

# **High-conductivity reduced-graphene-oxide copper aerogel for energy storage**





## Overview

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- A straightforward and simple method for producing.

Aerogels have attracted vast attention due to their interconnected three-dimensional (3D) porous structure with high specific surface areas and low densities for a variety of potenti.

2.1. MaterialsGO water dispersion (0.4 wt%) was used as-received from Graphenea, Spain. Sodium hydroxide, ammonium tetrachloropallad.

As shown in the illustration (Fig. 1), the mixture of Entry 0 underwent the various steps from formation of Cu/Cu<sub>x</sub>O NPs, to reduction of GO flakes and to self-assembly of the component.

A simple solution-phase, one-pot method is reported for synthesizing Cu/Cu<sub>x</sub>O@rGO hydrogel with rGO network decorated with Cu/Cu<sub>x</sub>O NPs under ambient condition. The Cu/Cu<sub>x</sub>O@r.

What is next reduce graphene oxide (rGO) aerogel?

NEXT Reduce graphene oxide (rGO) aerogels with different precursor graphene oxide sheet sizes are synthesized using l-ascorbic acid reduction followed by an ambient pressure drying method. The sheet sizes determine the oxygen functionality content during aerogel formation, which subsequently affect its structural properties.

Why is graphene a good electrode material?

Among various aerogel materials, graphene or rGA has been widely utilized in energy-related applications due to its chemical stability, high electrical conductivity, and large specific surface area as excellent candidates for electrode materials/current collectors .

Who are the authors of ultralight 3D graphene oxide aerogel?

Celia Ferrag, Meissam Noroozifar, Kagan Kerman. Ultralight 3D Graphene Oxide Aerogel Decorated with Pd-Fe Nanoparticles for the Simultaneous Detection of Eight Biomolecules.



Are graphene oxide inks suitable for energy storage applications?

Regarding the energy storage applications, graphene oxide (GO) inks have been extensively investigated to match the requirements for the DIW 3D printing technology, where the consecutive reduction process can lead to the targeted reduced graphene oxide (rGO) as an electrically conductive host for SCs and batteries.

Is RGO aerogel a good electrode material for a supercapacitor?

Such surface properties enhance the electrochemical properties of rGO aerogel ( $182 \text{ F g}^{-1}$  at  $0.75 \text{ A g}^{-1}$ ) and render it to be an excellent electrode material for a supercapacitor. To access this article, please review the available access options below.

Why is graphene used in DIW?

Graphene has been pioneeringly employed in the DIW technique due to its particular two-dimensional structure, high electrical conductivity, remarkable chemical stability, and large specific surface area [ 33, 34 ]. Additionally, graphene has been widely used as a high-performance electrode material for ESDs [ 33, 35, 36 ].



## High-conductivity reduced-graphene-oxide copper aerogel for energy

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### High-conductivity reduced-graphene-oxide/copper aerogel for ...

The aerogel, featuring reduced graphene oxide (rGO) networks decorated with Cu and Cu<sub>x</sub>O nanoparticles (Cu/Cu<sub>x</sub>O@rGO), exhibits a specific surface area of 48 m<sup>2</sup>/g and an ...

### Graphene aerogel stabilized phase change material for thermal energy

Due to the rapidly increasing gap between the energy consumption and storage, improving the efficiency of energy became urgent [[1], [2], [3], [4]]. Thermal energy storage technology could absorb and release energy during the phase change process, therefore it has received immense attention to the satisfaction of the imbalance between the energy supply and ...



### Facilely synthesized nitrogen-doped reduced graphene oxide

Nitrogen-doped reduced graphene oxide is successfully synthesized and functionalized with hydroxylated copper ions via one-pot microwave-assisted route. The presence of cationic Cu coordinated to

### A Facile and Green Synthesis of a MoO<sub>2</sub>-Reduced Graphene Oxide Aerogel

A simple, low cost, and "green" method of hydrothermal synthesis, based on the addition of l-ascorbic acid (l-AA) as a reducing agent, is

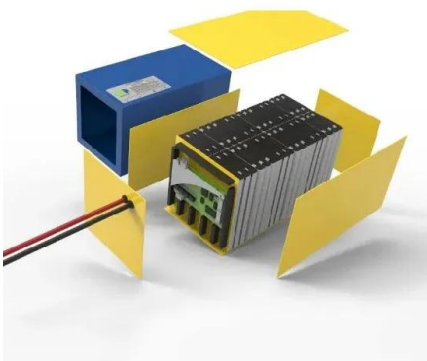


presented in order to obtain reduced graphene oxide (rGO) and hybrid rGO-MoO<sub>2</sub> aerogels for the fabrication of supercapacitors. The resulting high degree of chemical reduction of graphene oxide (GO), confirmed by X-Ray ...



**High-conductivity reduced-graphene-oxide/copper aerogel for ...**

Highlights: o A straightforward and simple method for producing Cu/Cu x O@rGO aerogel had been developed. o The Cu/Cu x O@rGO aerogel exhibits rather high apparent electrical ...



