

This synthesis took place by ion exchange and etching reaction process followed via thermal treatment. ... It was a self-supported type core-shell structure for energy storage application purposes. The presence of CoS ... 2 shell at the surface and ZnCoS in the core (Fig. 9 a-d). The elemental mapping showed the uniform distribution whereas ...

Electric double layer capacitors (EDLCs), storing charges via physical ionic adsorption/desorption on the carbon surface, feature high-rate charge-discharge, long cycle life and low cost [1, 2]. Nevertheless, the energy density of EDLCs ( $\sim 5 \text{ Wh kg}^{-1}$ ) is much lower than that of batteries (usually  $> 40 \text{ Wh kg}^{-1}$ ), which hinders their wide commercialization in the ...

1. Introduction. Latent heat thermal energy storage (LHTES) is an effective means to store solar thermal energy due to its high storage density, compactness and low energy loss (Seddegh et al., 2015a, Seddegh et al., 2015b). Among different LHTES techniques, the shell-and-tube LHTES system is the most intensely studied due to its design simplicity and ...

Due to the advantages of high latent heat characteristics, small volume changes, and isothermal characteristics during the phase transition, thus the application of PCM-based thermal energy storage technology has gotten much more attention, which has been widely used in various fields such as waste heat recovery [1], [2], aviation [1], solar ...

Lithium-ion batteries (LIBs) have become the most appropriate form of mobile energy storage due to their high energy density and long cycling lifetime [[1], [2], [3]]. The narrow distribution and limited storage of lithium resources severely limit its potential for large-scale energy storage [4]. Recently, SIBs have become a promising replacement for LIBs owing to ...

In view of the key position of the energy storage density to meet the development of high-performance electronic devices, it is still essential to continue to propose an ideal energy storage device, pursuing high energy density, lightweight, good flexibility, excellent charging and discharging capabilities [8], [9].

B 4 C is widely known by a series of unique advantages, such as low density, high hardness, good chemical stability and excellent environmental stability, as a hard ceramic material. However, the study of B 4 C as the electrode material on micro-electrochemical energy storage devices has not yet been reported. To some extent, the poor conductivity of B 4 C is ...

Liu [17] synthesized a hybrid material with a core-shell filler by introducing the strontium titanate (STO) on multi-walled carbon nanotubes (MWCNTs) and compounding it with epoxy resin as a filler. When the filler

content was 11 wt%, the dielectric constant of the composite can reach 283 with a dielectric loss of 0.07 at 10<sup>3</sup> Hz. Hou [18] synthesized a core-shell-shell ...

BaTiO<sub>3</sub> (BT) nanofibers with different surface defects were prepared by electrospinning process through controlling the sintering atmospheres (Air, N<sub>2</sub> and H<sub>2</sub>), and introduced into polyimide (PI) matrix to form composite films. The effects of different surface defects on dielectric and energy storage properties of PI composites were systematically ...

Graphene oxide (GO), the most popular derivative of graphene, has attracted tremendous attention due to its reputable properties such as excellent electrical, catalytic and thermal properties, high conductivity and chemical stability, as well as large surface area [1, 2]. As a result, GO is utilized in a wide variety of applications including electronics, optics, energy storage, ...

Different from storage in bulk in batteries, surface storage in ECs leads to much lower energy density, although state-of-the-art energy density is already several orders of magnitude higher than that of traditional dielectric capacitors. Therefore, ECs could meet ...

The electron energy loss spectroscopy (EELS) analysis indicated that the shell is composed of 52.2 at% of B and 47.8 at% of N, and the B and N atoms in the shell form both p\* and s\* bonds, suggesting the presence of both sp<sup>2</sup> and sp<sup>3</sup> bonding within the BN shell [36], [37]. The FT-IR spectrum and x-ray diffraction (XRD) pattern of the shell ...

With an advanced understanding of cathode materials in Li-ion batteries (LiBs) and supercapacitors, it has been observed that the surface structures of cathodes play an important role in these devices and significantly affects the whole system's performance e.g. maintain the structural stability and material's conductivity. Various approaches are being ...

In recent years, biochar has emerged as a remarkable biosourced material for addressing global environmental, agricultural, biomedical, and energy challenges. However, the performances of biochar rest in part on finely tuning its surface chemical properties, intended to obtain specific functionalities. In this review, we tackle the surface treatment of biochar with ...

The Sun group synthesized hollow multi-layer mesoporous carbon spheres as a carbon-shell from dopamine by treatment with 4 M hydrochloric acid, which showed a surface area of 1546.76 m<sup>2</sup> g<sup>-1</sup>. Shen and co-workers prepared tin phosphides@carbon as a yolk-shell structure, where dopamine hydrochloride constructed the carbon-shell, showing a ...

Abstract Direct electrical energy storage by supercapacitors is the leading energy storage technology. The performance of supercapacitors depends mainly upon the electrode material constituents. Carbon is the preferred energy storage material for its some main properties such as a large surface area, electrical

conductivity, porosity, thermal stability, etc. ...

The surface treatment of the Walnut Shell Powder (WSP) was carried out with alkali (NaOH), followed by silane, to reduce moisture sensitivity and enhance the interface compatibility with the matrix ; Figure 1 shows the treatment procedure. Firstly, the WSP was soaked in a solution of aqueous alkaline (NaOH) for 3 h at room temperature.

The energy density of the capacitors is determined by the breakdown strength and the relative dielectric constant. Polyimide (PI) has high breakdown strength, linear polarization property and high energy efficiency. However, due to the low dielectric constant of PI, its energy storage density is not high enough to satisfy the requirement. Therefore, seeking a method to ...

The dielectric capacitors with high energy storage capability are demand for power electronic devices to keep pace with the development of the modern electronic and electrical industry. Although polymer-based dielectric composites showing the superiorities of ease processing, self-healing and low cost have a great potential in various applications, their ...

Apart from advanced properties of doped materials to be utilized, the structure of energy particles also strongly influences the thermal energy storage performance of  $\text{CaCO}_3$  material, including absorption, cyclic stability, sintering resistance, anti-breakage behavior, etc. Various methods have been used to synthesize  $\text{CaCO}_3$ -based sorbent particles with desired ...

Core-shell structured  $\text{Fe}_3\text{O}_4/\text{SiO}_2$  nanoparticles were synthesized through a facile in situ surface-treatment process. Surface treatments of the as-prepared  $\text{Fe}_3\text{O}_4$  nanoparticles with acid or base caused changes in the shape of spherical particles agglomerated into clusters. The morphological changes of the particles experienced an abrupt change ...

A simple shell and tube heat exchanger provides a straightforward design for near-term integration of latent heat thermal energy storage (LHTES) systems in concentrated solar thermal-tower (CST-tower) plants, but currently there is no literature available for this configuration in the 286-565 °C temperature range.

The experimental platform system for the energy storage performance testing of the shell-and-tube phase change energy storage heat exchanger studied in this article is mainly composed of a heater, constant temperature water tank, pumps, electromagnetic flowmeter, shell-and-tube phase change heat exchanger, thermocouple, and data acquisition and ...

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