# Solid-state electrochemistry and energy storage

What is solid state electrochemistry?

One of the most active research areas in solid state electrochemistry concerns the development of ion-conducting materials for application in the conversion and storage of energy(e.g. high energy density batteries and fuel cells).

What is the Journal of solid state electrochemistry?

The Journal of Solid State Electrochemistry is devoted to all aspects of solid-state chemistry and solid-state physics in electrochemistry,publishing novel papers on all aspects of electrochemical science and technology (E-chem S&T) of solid compounds,including experimental and theoretical,basic and applied works.

Are solid-state electrochemical interfaces for energy storage atomistic?

One of the key open questions toward the atomistic understanding of solid-state electrochemical interfaces for energy storage is the nature of the physical descriptor for the charge-transfer activation energy, which is a fundamental interfacial process at redox-active electrochemical interfaces.

What are solid-state electrolytes (SSEs)?

Provided by the Springer Nature SharedIt content-sharing initiative Solid-state electrolytes (SSEs) have emerged as high-priority materials for safe, energy-dense and reversible storage of electrochemical energy in batteries.

Can solid-state electrochemistry be applied to lithium storage materials?

Approaches to the study of solid-state electrochemistry in the application to the lithium storage materials have undergone substantial development from classical approaches since the processes in solid-state systems are markedly different from those in classical electrochemistry - processes at the metal/electrolyte interface.

How does a solid state battery work?

In solid-state batteries,the interface between solid-state electrolytes and electrode materials is where the electrochemical "action" happens--the ion redox and migration of species to,from,and across the interface resulting in reversible electrical-to-chemical energy conversion.

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Journal of Solid State Electrochemistry - Manganese oxides are widely studied due to their exceptionally high theoretical specific capacitance and environmentally friendly characteristics. ... This paper employs an electrooxidation strategy to enhance the energy storage performance of Mn3O4. The physical and electrochemical properties of the ...

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The electrochemical properties and high-density energy storage performance of graphene nano-platelet-based solid-state electrical double-layer supercapacitor device are reported. The graphene device is fabricated with electrolyte comprising of 1-butyl-3-methylimidazolium tetrafluoroborate (BMIMBF4) room temperature ionic liquid and LiClO4 ...

About this collection. We are delighted to present a Chemical Society Reviews themed collection on "Electrochemistry in Energy Storage and Conversion", Guest Edited by Jun Chen (Nankai University) and Xinliang Feng (TU Dresden). Rapid depletion of fossil fuels and increasing environmental concerns induce serious scientific and technological challenges to address the ...

With their work, our team of around 150 researchers at MEET Battery Research Center is responding to the steadily increasing demands being made on batteries as a form of energy storage - for example through ...

Hence, building next-generation "beyond Li-ion" batteries has been key to meet the increasing demands of the energy storage market. 5-7 One promising strategy is to assemble all-solid ...

The clean energy transition is demanding more from electrochemical energy storage systems than ever before. The growing popularity of electric vehicles requires greater energy and power ...

Electrochemical energy storage and conversion systems such as electrochemical capacitors, batteries and fuel cells are considered as the most important technologies proposing environmentally friendly and sustainable ...

Particularly for large-scale energy storage equipment, this improvement is not enough to fulfill the demand. ... At present, solid-state batteries with high energy density and high safety characteristics are attracting worldwide attention [168]. The solid-state lithium battery is expected to become the leading direction of the next generation ...

The Chimie du Solide et Energie (CSE, solid-state chemistry and energy) lab is part of the Collège de France, the most prestigious research establishment in France, led by Prof Jean-Marie Tarascon and active in the ...

The dependence on portable devices and electrical vehicles has triggered the awareness on the energy storage systems with ever-growing energy density. Lithium metal batteries (LMBs) has revived and attracted considerable attention due to its high volumetric (2046 mAh cm -3 ), gravimetric specific capacity (3862 mAh g -1 ) and the lowest ...

All-solid-state lithium metal batteries (ASSLMBs) have currently garnered significant academic and industrial interest, due to their great potential to overcome intrinsic shortages of ...

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Since their market introduction in 1991, lithium ion batteries (LIBs) have developed evolutionary in terms of their specific energies (Wh/kg) and energy densities (Wh/L). Currently, they do not only dominate the small format battery ...

With the rapid development of wearable electronic devices, medical simulation equipment, and electronic textile industries, their energy storage devices need to maintain stable chemical properties after undergoing multiple tensile deformations. Flexible supercapacitors have long cycle life and mechanical properties due to their own strong, green, low-cost, and many other ...

