Inspired design energy storage concept

Engineers can study scaling effects in animal locomotion in order to determine the optimal gait for a given-size robot. In this paper the design of a miniature jumping robot is presented. Inspired by small jumping animals, the robot performs catapult jumps, using an elastic energy storage and a release mechanism.

Conventional Electricity Storage Strategies: Concept and Applications at Building Scale. ... This bio-inspired design exhibited 88% capacitive retention for 15,000 cycles and 211 F/g layer-cytance at a current of 1.0 A/g. ... Energy storage systems have played a relevant role in applications in different areas, and, for this reason, proposing ...

The field of bio-inspired design has tremendously transitioned into newer automated methods, yet there are methods being discovered which can elucidate underlying principles in design, materials, and manufacturing. Bio-inspired design aims to translate knowledge from the natural world to the current trends in industry. The recent growth in ...

The locust is good at jumping. Thanks to the excellent structure of the hind legs, the locust can change the degree of compression of the simi-lunar process (SLP) and change the energy storage while maintaining the same jumping stance. Herein, we design a locust-inspired energy storage joint and verified its function on a jumping robot.

Energy and Resource Efficiency: Nature"s systems are inherently energy-efficient and resource-conserving. Understanding these ecological processes enables designers to develop solutions that optimize energy use and resource management. From energy-efficient buildings to water-saving systems, biomimicry offers innovative ways to conserve resources.

The solutions provided through natural evolution of living creatures serve as an ingenious source of inspiration for many technological and applicative fields. Along these lines, bone-inspired concepts lead to fascinating advances in product design, architecture and garments, thanks to the bone"s exceptional combination of strength, toughness and lightness. ...

Thermal energy storage (TES) systems play a very important part in addressing the energy crisis. Therefore, numerous researchers are striving to improve the efficiency of TES tanks. The TES technology has the potential to reach new heights when the biological behavior of nature is incorporated into the design of TES tanks. By mimicking the branched vein pattern ...

The multifunctional performance of novel structure design for structural energy storage; (A, B) the mechanical and electrochemical performance of the fabric-reinforced batteries 84; (C, D) the schematic of the interlayer locking of the layered-up batteries and the corresponding mechano-electrochemical behaviors 76; (E, F) the

tree-root like ...

In this paper, we propose a new design concept of LSG-MSCs using bioinspired electrodes based on the ingenious fractal structures 17 with broadened aspects for on-chip energy storage integrated ...

In the future, some features are a must for NIBs used in large-scale energy storage systems: (1) A high recycling rate, enabling a fast response to energy fluctuations in renewable energy and peak ...

The growing need for energy requirements in day-to-day life with diminishing fossil fuel sources across the world has made to explore various non-conventional energy sources and develop advanced energy harvesting, conversion, and storage devices [1, 2].The energy devices work with an independent mechanism for harvesting (nano generators, solar cells), ...

The multiscale structures derived from fabrics, interlayer locking configurations, bio-inspired composites, and programmable architectures exhibit potential for advancing multifunctional ...

With a comprehensive understanding of the internal microstructures of beetles" elytra, various bio-inspired structures with superb energy-absorbing performances have been proposed and investigated (Fig. 2 (d)-(h)).For example, Hao et al. [63] designed a bionic energy-absorbing structure inspired by the hollow column and pole canal observed in beetle elytra.

Combining different features inspired by biological systems is necessary to obtain uncommon and unique multifunctional biologically inspired conceptual designs. The Expandable Domain Integrated Design (xDID) model is proposed to facilitate the multifunctional concept generation process. The xDID model extends the previously defined Domain Integrated Design ...

design-by-analogy called bio-inspired design (BID). Although BID as a design method has been proven beneficial, the gap between biology and engineering continuously hinders designers from effectively applying the method. Therefore, we explore the recent advance of artificial intelligence (AI) for a datadriven approach - to bridge the gap.

Due to their distinct ability to store and release thermal energy during phase transitions, phase change materials (PCMs) play a critical role in modern heat storage systems [].PCMs offer an efficient means of managing and optimizing thermal energy storage as the demand for energy rises and sustainable solutions become imperative [].PCMs maintain a ...

Inspired by nature, many new materials and designs emerge recently to achieve mechanically flexible and high storage capacity of lithium-ion batteries at the same time. Here, ...

(a) Design of the water lily-inspired hierarchical structure for SWEG [74]. (b) Evaporation-driven, water-flow-induced electricity with a Limnobium Laevigatum nanogenerator [8]. (c) The operational concept

behind the banyan-inspired hierarchical evaporator [75]. (d) Illustration of a groundwater pumping process of a plant.

Capturing and converting solar energy into fuels and feedstocks is a global challenge that spans numerous disciplines and fields of research. Billions of years of evolution have allowed natural ...

Here, a novel design of a magnetically actuated, energy-efficient smart adhesive with rapidly tunable, great switchable, and highly reversible adhesion strength inspired by the elastic energy ...

Performance comparison of moisture energy harvesting with nature-inspired design ... The transistor-like design concept provides a ... C. Review of commercial thermal energy storage in ...

design has expanded its influence beyond aesthetics, extending to functionality, exemplified by DaimlerChrysler"s bionic concept car inspired by the boxfish"s exterior shape [40]. The Japanese bullet train"s design, inspired by the kingfisher"s beak, reduces sonic booms and air resistance, mirroring the bird"s splash-minimizing dive.

Conversion and energy storage biological structures constitute a remarkable example of well-managed and efficient energy systems. Interestingly, different types of microbial systems can facilitate long-range extracellular electron transfer (ET) processes using highly electrically conductive pathways known as pili nanowires, which pave the way toward the ...

Concentrating solar power (CSP) remains an attractive component of the future electric generation mix. CSP plants with thermal energy storage (TES) can overcome the intermittency of solar and other renewables, enabling dispatchable power production independent of fossil fuels and associated CO 2 emissions.. Worldwide, much has been done over the past ...

Being an inspired mechanism for electrical energy storage, a strategy (microbial electro-synthesis) capable of absorbing and storing energy from any electrical source is ...