

Are ionic liquids a viable energy storage solution?

Ionic liquids (ILs), composed of bulky organic cations and versatile anions, have sustainably found widespread utilizations in promising energy-storage systems. Supercapacitors, as competitive high-power devices, have drawn tremendous attention due to high-rate energy harvesting and long-term durability.

Why are ionic liquids used in energy storage?

Ionic liquids (ILs) have attracted considerable attention in energy storage due to their unique properties, including a wide electrochemical stability window that facilitates their use in high-volt...

Can ionic liquid electrolytes be used for energy storage devices?

Taking this into consideration, this Review highlights recent advancements in the development and utilization of ionic liquid electrolytes for various energy storage devices, including batteries and supercapacitors. Additionally, this review presents the bibliometric analysis of global research on ILs for energy storage devices from 2019 to 2024.

Which ionic materials are used in energy storage?

Ionic materials that conduct electricity and are based on liquid crystals are now being utilized in energy storage, specifically in lithium-ion batteries (LIBs) and dye-sensitized solar cells. Typically, the LC system cannot directly transport Li^+ .

Can ionic liquids be used in electrochemical energy devices?

Design of ionic liquids with suitable physicochemical properties for their potential use in electrochemical energy devices. Ionic liquids can serve as multifunctional materials with countless applications in the energy field. An overview of these novel materials, their limitations and methods toward overcoming those limitations.

Are ionic liquids a multifunctional material?

Ionic liquids can serve as multifunctional materials with countless applications in the energy field. An overview of these novel materials, their limitations and methods toward overcoming those limitations. Discussion of the latest important advances in the use of ionic liquids in energy conversion and storage.

Increasing Energy Storage in Electrochemical Capacitors with Ionic Liquid Electrolytes and Nanostructured Carbon Electrodes. The Journal of Physical Chemistry Letters 2013, 4 (17), 2829-2837.

Energy storage devices have become a major focus globally due to the depletion of fossil fuels and the significant increase in energy consumption. Lithium batteries are the key contenders among all the battery variants due to their higher operating voltage, and longer cycle stability. ... Application of ionic liquids to energy storage and ...

The development of all-organic batteries promises novel customizable energy storage devices by fabrication processes based on roll-to-roll casting or printing techniques. Despite a continuous effort to improve the electrode materials, barely any attention has been paid to a suitable electrolyte system providing a sufficient ionic conductivity ...

The absorption thermal energy storage (ATES) systems using H₂O/ionic liquid (IL) mixtures as novel working fluids are explored to avoid the crystallization problem. The property model and cycle model are established and validated against experimental data.

With the increasing attention on environmental protection and carbon neutralization, it is imperative to develop reliable, efficient, and sustainable energy storage technologies to couple with renewable energy resources such as solar, wind and tidal energy [1], [2], [3], [4] this respect, rechargeable aqueous metal-ion (Al³⁺, Mg²⁺, K⁺, Zn²⁺) batteries turn out to be ...

Energy storage using ionic liquids avoids crystallization, lowers charging temperature, and improves energy storage performance. Abstract. Thermal energy storage technologies play a significant role in building energy efficiency by balancing the mismatch between renewable energy supply and building energy demand. The absorption thermal ...

Concerning electrolytes, ionic liquids (ILs) for their high ionic conductivity, wide electrochemical stability, low vapor pressure, and non-flammability are emerging as a safer alternative to conventional organic electrolytes for flexible, thin SCs operating at 3 V and above [15], [16]. ILs have also been reported to provide SCs with lower ...

The scarcity of fossil energy resources and the severity of environmental pollution, there is a high need for alternate, renewable, and clean energy resources, increasing the advancement of energy storage and conversion devices such as lithium metal batteries, fuel cells, and supercapacitors [1]. However, liquid organic electrolytes have a number of disadvantages, ...

Ionic liquids (ILs), often known as green designer solvents, have demonstrated immense application potential in numerous scientific and technological domains. ILs possess high boiling point and low volatility that make them suitable environmentally benign candidates for many potential applications. The more important aspect associated with ILs is that their ...

The thermal energy storage can be divided into hot energy storage and cold energy storage since the different purposes, aiming at converting thermal energy into stable and controllable heating or cooling output whenever and wherever possible [6], [7], [8]. The traditional way is to storage and transport thermal energy via the sensible heat of fluids, such as water, ...

Santiago-Alonso A, Sánchez-Pico JM, Emeterio RS, Villanueva M, Parajás JJ, Salgado J. Designing Pyrrolidinium-Based Ionic Liquid Electrolytes for Energy Storage: Thermal and Electrical

Behaviour of Ternary Mixtures with ...

