LIGHT ENERGY STORAGE DEVICES

What are flexible energy storage devices? To date,numerous flexible energy storage devices have rapidly emerged,including flexible lithium-ion batteries (LIBs),sodium-ion batteries (SIBs),lithium-O 2 batteries. In Figure 7E,F,a Fe 1a??x S@PCNWs/rGO hybrid paper was also fabricated by vacuum filtration,which displays superior flexibility and mechanical properties.

What are light-assisted energy storage devices? Light-assisted energy storage devices thus provide a potential way to utilize sunlight at a large scale that is both affordable and limitless.

Which energy storage devices are suitable for energy storage? A large number of energy storage devices,such as lithium-ion batteries(LIBs) [,,],lithium-sulfur batteries [,,],and supercapacitors (SCs) [,,],can be the appropriate candidates.

How can flexible energy storage improve wearable electronics? Addressing the escalating energy demands of wearable electronics can be directly approached by enhancing the volumetric capacityof flexible energy storage devices,thereby increasing their energy and power densities.

Do light-assisted energy storage devices have a bottleneck? After the detailed demonstration of some photo-assisted energy storage devices examples, the bottleneck of such light-assisted energy storage devices is discussed and the prospects of the light-assisted rechargeable devices are further outlined. The authors declare no conflict of interest.

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What are energy harvesting and storage devices? Energy harvesting and storage devices, including lithium-ion batteries (LIBs), supercapacitors (SCs), nanogenerators (NGs), biofuel cells (BFCs), photodetectors (PDs), and solar cells, play a vital role in human daily life due to the possibility of replacing conventional energy from fossil fuels.


Light-assisted energy storage devices thus provide a potential way to utilize sunlight at a large scale that is both affordable and limitless. Considering rapid development and emerging problems for photo-assisted energy storage devices, this review starts with the fundamentals of batteries and supercapacitors and follows with the state-of-the


Designing high-performance electrodes via 3D printing for advanced energy storage is appealing but remains challenging. In normal cases, light-weight carbonaceous materials harnessing excellent electrical conductivity have served as electrode candidates. However, they struggle with undermined areal and volumetric energy density of supercapacitor a?|

With the rapid advancements in flexible wearable electronics, there is increasing interest in integrated electronic fabric innovations in both academia and industry. However, currently developed plastic board-based batteries remain too rigid and bulky to comfortably accommodate soft wearing surfaces. The integration of fabrics with energy-storage devices a?|


Flexible microelectronic devices have seen an increasing trend toward development of miniaturized, portable, and integrated devices as wearable electronics which have the requirement for being light weight, small in dimension, and suppleness. Traditional three-dimensional (3D) and two-dimensional (2D) electronics gadgets fail to effectively comply with a?|

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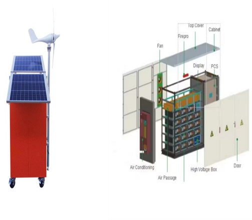
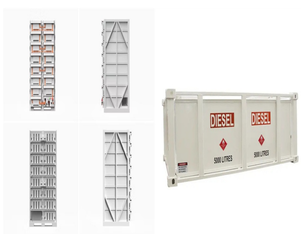
For energy-related applications such as solar cells, catalysts, thermo-electrics, lithium-ion batteries, graphene-based materials, supercapacitors, and hydrogen storage systems, nanostructured materials have been extensively studied because of their advantages of high surface to volume ratios, favorable tran

LIBs and SCs are two mainstream energy storage devices widely used in almost every appliance of daily life [303]. However, on one hand, Under simulated indoor light, the system yields a total energy conversion and storage efficiency (ECSE) of 2.9%. Those energy and power levels would be sufficient to power low-consumption electronic devices

Batteries, also called chemical power devices, are energy storage devices that can interconvert chemical energy with electrical energy (Chen and Lee, 2021, Li-ion batteries are extensively deployed in electric vehicles and portable electronics due to the light weight, long lifespan, high energy density and power density. The charging and



These results indicate that the PANI electrode is suitable to fabricate electrochromic devices with energy storage capacity. The electrochromic device is light-weight, thin-thickness and flexible. As shown in Fig. 7 B and Fig. S4, the electrochromic device with a thickness of less than 0.3 mm was remarkably thinner than commercial ITO glass



Main components of an electrochemical energy storage device containing light elements that can be investigated by soft X-ray spectroscopies. Secondly, the in-depth characterization of the electrolytes is highly desired. Aqueous and organic electrolytes, as well as ionic liquids that are attracting increasing interest for energy storage, are

This soft energy-storing fabric can light a red light-emitting diode (LED). In addition, flexible zinc-ion batteries and other alkaline batteries have been fabricated. To date, numerous flexible energy storage devices have rapidly emerged, including flexible lithium-ion batteries (LIBs), sodium-ion batteries (SIBs), lithium-O 2 batteries.

