

Multifunctional energy storage vehicle design

What is multifunctional energy storage composite (MESC)?

Multifunctional energy storage composites (MESC) embed battery layers in structures. Interlocking rivets anchor battery layers which contribute to mechanical performance. Experimental testing of MESC shows comparable electrochemical behavior to baseline. At 60% packing efficiency, MESC gain 15%; mechanical rigidity compared to pouch cells.

Are multifunctional energy storage composites a novel form of structurally-integrated batteries?

Conclusions In this paper, we introduced multifunctional energy storage composites (MESCs), a novel form of structurally-integrated batteries fabricated in a unique material vertical integration process.

Can structurally-integrated batteries be used as energy storage units?

System-level opportunities arise through multifunctional design of structurally-integrated batteries that can simultaneously serve as vehicle structural members and energy storage units? [7,8]. Fig. 2. A-D) Mechanical comparison between MESC and typical Li-ion pouch cell.

Can unifunctional components be replaced with energy-storage structures?

Traditional unifunctional components can be replaced with similarly-sized energy-storage structures, resulting in significant weight and volume savings, enhanced packing factors, and reduced complexity.

Can MESCs be both energy storage units and load-carrying members?

Ultimately, it has been demonstrated that MESCs can simultaneously function as both energy storage units and load-carrying members through careful harnessing of these materials' inherent multifunctional capabilities.

Can MESC structural batteries be used as energy-storing structural components?

The rivets' ability to suppress both cyclic strain and deformation due to mechanical fatigue confirm the feasibility of practical implementation of the MESC structural battery as an energy-storing structural component.

Implementation of multifunctional concepts and materials in batteries can eliminate some of the inactive components in battery structure. Developments in this area are expected ...

Multifunctional composite materials for energy storage in structural load paths Prof. Leif E. Asp and Dr Emile S. Greenhalgh ARPA-E safe energy storage systems for electric vehicles, ...

Demonstrating the design of a system for improving the ability to monitor the State of Health (SOH) and End-of-life (EOL) of a typical battery packs and Multifunctional Energy Storage ...

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Structural analysis results with multifunctional energy storage panels in the fuselage of the test vehicle are presented. The results indicate that the mid-fuselage floor composite ...

A structure-battery-integrated energy storage system based on carbon and glass fabrics is introduced in this study. The carbon fabric current collecto...

Multifunctional Energy Storage Composite (MESC) Structures Additionally, the advantages of high-energy cells are also largely offset by the complexity and cost of the more demanding ...

This work presents the development of the first-generation Multifunctional Energy Storage (MES) Composites-a multifunctional structural ...

Structural Composite Energy Storage Devices (SCESDs) have garnered attention and interest due to their unique combination of mechanical strength and energy storage ...

The authors have recently developed a multifunctional energy harvesting solution in which energy harvesting, energy storage, and Multifunctional structural materials are capable of reducing ...

Lightweight structural battery with high energy density and excellent mechanical strength is crucial. By integrating three subsystems - energy storage, structure, and health monitoring - into a ...

Under the NASA Aeronautics Research Mission Directorate (ARMD) Convergent Aeronautical Solutions (CAS) project, NASA Glenn Research Center has been leading Multifunctional ...

In this presentation, we introduce a new multifunctional energy storage composite (MESC) for the design of battery-power electrical vehicles. MESC is made of high-strength carbon-fiber ...

Abstract. Energy storage is a common challenge for spacecraft and vehicles, whose operating range and operational availability are limited to a considerable extent by the storage ...

The electric vehicle (EV) technology addresses the issue of the reduction of carbon and greenhouse gas emissions. The concept of EVs focuses on the utilization of alternative ...

Overall, this design strategy provides a new path for developing structural battery composites with remarkable energy storage capabilities especially under high compressive ...

This multifunctional energy storage building-block is highly scalable weight and volume savings at the system level for e and can potentially deliver considerable various types of electric vehicles ...

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