Thin films of nanoconfined ILs are relevant to applications in energy storage and lubrication [20, 34, 35]. A recent investigation with a tuning-fork AFM showed that the IL 1-butyl-3-methylimidazolium tetrafluoroborate [C₄Im][BF₄] forms thick solid-like structures on the surface of metals [36]. The underlying mechanism was discussed in terms of a confinement ...

The ability to store and convert energy in the form that is most frequently used globally makes thermal energy storage (TES) systems an excellent emerging solution in a number of contexts [1], and the capture-storage mechanism in TES systems does not necessitate energy conversion between forms (e.g., thermal to electrical) [2]. This potentially enables the ...

Now in many types of gels, as a kind of new advanced materials, the ILs-based gels which means that the gel contains ILs are attractive. ILs are organic salts formed by organic cations together with organic or inorganic anions with melting points below 100 °C and have been applied to prepare some gels [[16], [17], [18]]. Poly(ionic liquids) (PILs) are polymer chains ...

Many applications in chemistry, biology, and energy storage/conversion research rely on molecular simulations to provide fundamental insight into structural and transport properties of materials with high ionic ...

E_v = latent volumetric energy storage. E_v^* = volumetric energy storage within 20 °C of T_m ($T_m \pm 10$ °C). This value accounts for the small but significant additional energy stored in the form of sensible heat. We have ...

Herein, varieties of ionic liquids applications are reviewed on their utilization as electrolytes for Li-ion batteries, Na-ion batteries, Li-O₂(air) batteries, Li-Sulfur (Li-S) batteries, ...

In this Perspective, we discuss the evolution and promise of the emerging field of ionic liquids for renewable thermal energy storage. Systems are considered from a holistic, sustainable point of view, demonstrating the importance of ...

Two such materials are ionic liquids (ILs) and PCMs [7, 8]. The ILs possess low vapor pressure and high thermal stability, making them ideal for high-temperature applications in TES systems [9, 10]. Their ability to remain in a liquid state over a wide temperature range allows for efficient and reversible heat storage.

Ionic liquids (ILs), composed of bulky organic cations and versatile anions, have sustainably found widespread utilizations in promising energy ...

a,b | Cations and anions commonly used for the formulation of ionic-liquid electrolytes for energy-storage devices (where R represents an alkyl group, which can be replaced by other groups, such ...

Due to the great potential of ionic liquid (ILs) for solar energy storage, this work combines computer-aided ionic liquid design (CAILD) and a TRNSYS simulation to identify promising IL candidates as simultaneous ...

Recently developed ionic liquid crystals (ILCs) offer promising opportunities for tailoring ion transport channels through modified nano segregated structures, thereby ensuring ...

Performance evaluation of absorption thermal energy storage/transmission using ionic liquid absorbents. Author links open overlay panel Jintong Gao a b, Zhenyuan Xu a b. ... Low-temperature compression-assisted absorption thermal energy storage using ionic liquids. Energy Built Environ, 1 (2020), pp. 139-148, 10.1016/j.enbenv.2019.11.001. View ...

In this review-perspective article we are considering protic ionic liquids (PILs) and we are critically comparing their characteristics, syntheses as well as benefits and drawbacks to the more prominent aprotic ionic liquids. ... In order to be effectively used as liquid electrolytes in energy storage devices the liquidous range of ILs should ...

Manipulating van der Waals (vdW) and ionic interactions in polymers enable energy storage and formations of active or passive components of electrical circuits. The ...

A hybrid energy storage system (HESS) comprising two or more energy storage components is an option for compensating any shortcoming of single technology by pairing it with a complementary option [7] binning two energy storage technologies, the advantages of each can compensate for the disadvantages of the other so that the combined benefits should ...

Design of ionic liquids with suitable physicochemical properties for their potential use in electrochemical energy devices. Ionic liquids can serve as multifunctional materials with ...

Ionic liquid-based electrolytes for energy storage devices: a brief review on their limits and applications. Polymers, 12 (4) (2020 ... 3D printed solid polymer electrolytes with bicontinuous nanoscopic domains for ionic liquid conduction and energy storage. Small (2023), Article 2206639, 10.1002/smll.202206639. View in Scopus Google Scholar ...

The energy storage ability and safety of energy storage devices are in fact determined by the arrangement of ions and electrons between the electrode and the electrolyte. In this paper, the physicochemical and ...

Energy consumption has experienced unpredictable growth in recent decades due to technological advancements and improved living standards. To mitigate the adverse effects it generates, it is ...

Ionic liquid crystals are organic salts having synergistic properties of ionic liquids and liquid crystalline materials endowed with non-covalently bound delocalised ion pairs of large organic cations and anions. They

can undergo ...

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