitor electrodes

Section 2 describes various type of electrodes based on the SC types. Section 3 describes key factors for designing graphene-based electrodes. Section 4 presents a classification of graphene

Graphene-based materials for next-generation energy storage:

Graphene, a two-dimensional carbon nanomaterial with exceptional electrical, mechanical, and chemical properties, has emerged as a game-changing material in the field of

Advances in graphene-based supercapacitor electrodes

Various studies have explored many possible ways to utilize the maximum potential of graphene-based SC electrodes, and graphene research is booming, given its exceptional charge

Energy storage improvement of graphene based super capacitors

The charge-discharge cycles are much faster in its routine when the super capacitors undergo the electrostatic charge separation. The properties, applications and synthesis of the

Are We Close to Available Graphene Supercapacitors?

Innovations in graphene supercapacitors are bringing many far-fetched possibilities to life, but how close are we to large-scale availability?

Supercapacitor technology: The potential of graphene

Graphene has become the focal active material in supercapacitor research thanks to its high electrical conductivity and surface area, but adoption

Graphene-based supercapacitors for next-generation energy storage

Graphene has a surface area even larger than that of the activated carbon used to coat the plates of traditional supercapacitors, enabling better electrostatic charge storage. Graphene-based

Graphene-based supercapacitors for next-generation energy storage

The hybrid graphene materials that First Graphene will mass-produce will significantly increase the performance of supercapacitors in a wide range of applications, as well as increasing the available

Graphene and its derivatives in supercapacitors: a comparative review

In this review, fundamentals, type, mechanism, formulae, electrode materials, material properties, and electrochemical behaviors are discussed, along with an outlook on existing

How graphene is leading the way for supercapacitor technologies

Supercapacitor technologies have limitations that prevent them from replacing lithium-ion. See how implementing graphene is helping this tech overcome those challenges to be a potential

Graphene for batteries, supercapacitors and beyond

Graphene has now enabled the development of faster and more powerful batteries and supercapacitors. In this Review, we discuss the current

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