**Recent Advances in Effective Reduction of Graphene ...**

1 Introduction Graphene, a two-dimensional (2D) carbon material composed of sp<sup>2</sup>-bonded single-layer of carbon atoms, was firstly prepared in 2004, 1 which has since emerged as a hot subject in the field of ...



**High-conductivity reduced-graphene-oxide/copper aerogel for energy**

This work reports a room-temperature, solution-phase and one-pot method for macro-assembly of a three-dimensional (3D) reduced-graphene-oxide/copper hybrid hydrogel. The hydrogel is subsequently transformed into a highly conductive aerogel via freeze-drying.





### Graphene aerogel based energy storage materials - A review

Aerogels made of graphene oxide and dialdehyde starch nanocrystals were highly porous, mechanically stable, and compressible. The aerogel skeleton grew sturdy, mechanical properties improved, and primary capacitance rose (198 to 316 Fg<sup>-1</sup>) after the addition [32].) after the addition [32].



### High-conductivity reduced-graphene-oxide/copper aerogel for ...

TLDR. The 3D interconnection network designed by combination of 2D functionalized graphene oxide (FGO), 1D acidified carbon nanotube (ACNT), and 0D copper ...

### High-conductivity reduced-graphene-oxide/copper aerogel for ...

It delivers a specific capacity of ~453 mAh g<sup>-1</sup> at a current density of 1 A/g and ~184 mAh g<sup>-1</sup> at 50 A/g in a 3 M KOH aqueous electrolyte. The high electrical conductivity ...



### Hybrid MXene/reduced graphene oxide aerogel microspheres for ...

Hybrid MXene/reduced graphene oxide aerogel microspheres (MXene/rGOAMs), where MXenes are two-dimensional (2D) transition metal carbides, with abundant macro/meso/micro multi-scale pores and self-supporting structure, are prepared by electrospaying followed by freeze-drying and then thermal annealing. A center-diverging ...



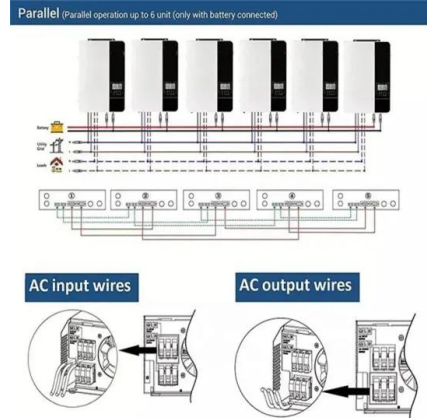
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### Highly Aligned Graphene Aerogels for Multifunctional Composites

Stemming from the unique in-plane honeycomb lattice structure and the sp<sup>2</sup> hybridized carbon atoms bonded by exceptionally strong carbon-carbon bonds, graphene exhibits remarkable anisotropic electrical, mechanical, and thermal properties. To maximize the utilization of graphene's in-plane properties, pre-constructed and aligned structures, such as oriented ...



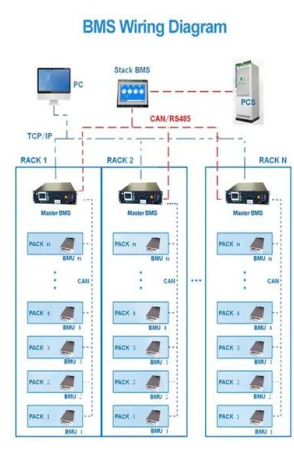
### High-conductivity reduced-graphene-oxide/copper aerogel for ...

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### Recent Progress in Porous Graphene and Reduced Graphene Oxide...

low conductivity limits their application in high efficiency energy storage devices. As for CNTs, Cai et al. proposed a unique and highly uniform composite material composed of porous NiCo-LDH and reduced graphene oxide as supercapacitor electrode.



### Graphene Aerogels: Structure Control, Thermal Characterization and

Graphene aerogel (GA) as one of the innovative carbon nanostructured materials is superior with flexibility, strong mechanical strength, lightweight, high porosity and excellent durability, which attracted wide research interests and fulfill the requirements for various novel applications in energy conversion and storage, sensor, thermal management, and ...

### Spontaneous assembly of strong and conductive graphene/polypyrrole

High-conductivity reduced-graphene-oxide/copper aerogel for energy storage Article Apr 2019 Jie (3D) reduced-graphene-oxide/copper hybrid hydrogel. The hydrogel is subsequently transformed



### 3D free-standing nitrogen-doped reduced graphene oxide aerogel ...

Sodium ion batteries have drawn extensive attentions for large-scale energy storage to replace lithium ion 3D free-standing nitrogen-doped reduced graphene oxide aerogel as anode material for





### Engineering nanocellulose/graphene hybrid aerogel for form ...

Polyethylene glycol/graphene oxide aerogel shape-stabilized phase change materials for photo-to-thermal energy conversion and storage via tuning the oxidation degree of graphene oxide Energy Convers. Manag., 146 ( 2017 ), pp. 253 - 264



### Optimizing Reduced Graphene Oxide Aerogel for a

Reduce graphene oxide (rGO) aerogels with different precursor graphene oxide sheet sizes are synthesized using l-ascorbic acid reduction followed by an ambient pressure drying method. The sheet sizes determine the oxygen functionality content during aerogel formation, which subsequently affect its structural properties. The optimized sheet size renders ...

