Quasi-crystal energy storage

Here, we report the combination of a heteroatom-based gel polymer electrolyte with a hybrid cathode comprising of a Li-rich oxide active material and graphite conductive agent to produce a high ...

Quasi-solid-state lithium metal batteries are considered as one of the most promising energy storage devices, and the application of ionic liquids (ILs) as a new generation of functionalized electrolyte components in lithium metal batteries has become one of the research focuses. ... Nematic liquid crystal (C6M) LiTFSI: Improve conductivity ...

Unlike regular crystals, quasicrystals boast unique properties. Researchers have focused on a specific type of quasicrystal called the Tsai-type icosahedral quasicrystal (iQC) and its cubic ...

Potential energy surface for silver depositing on an aluminium-palladium-manganese (Al-Pd-Mn) quasicrystal surface. Similar to Fig. 6 in Ref. [1] A quasiperiodic crystal, or quasicrystal, is a structure that is ordered but not periodic.A quasicrystalline pattern can continuously fill all available space, but it lacks translational symmetry. [2] ...

A fast-charging battery that supplies maximum energy is a key element for vehicle electrification. High-capacity silicon anodes offer a viable alternative to carbonaceous materials, but they are ...

The Ti-Zr-Ni quasicrystal alloys have prospected to be one of the promising materials for hydrogen storage. This is because this type of quasicrystal contains 140 interstitial sites (T-sites) constituted in the Bergman Cluster that could accommodate hydrogen. The number of available sites is far greater than the number found in regular crystals, therefore the ...

Ti 49 Zr 26 Ni 25 quasicrystal alloy was fabricated via mechanical alloying and subsequent annealing. In order to enhance the electrocatalytic activity and conductivity of Ti 49 Zr 26 Ni 25, the porous graphene (PoRGO) material was synthesized by a facile CO 2 activation treatment of reduced graphene oxide (RGO). The composites of Ti 49 Zr 26 Ni 25 doping with ...

3.1 W 18 O 49 NWs for photovoltaic applications. Large-scale utilization of solar energy and technologies is the final solution to address the excess emissions of CO 2.Photovoltaics (PV) or solar cells have been considered the most efficient way to utilize solar energy on a large scale [66,67,68].Exploring and investigating new materials and technology is ...

Na-O 2 batteries have emerged as promising candidates due to their high theoretical energy density (1,601 Wh kg -1), the potential for high energy storage efficiency, and the abundance of sodium in the earth"s crust. Considering the safety issue, quasi-solid-state ...

The results showed that the elastic energy associated with crystal defects contributed to the energy storage and

the final crystallographic orientation of the grains correlated with the stored energy as well as the accumulated plastic strain. ... the results for energy storage and dissipation under quasi-static compression in Section 3.1 were ...

In crystals, atoms are arranged in a repeating pattern. In quasicrystals, they are still ordered but the pattern is not periodic: it doesn"t repeat. This oddity results in unexpected rotational...

Phys. Rev. B 1990, 41, 7238, DOI: 10.1103/PhysRevB.41.7238 This article has not yet been cited by other publications. Na-O2 batteries have emerged as promising candidates due to their high theoretical energy density (1,601 Wh kg-1), the potential for high energy storage efficiency, and the abundance of sodium in t...

Hydrogen Storage in Quasicrystals - Volume 22 Issue 11. ... They may also be critical materials for the future energy economy. The depletion of the world"s petroleum reserves and the increased environmental impact of conventional combustion-engine powered automobiles are leading to renewed interest in hydrogen. ... 1/1 crystal approximant ...

This perspective points out the potential of solid-state Na-air/O 2 batteries for powering next-generation storage devices, highlighting their high energy density, efficiency, and cost-effectiveness. The challenges faced by Na ...

We need to build a genome for 2D material heterostructures for energy storage. As a result of these research efforts, 2D heterostructures can greatly expand the limits of current energy storage technology and open a door to next-generation batteries with improved storage capabilities, faster charging and much longer lifetimes.