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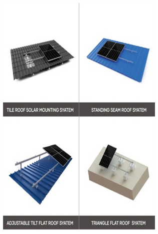
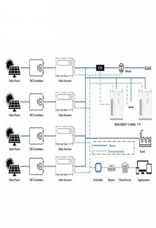


Understanding why certain materials work better than others when it comes to energy storage is a crucial step for developing the batteries that will power electronic devices, electric vehicles and

As a common electrochemical energy storage device, supercapacitors are usually utilized in combination with solar cells to form an integrated system. The integrated device combines the processes of light energy conversion and electrochemical energy storage. When sunlight falls on the integrated device, the silicon solar cell converts light



As evident from Table 1, electrochemical batteries can be considered high energy density devices with a typical gravimetric energy densities of commercially available battery systems in the region of 70a??100 (Wh/kg).Electrochemical batteries have abilities to store large amount of energy which can be released over a longer period whereas SCs are on the other a?|

SCs show great potential as energy storage devices that could complement or even replace lithium-ion batteries in wearable and stretchable microelectronics. when exposed to laser light, its

Portable electronics such as wireless sensors, roll-up displays, electronic skins, and flexible smartphones are light in weight and come in smaller sizes that can easily be a?|

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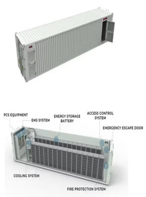
Exploring effective energy storage systems is critical to alleviate energy scarcity. Rechargeable zinc-air batteries are promising energy storage devices. However, conventional rechargeable zinc-air battery systems face many challenges associated with electrolytes and electrodes, causing inferior electrochemistry performance.


Flexible energy storage devices have received much attention owing to their promising applications in rising wearable electronics. By virtue of their high designability, light weight, low cost, high stability, and mechanical flexibility, polymer materials have been widely used for realizing high electrochemical performance and excellent flexibility of energy storage a?|

In summary, the 2D configuration energy storage devices usually exhibit a series of fascinating properties, such as being light-weight, ultrathin, and highly flexible. These features enable 2D flexible/stretchable energy storage devices to be integrated into a variety of wearable/portable electronics. 3D configuration energy storage devices


This device shows synergic performance of solar energy harvest and storage, as well as light and thermal transmission control. Dense and mesoporous WO 3 thin films are incorporated as electrochromic and energy storage layer. The device with mesoporous WO 3 film exhibits modulation of a? 1/4 40% in visible light range and a? 1/4 50% in near infrared

To meet the growing energy demands in a low-carbon economy, the development of new materials that improve the efficiency of energy conversion and storage systems is essential. Mesoporous materials

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The biggest obstacle to fully and effectively using non-renewable energy sources is the inexpensive and efficient energy storage devices. The designing of nanoelectrode materials has become a highly desirable research field in recent years for the environmentally friendly development of energy storage devices like supercapacitors.


Charging would become more convenient if the battery is combined with one or more devices that harvest energy from ambient sources, such as light, thermal, or vibrational energy 4,10,11,12,13


Interdigital electrochemical energy storage (EES) device features small size, high integration, and efficient ion transport, which is an ideal candidate for powering integrated microelectronic systems. However, traditional manufacturing techniques have limited capability in fabricating the microdevices with complex microstructure. Three-dimensional (3D) printing, as a?|


Solar-thermal storage with phase-change material (PCM) plays an important role in solar energy utilization. However, most PCMs own low thermal conductivity which restricts the thermal charging


This review provides a comprehensive overview of the progress in lighta??material interactions (LMIs), focusing on lasers and flash lights for energy conversion and storage applications. We discuss intricate LMI parameters such as light sources, interaction time, and fluence to elucidate their importance in material processing. In addition, this study covers a?|

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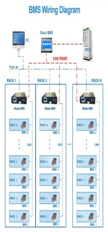
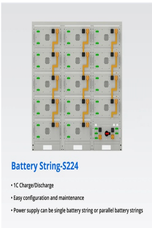


Miniaturized energy storage devices, such as micro-supercapacitors and microbatteries, are needed to power small-scale devices in flexible/wearable electronics, such as sensors and microelectromechanical systems (MEMS). Inkjet printing has been widely used to fabricate various devices, especially organic light-emitting diodes and organic



In this paper, we focus on the energy conversion and storage mechanism of flexible hydrogels in light-thermal-electricity energy conversion systems. We also introduce the a?|


Recently, the three-dimensional (3D) printing of solid-state electrochemical energy storage (EES) devices has attracted extensive interests. By enabling the fabrication of well-designed EES device architectures, enhanced electrochemical performances with fewer safety risks can be achieved. In this review article, we summarize the 3D-printed solid-state a?|