

What are fibre-based energy harvesting and storage devices?

In this Review, the development of fibre-based energy harvesting and storage devices is presented, focusing on dye-sensitized solar cells, lithium-ion batteries, supercapacitors and their integrated devices. An emphasis is placed on the interface between the active materials and the electrodes or electrolyte in the 1D devices.

How can energy harvesting and storage devices be integrated?

The integration of energy harvesting and storage devices is generally realized by coating in turn photovoltaic and electrochemically active materials on a fibre electrode or sequentially depositing them from inside out 29, 30.

Which energy harvesting and storage devices are not suitable for wearable electronics?

In particular, conventional energy harvesting and storage devices, including silicon-based solar cells, dielectric capacitors, lead-acid and lithium-ion batteries, fail to meet the flexibility required for wearable electronics 5.

What are textile-based energy storage devices?

The reported textile-based energy storage devices include supercapacitors (SCs), flexible lithium-ion batteries, Li-S batteries, Li-air batteries, sodium-ion batteries, Zn-ion batteries and silver-zinc batteries.

What are the developments in 1D energy harvesting and storage?

Figure 2: Timeline of developments in 1D energy harvesting and storage. Energy harvesting devices include solar cells and nanogenerators, and energy storage devices include supercapacitors and batteries.

How do energy harvesting and storage devices evolve from 3D to 1d?

Figure 1: Evolution of energy harvesting and storage devices from 3D to 1D. a | The 1D devices are typically either coaxial or twisted structures. b | A rotation-translation setup for the production of fibre-based dye-sensitized solar cells with a twisted structure.

The effective energy harvest and storage is critical to the modern society. For the energy harvest, solar energy that is inexhaustible, free, environmentally friendly and uniformly distributed to all ...

Here, the key advancements related to fiber-shaped energy storage devices are reviewed, including the synthesis of materials, the design of structures, and the optimization of properties for the ...

In this chapter, the necessity for the fiber-shaped device is discussed in modern electronics. The main efforts are first paid to describe the difficulty in the development of conventional planar energy harvesting and storage devices including solar cells, electrochemical capacitors, and lithium ion batteries.

Super-capacitors, lithium ion batteries, aluminium air batteries, lithium air batteries, lithium sulfur batteries, and zinc-air batteries can be utilized for flexible electronic device applications as their energy storage devices. All of them possess desired features of all-dimension-deformability and weaveability. Also they can be part of bigger picture by integrating with flexible, wearable ...

PDF. PDF. Tools. Request permission; Export citation; Add to favorites; Track citation; Share Share. Summary. For better wearing flexibility and breathability, a series of fiber-shaped energy harvesting devices have been manufactured to adapt to deformations caused by twisting or stretching, which can serve as very promising on-body power ...

Fibrous energy-autonomy electronics are highly desired for wearable soft electronics, human-machine interfaces, and the Internet of Things. How to effectively integrate various functional energy fibers into them and realize versatile applications is an urgent need to be fulfilled. Here, a multifunctional coaxial energy fiber has been developed toward energy ...

Hence, a new family of 1D fiber-shaped electronic devices including energy-harvesting devices, energy-storage devices, light-emitting devices, and sensing devices has risen to the ...

This comprehensive book covers flexible fiber-shaped devices in the area of energy conversion and storage. The first part of the book introduces recently developed materials, particularly, various nanomaterials and composite materials based on nanostructured carbon such as carbon nanotubes and graphene, metals and polymers for the construction of fiber electrodes.

In this review, recent advances and applications in fiber-shaped SCs and LIBs are summarized. The general design principles of these 1D electrochemical storage devices are first ...

The boom in portable and wearable electronics has increased the high demand for suitable energy storage devices. To satisfy these requirements, new strategies for fiber-shaped supercapacitors (SCs ...

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In general, energy delivery and storage of lithium ion batteries are based on the migration of lithium ions between the two electrodes, which serve as lithium host through "electrochemical intercalation," in charge and discharge process (Fig. 7.2). Exemplified with LiCoO_2 -graphite system, the main cell reactions are reversible lithium ion insertion and extraction ...