A Ti 49 Zr 26 Ni 25 quasicrystal alloy was prepared by mechanical alloying and subsequent annealing. Mesoporous a-Fe 2 O 3 particles were obtained via a hydro-thermal procedure using chitosan as the template. Composites of Ti 49 Zr 26 Ni 25 mixed with different amounts of mesoporous a-Fe 2 O 3 were synthesized to enhance the electrochemical ...

In this article, the nonlinear dynamic characteristics and bifurcation of a Ti-Zr-Ni quasicrystal impacted by hydrogen atoms are studied. New nonlinear damping terms are proposed to express the delay characteristics of Ti-Zr-Ni quasicrystal, and the accurate natural frequency is obtained by the harmonic balance method. A new method based on the ...

Herein, we design and fabricate a quasi-solid-state electrolyte (QSSE) based on a POC to enable the stable operation of Li-metal batteries (LMBs). Benefiting from the ordered channels and cavity-induced anion-trapping effect of POC, the resulting POC-based QSSE ...

By selecting 1-butyl-3-methylimidazolium ion (BMI +) as the cation, a liquid-solid cathode/quasi-solid-state electrolyte interface can be achieved to facilitate the interfacial charge transfer, rendering quasi-solid-state aqueous electrochromic batteries with a high areal ...

Bismuth (Bi)-based materials have been receiving considerable attention as promising electrode materials in the fields of electrochemical energy storage, due to their excellent physical and chemical properties. However, they suffer from large volume expansion and sluggish reaction kinetics, leading to rapid capacity degradation and inferior rate ...

Request PDF | Hydrogen storage in Ti-based quasicrystal powders produced by mechanical alloying | Ti-based quasicrystals belong to the second largest group of the stable quasicrystals, showing ...

Most of quasi-crystals are brittle at room temperature due to their specific cluster structures. Phase-field fracture models have demonstrated a powerful ability to predict brittle crack evolution.

The fracture behavior of QCs is different from that of traditional crystals due to the existence of the phason field (Fan, 2011).The excess energy carried by the phason wall makes the crack propagate along a new low-energy path, which leads to the brittleness of QCs (Mikulla et al., 1998).The approach of rapid solidification is commonly used to manufacture QCs (Han et ...

Rechargeable dual-ion sodium metal batteries (DISBs) with graphitic cathode materials are viable for large-scale stationary energy storage because of the low cost and high output voltage. However, DISBs are greatly burdened by low capacity and limited cycle life ...

Rechargeable dual-ion sodium metal batteries (DISBs) with graphitic cathode materials are viable for large-scale stationary energy storage because of the low cost and high output voltage.

Ti-Zr-Ni-based icosahedral quasicrystals (IQCs) are a type of hydrogen storage materials with promising application in the fields of hydrogen energy and nuclear fusion energy. In the present paper, the preparation of Ti39Zr38Ni17Pd6 IQC and its deuterium storage properties were investigated by XRD, TEM, XPS analysis and a gas-solid reaction system. Results show that ...

As a proof-of-concept of the high-temperature QSS electrolyte, its potential application to rechargeable high-temperature molten salt iron-oxygen batteries (MIBs) is explored with particular attention to the volatility and flowability of molten electrolyte.

Supercapacitors and batteries are among the most promising electrochemical energy storage technologies available today. Indeed, high demands in energy storage devices require cost-effective fabrication and robust electroactive materials. In this review, we summarized recent progress and challenges made in the development of mostly nanostructured materials as well ...

This perspective points out the potential of solid-state Na-air/O 2 batteries for powering next-generation storage devices, highlighting their high energy density, efficiency, and cost-effectiveness. The challenges faced by Na-air/O 2 batteries, including liquid electrolyte instability, O 2 /O 2 - crossover, Na anode

passivation, and dendritic growth are addressed.

Metal-based quasicrystals with unique quasi-periodic atomic arrangements are known to store a large amount of hydrogen under reasonable pressure and temperature for practical application as energy ...

The preliminary study on the quenched alloy obtained by quenching Ti 45 Zr 38 Ni 17 shows that the quasicrystal alloy has good hydrogen storage performance and 2.5% hydrogen can be stored which has higher hydrogen storage performance than the hydrogen storage alloys currently studied, and is expected to be used in hydrogen storage batteries [[5 ...