### Aerogels: promising nanostructured materials for energy

Aerogels are 3-D nanostructures of non-fluid colloidal interconnected porous networks consisting of loosely packed bonded particles that are expanded throughout its volume by gas and exhibit ultra-low density and high specific surface area. Aerogels are normally synthesized through a sol-gel method followed by a special drying technique such as ...



### 3D reduced graphene oxide aerogel supported TiO<sub>2</sub>-x for shape ...

Polyethylene glycol/graphene oxide aerogel shape-stabilized phase change materials for photo-to-thermal energy conversion and storage via tuning the oxidation degree of graphene oxide Energy Convers. Manag., 146 ( 2017 ), pp. 253 - 264, 10.1016/j.enconman.2017.05.037



### Form-Stable Composite Phase Change Materials Based on Porous Copper

Solar-thermal energy conversion and storage technology has attracted great interest in the past few decades. Phase change materials (PCMs), by storing and releasing solar energy, are able to effectively address the imbalance between energy supply and demand, but they still have the disadvantage of low thermal conductivity and leakage problems. In this work, ...



### Optimizing Reduced Graphene Oxide Aerogel for a

Reduce graphene oxide (rGO) aerogels with different precursor graphene oxide sheet sizes are synthesized using l-ascorbic acid reduction followed by an ambient pressure drying method. The sheet sizes determine ...

### [??]High-conductivity reduced-graphene-oxide/copper aerogel ...

Abstract This work reports a room-temperature, solution-phase and one-pot method for macro-assembly of a three-dimensional (3D) reduced-graphene-oxide/copper hybrid hydrogel. The ...



### Reduced graphene oxide aerogel with the dual-cross-linked ...

The as-prepared aerogel sample was then immersed into an aqueous 5% (w/w) CaCl<sub>2</sub> solution overnight to generate a Ca<sup>2+</sup> cross-linked GO-SA aerogel, then washed with deionized water several times and reduce with ascorbic acid (10 mg mL<sup>-1</sup>) at 95 for 2



### Development of new magnetic nanocomposite designed by reduced graphene

In this study, new magnetic reduced graphene oxide aerogel/HKUST-1 nanocomposite was designed and synthesized given the transformation of graphene oxide sheets to three-dimensional reduced



Deye inverters and Deye batteries are more compatible.

### Graphene oxide: An emerging electromaterial for energy storage ...

Additionally, by means of an electrophoretic deposition or hydrothermal process or electrostatic co-precipitation, nickel oxide, nickel sulphide and copper oxide could be attached on the surfaces of GO nanosheets for high-performance SCs, which achieved the -1



## Self-Assembly of Binderless MXene Aerogel for Multiple

The severe dependence of traditional phase change materials (PCMs) on the temperature-response and lattice deficiencies in versatility cannot satisfy demand for using such materials in complex application scenarios. Here, we introduced metal ions to induce the self-assembly of MXene nanosheets and achieve their ordered arrangement by combining suction ...

## 12.8V 200Ah



Our Lifepo4 batteries can be connected in parallels and in series for larger capacity and voltage.



## Form-stable paraffin/graphene aerogel/copper foam composite ...

Polyethylene glycol/graphene oxide aerogel shape-stabilized phase change materials for photo-to-thermal energy conversion and storage via tuning the oxidation degree of graphene oxide Energy Convers. Manag., 146 ( 2017 ), pp. 253 - 264

## Compressible cellulose nanofibrils/reduced graphene oxide ...

The investigation of electrodes with excellent electrochemical and mechanical properties is the key to achieve flexible supercapacitors. Herein, a nanocellulose-based carbon aerogel with 3D porous structure for high performance composite electrodes of compressible supercapacitors is proposed. Cellulose nanofibril (CNF) is used to construct the elastic network ...



## High content reduced graphene oxide reinforced copper with a

By using CuO/graphene-oxide/CuO sandwich-like nanosheets as the building blocks, bulk nacre-inspired copper matrix nano-laminated composite reinforced by molecular-level dispersed and ordered



### **Construction of multifunctional cellulose nanofibers/reduced graphene**

Carbon aerogels (CAs) are an emerging carbon-based material, which is favored by many researchers because of its ultra-high specific surface area, rich pore structure and good electrical conductivity [[10], [11], [12]]. CAs are usually obtained by carbonizing



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