Because it is easily incorporated into textiles, the fiber-shaped supercapacitor attracted widespread interest. 69-71 Peng's group also reported much work about fiber-shaped devices based on graphene. 54, 55, 57, 59 With the graphene fiber as the core, nanorod-like polyaniline was deposited by an in situ chemical polymerization strategy (Figure ...

6.1.1 Energy Storage Mechanism. Supercapacitors, also scientifically named as electrochemical capacitors, are attracting much attention in a wide range of applications pertaining to electrical or hybrid vehicles, renewable energy generation devices, backup energy sources, and portable devices.

The fiber-shaped perovskite solar cells with the unique shape and the characteristic of all-solid-state have unprecedented potential to produce energy fibers, even energy textiles. The development of novel coating process to fabricate uniform layers, similar as spin-coating process counterpart in planar solar cell, is key to boost the PECs ...

Continuously charging an energy storage system (ESS) without the consumption of fossil fuels has always been an attractive proposition towards a sustainable low-carbon society [1, 2]. This is especially desirable with the tremendous adoption of portable devices such as wearable electronics in recent years, where energy consumption has been rapidly on the rise over the ...

The recent progress in advanced functional fiber-shaped devices that consist of fiber-based energy harvesting devices, energy storage devices, fiber-shaped chromatic devices, and shape deformable fibers are systematically summarized.

This paper will provide a detailed review on the importance of substrates in electronic devices, intrinsic property requirements, fabrication classification and applications in ...

[1] Kim D H and Rogers J A 2008 Stretchable electronics: materials strategies and devices Adv. Mater. 20 4887-92 Crossref Google Scholar [2] Sun H, Zhang Y, Zhang J, Sun X M and Peng H S 2017 Energy harvesting and storage in 1D devices Nat. Rev. Mater. 2 17023 Crossref Google Scholar [3] Yetisen A K, Qu H, Manbachi A, Butt H, Dokmeci M R, Hinesstroza ...

Those characteristics indicate that the graphene fiber may be useful fiber electrodes for fiber-shaped devices. The fiber-shaped DSC was fabricated by twisting a graphene fiber around a modified Ti wire . The cell obtains a V OC of 0.72 V, J SC of 12.67 mA cm⁻², and FF of 0.42, and the efficiency is 3.85 %. The pristine graphene fibers are ...

Download PDF. Amjid Rafique 1, Isabel Ferreira 1, ... In the following section, fiber and textile-based applications will be discussed mainly in two fields fiber-shaped energy harvesting and fiber-shaped energy storage devices, both from materials and application's perspective. Thanks to fiber and textile-based substrate, flexible electronics ...

Power systems and electronic devices that are bulky and rigid are not practical for use in wearable applications that require flexibility and breathability. To address this, a range of 1D energy harvesting and storage devices have been fabricated that show promise for such applications compared with their 2D and 3D counterparts. These 1D devices are based on ...

the lithium ion storage unit may include a cathode having a fiber shape and disposed around the substrate, an anode having a fiber shape and disposed around the substrate, a first cylindrical tube disposed to be spaced apart from the substrate and surround the substrate, and a first electrolyte disposed to fill a space between the substrate and the first cylindrical tube.

View PDF; Download full issue; Search ScienceDirect. Nano Energy. Volume 96, 1 June 2022, 107054. Self-powered and flexible integrated solid-state fiber-shaped energy conversion and storage based on CNT Yarn with efficiency of 5.5% ... Integrating energy-harvesting and energy-storage devices as a self-powering system can solve the factors of ...

5 Fiber-Shaped Energy Storage Devices. Energy storage is inevitably an important future technology, with its role mounting following a stronger entanglement between human activities and cyber technologies. In this section, we discuss key updates regarding the fiber-shaped energy storage devices, namely, supercapacitor (Section 5.1) and ...

Figure 8 (a) An integrated textile system consisting of all fiber-shaped displays, information input (keyboard) and power supply modules; (b) The integrated textile performing as a smart ...

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