

# Illustration of ionic liquid energy storage trends

Are ionic liquids a safe energy storage device?

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 review, we provide an overview of ionic liquids as electrolytes in lithium-ion batteries, supercapacitors and, solar cells.

Can ionic liquids be used as electrolytes for energy storage devices?

Ionic liquids as electrolytes for energy storage devices is a promising field. Here, the various approaches of how ionic liquids can be modelled are discussed along with how the modelling connects to experimental results.

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...

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  $\text{Li}^+$ .

Can ionic liquids improve solar energy performance?

It emphasizes the potential of these electrolytes to enhance the green credentials and performance of various energy storage devices. Unlike the previous publications, it touches on the increased durability and heightened efficiency of solar cells when utilizing ionic liquids.

How does ionic conductivity affect the performance of energy storage devices?

The performance of energy storage devices is greatly influenced by the ionic conductivity and viscosity of the electrolyte. In liquid electrolytes, conductivity is closely linked to viscosity.

Due to characteristic properties of ionic liquids such as non-volatility, high thermal stability, negligible vapor pressure, and high ionic conductivity, ionic liquids-based electrolytes have ...

In 1982, Hurley et al. synthesized a room-temperature liquid ionic liquid of 1-ethyl-3-methylimidazolium chloride ([Emim]<sup>+</sup>) by reacting it with  $\text{AlCl}_3$ . In 1992, Wilks et al. prepared ...

Recently, ionic liquid has attracted much attention and been used as wetting agent [20], electrolyte additive [32] and gel electrolyte [33] in the field of energy storage due to its ...

The role of electrolytes is crucial in AIBs, and Ionic liquids (ILs) present a promising practical choice, with

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chloroaluminates being among the earliest ILs reported. ...

Ionic liquids as electrolytes for energy storage devices is a promising field. Here, the various approaches of how ionic liquids can be modelled are discussed along with how the ...

Ionic liquids are fascinating compounds that have gained significant attention among industrial and academic researchers in recent years. Unlike traditional liquids composed of molecules, ionic liquids are made up of ...

Among many energy-storage devices, Li-O<sub>2</sub> (air) battery based on the reversible electrochemical reaction of  $2\text{Li}^+ + \text{O}_2 \rightleftharpoons \text{Li}_2\text{O}_2$  ( $E^0 = 2.96 \text{ V}$ ), is considered to be one of ...

It guides the reader through the application of ionic liquids and their analogues as i) phase change materials (PCMs) for thermal energy storage, ii) organic ionic plastic crystals (OIPCs), which ...

a) Schematic illustration of the energy conversion and storage principles of ionic thermoelectric capacitors. b) Thermovoltage profiles with an external load connected or disconnected under given ...

Ionic liquids have promising applications as multifunctional components in the fabrication of advanced materials. The new progress of ionic liquids and their applications in ...

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

Supercapacitors are representative power-type electrochemical energy storage devices, which store charges through physical adsorption and desorption processes occurring ...

Solid polymer electrolytes (SPEs), possessing high flexibility and security assurance, have become increasingly attractive over the years and are considered to be favorable candidates to replace conventional organic liquid ...

Depending on the solvents employed, electrolytes can be classified into organic, ionic liquid, and aqueous types. Organic electrolytes offer a wide electrochemical stability ...

Since the ability of ionic liquid (IL) was demonstrated to act as a solvent or an electrolyte, IL-based electrolytes have been widely used as a potential candidate for renewable energy storage devices, like lithium ion ...

In meantime, for simple co-insertion with  $\text{Zn}^{2+}$ , the size of organic molecules should be kept to a minimum, contributing to lower solvent energy penalties. Since ionic liquids ...

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Ionic liquids (ILs) are known as green solvents that comprise of cations and anions in equal ratios and exist as liquid at temperature below 100 °C. They possess desirable ...

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-voltage systems, enhancing the ...

Ionic liquid-based electrolytes: For safety concerns, ionic liquids with low vapor pressure and non-flammable properties, attract enormous interest in high-energy storage ...

Conspectus Lithium-ion batteries (LIBs) based on graphite anodes are a widely used state-of-the-art battery technology, but their energy density is approaching theoretical limits, prompting interest in lithium-metal batteries ...

Self-segregated liquid-electrode batteries are a promising solution for large-scale energy storage, aimed at mitigating the impact of renewable energy source intermittency on ...

Up to now, the most attractive motivation for the development of ILs in the electrochemical energy storage field was related to their use as functional electrolytes, ...

scalability, demonstrating great potential for large-scale energy storage applications. 1. Introduction Self-segregated liquid-electrode batteries are a promising solution ...

Poly(ionic liquid)s (PILs), also called polymerized ionic liquids, refer to a subclass of polyelectrolytes that feature an ionic liquid (IL) species in each monomer repeating unit, ...

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 ...

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The review systematically discusses the progress made in stretchable ionogels in terms of both structural design and toughening mechanisms. In addition, this review ...

The ability of an electrolyte to conduct ions is evaluated by its ionic conductivity. The ionic conductivity is defined in Eq. (1) [19], where  $m_i$  is the ion mobility of different ions,  $n_i$  ...

We have reviewed in this article applications of ionic liquids to energy storage and conversion materials and

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devices by specifically focusing on the applications as electrolyte ...

Membrane technology is the most prominent, excellently, and well-developed separation technique today [1] was crucial in establishing a decisive separation process that ...

The limitation facing the hydrogen energy development is the extremely low volumetric energy density of hydrogen. For instance, at standard temperature and pressure ...

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 ...

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