Energy Storage Materials. Volume 27, May 2020, Pages 140-149. Single-crystal nickel-rich layered-oxide battery cathode materials: synthesis, electrochemistry, and intra-granular fracture. Author links open overlay panel Guannan Qian a, Youtian Zhang b, ... Ni-rich SC NMC materials were also synthesized via solid-state reaction [25] ...

Mobile Energy Storage Systems and Electrochemistry. Ceramic electrolytes for lithium and sodium solid-state batteries; Recycling and Green Battery; Cell Design and Testing; Process Development and Process Control; Stationary ...

JOURNAL OF SOLID STATE ELECTROCHEMISTRY 1432-8488 4 IONICS 0947-7047 4 International Journal of Electrochemical Science 1452-3981 4 Fuel Cells 1615-6846 4 Journal of Electrochemical Science and Technology

All-solid-state batteries (ASSBs) are considered promising candidates for next-generation batteries due to their excellent safety performance guaranteed by inorganic solid electrolytes (SEs) with the non-flammability nature as well as the doubled energy density (~400 Wh/kg) enabled by the adoption of lithium metal anode [1], [2], [3].The critical issue to be ...

We present the progress on the physical chemistry of the olivine compounds since the pioneering work of Prof. John Goodenough. This progress has allowed LiFePO4 to become the active cathode element of a new generation of Li-ion batteries that makes a breakthrough in the technology of the energy storage and electric transportation. This achievement is the fruit ...

Advanced Energy Materials. Volume 8, Issue 17 1703415. Review. Electrochemistry and Solid-State Chemistry of NaMeO 2 (Me = 3d Transition Metals) Kei Kubota, Kei Kubota. Department of Applied Chemistry, Tokyo ...

Our knowledge of charge transfer and interfacial dynamics at solid/solid interfaces lags behind that of solid/liquid electrochemical interfaces. Understanding how ...

Then, in 1978, polymer electrolytes were proposed for the first time by M. Armand for application in batteries

due to the advantages of both solid-state electrochemistry and ease of preparation [112, 113]. From 1978 till now, polymer electrolytes have attracted the attention of the R& D sector for the development of energy storage devices.

Fraunhofer IKTS develops materials and technologies for the production of mobile and stationary ceramic solid-state batteries for a sustainable energy economy. Search. ... Mobile Energy Storage Systems and Electrochemistry. Fraunhofer ...

Solid State Ionics - the key to the discovery, introduction and domination of lithium batteries for portable energy storage ... As Huggins and Whittingham predicted [4] in 1972 "v-alumina Preclude to a Revolution in Solid State Electrochemistry", the field has absolutely taken-off in the 1967-2017 period.

The second field incorporates, additionally, the use of vegetal matter as a source for the preparation of electrochemical devices for sensing, energy storage, etc. Solid-state electrochemistry has been incorporated to the pool of techniques of application in plant science based on the voltammetry of immobilized microparticles (VIMP) methodology ...

Anionic redox electrochemistry, exemplified by lithium sulfur (Li-S) and lithium oxygen (Li-O 2) batteries 8,22,23, necessitates substantial structural modifications to facilitate energy ...

Solid state ionics is one of the key research topics of the Institute of Solid State Physics, University of Latvia since its establishment. The research direction included topics ranging from electrochromic phenomena in transition metal oxides through gas sensors and electronic nose to materials for rechargeable battery electrodes and materials for hydrogen ...

Solid-state batteries based on electrolytes with low or zero vapour pressure provide a promising path towards safe, energy-dense storage of electrical energy.

In this paper, high-performance dual-functional electrodes based on tungsten trioxide (WO3) nanostructures are developed, which successfully realize the combination of electrochromism and energy storage. The WO3 nanostructures with various morphologies (nanospindles, nanopetals, nanosheets, and nanobricks) were prepared via a facile ...

Solid-state post-lithium-ion batteries are considered a possible next-generation energy storage technology. One immediate advantage of these power sources over commercial lithium-ion batteries is ...

In this study, we propose a core-shell structured composite electrolyte with Na3PS4 sulfide solid electrolyte (SE) as the core and Na2.25Y0.25Zr0.75Cl6 halide SE as the shell. ...

Indeed, one expects that electrochemistry will still offer new possibilities for further development in the field

of rechargeable batteries and energy storage. However, we witness in the last 50 years that ...

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