

Organic materials for energy storage

Can organic materials be used for energy storage?

Organic materials have gained significant attention in recent years for their potential use in energy storage applications (Iji et al. 2003; Solak and Irmak 2023; Duan et al. 2021). They offer unique advantages such as low cost, abundance, lightweight, flexibility, and sustainability compared to traditional inorganic materials.

Can organic active materials be used for electrochemical energy storage?

In particular, the replacement of environmentally questionable metals by more sustainable organic materials is on the current research agenda. This review presents recent results regarding the developments of organic active materials for electrochemical energy storage.

Can functional organic materials be used for energy storage and conversion?

The review of functional organic materials for energy storage and conversion has revealed several key findings and insights that underscore their significant potential in advancing energy technologies. These materials have demonstrated remarkable promise in meeting the increasing demand for efficient and sustainable energy solutions.

What is energy storage & conversion in functional organic materials?

In summary, the integration of energy storage and conversion capabilities in functional organic materials represents a paradigm shift toward more efficient, cost-effective, and versatile energy devices.

Are organic materials the future of energy storage & conversion?

As research and development continue to advance in this field, organic materials are expected to play an increasingly pivotal role in shaping the future of technology and innovation. To fully harness the potential of functional organic materials in energy storage and conversion, future research efforts should prioritize several key areas.

Can organic materials be used in energy-related applications?

Moreover, the commercialization of organic photovoltaics (OPVs) and organic light-emitting diodes (OLEDs) has already demonstrated the feasibility and potential of organic materials in energy-related applications (Dumur and Goubard 2014).

Organic small molecules with electrochemically active and reversible redox groups are excellent candidates for energy storage systems due to their abundant natural origin and design flexibility. However, their practical application is generally limited by inherent electrical insulating properties and high solubility. To achieve both high energy density and power ...

Organic electrodes are the key candidates for environment-friendly and sustainable energy storage owing to their abundant resources, robust structural design and high theoretical specific capacity in the future. So far,

the vast majority of organic materials applied in the area of energy storage have been pr Journal of Materials Chemistry A Recent Review Articles

Global energy demand is rising steadily, increasing by about 1.6 % annually due to developing economies [1] is expected to reach 820 trillion kJ by 2040 [2]. Fossil fuels, including natural gas, oil, and coal, satisfy roughly 80 % of global energy needs [3]. However, this reliance depletes resources and exacerbates severe climate and environmental problems, such as climate ...

Energy from renewable resources is a major concern nowadays and is being addressed by researchers over the globe to overcome the energy crises. Organic phase change materials are extensively utilized in thermal energy storage systems to integrate and manage the renewable energy.

The inorganic and organic materials used for the development of cathodes in lithium batteries possess the certain limitation in a similar manner as they used for the development of other components for the lithium batteries. ... for Energy Storage. In: Moharana, S., Gregory, D.H., Mahaling, R.N. (eds) Emerging Nanodielectric Materials for ...

In contrast, most of the polymer materials show excellent electrochemical performance (Guo et al., 2017; Poh et al., 2021), and the color contrast is large after electrochromic, so the materials used in organic discoloration (Li et al., 2019b; Wang et al., 2021), have gained much attention in energy storage field because it can not only ...

Organic electrodes are attractive candidates for electrochemical energy storage devices because they are lightweight, inexpensive and environmentally friendly. In recent years, many ...

In the last years, large efforts have been made regarding the investigation and development of batteries that use organic active materials since they feature superior properties compared to metal-based, in particular lithium ...

As a relatively young but quickly growing family of porous materials, metal-organic frameworks (MOFs) have generated a tremendous amount of interest from researchers in widespread areas (4, 5). ... Development of MOF-related materials for electrochemical energy storage and conversion has been a rapidly expanding research area in the past decade.

Aqueous organic redox flow batteries are promising for grid-scale energy storage, although their practical application is still limited. Here, the authors report highly ion-conductive ...

Quinones represent the most popular group of organic active materials for electrochemical energy storage. 24 They offer a stable and reversible redox chemistry, a wide range of electrochemical potentials, and a facile synthetic access. 25 The electrochemical charge storage is based on the transition between the reduced hydroquinone and the ...

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Materials that change phase (e.g., via melting) can store thermal energy with energy densities comparable to batteries. Phase change materials will play an increasing role in reduction of greenhouse gas emissions, by scavenging thermal energy for later use. Therefore, it is useful to have summaries of phase change properties over a wide range of materials. In the ...

Additionally, metal-organic frameworks (MOFs) with structural versatility, tunable components, and excellent stability are promising electrode materials for future energy storage devices, while the study for MOFs used in battery systems is still in the early stage.

ConspectusWith the ever-increasing demand on energy storage systems and subsequent mass production, there is an urgent need for the development of batteries with not only improved electrochemical performance but also better sustainability-related features such as environmental friendliness and low production cost. To date, transition metals that are sparse ...

The development of materials that reversibly store high densities of thermal energy is critical to the more efficient and sustainable utilization of energy. Herein, we investigate metal-organic compounds as a new class of solid-liquid phase-change materials (PCMs) for thermal energy storage. Specifically, we show that isostructural series of divalent metal amide ...

Organic batteries are considered as an appealing alternative to mitigate the environmental footprint of the electrochemical energy storage technology, which relies on materials and processes requiring lower energy consumption, generation of less harmful waste and disposed material, as well as lower CO₂ emissions. In the past decade, much effort has ...

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