

How to recover cryogenic energy stored in liquid air/nitrogen?

To recover the cryogenic energy stored in the liquid air/nitrogen more effectively, Ahmad et al. [102,103] investigated various expansion cycles for electricity and cooling supply to commercial buildings. As a result, a cascade Rankine cycle was suggested, and the recovery efficiency can be higher than 50 %.

Which energy sources can lead to new nitrogen conversion mechanisms?

Innovative energy sources, such as plasmas, which involve nonequilibrium chemistry, may lead to new nitrogen conversion mechanisms. Nitrogen is fundamental to all of life and many industrial processes.

Can a nitrogen-based redox cycle be used as a catholyte for Zn-based flow batteries?

We demonstrate here the successful implementation of such a nitrogen-based redox cycle between ammonia and nitrate with eight-electron transfer as a catholyte for Zn-based flow batteries, which continuously worked for 12.9 days with 930 charging-discharging cycles.

Is a nitrogen-centered redox cycle a catholyte?

A nitrogen-centered redox cycle operating between ammonia and nitrate via an eight-electron transfer as a catholyte was successfully implemented for Zn-based flow battery.

Is an aqueous nitrogen cycling process feasible for the cathode?

On the basis of all that knowledge, here an alkaline Zn-based RFB ( $\text{Zn-Zn}^{2+} // \text{NO}_3^- - \text{NH}_3$ ) is chosen to demonstrate the feasibility of an aqueous nitrogen cycling process for the cathode, a battery which offers a theoretical operating voltage of 1.08 V [Figure 1d, Eq. (1)-(3) (vs. NHE, pH 14)] and the discussed high energy density.

How can liquid air be produced from LNG regasification?

Che et al. proposed to produce liquid air by using cold energy from the LNG regasification process on-site, after which the liquid air is transported to a cold storage room for electricity supply (through a direct expansion cycle) and direct cooling supply ( $-29 \pm 176^\circ\text{C}$ ).

Microbial electrosynthesis systems (MESs), as one of the most desirable and sustainable biotechnology, can realize  $\text{CO}_2$  fixation through the interaction between electroactive microorganisms and cathode (Jiang et al., 2018, Nevin et al., 2010). The core of MESs lies in the ability of a microbe to uptake electrons from solid-state electron donors (e.g., carbon electrode ...

On the one hand, the pseudocapacitive charge storage is confirmed by the valence state changes of  $\text{Ti}^{3+} / \text{Ti}^{4+}$  obtained by X-ray photoelectron spectroscopy (XPS) analysis for the redox reaction ...

Engineering low-valent molybdenum sites in CoMoO<sub>4</sub> nanosheets to boost electrochemical nitrogen-rich wastewater ... Electrocatalytic technology is an efficient and sustainable way for molecule conversion and energy storage ... LSV tests were performed from 0.7 to 1.8 V vs. RHE at a scan rate of 10 mV s<sup>-1</sup> and with 50% iR compensation.

The doping level of nitrogen and sulfur and their chemical variations are likely to influence the electrochemical properties of the xNS-HC materials, potentially determining the K<sup>+</sup> storage ...

With the unceasing advancement of wide-bandgap (WBG) semiconductor technology, the minimal reverse-recovery charge  $Q_{rr}$  and other more powerful natures of WBG transistors enable totem-pole bridgeless power factor correction to become a dominant solution for energy storage systems (ESS). This paper focuses on the design and implementation of a ...

Energy storage systems (ESS) are an important component of the energy transition that is currently happening worldwide, including Russia: Over the last 10 years, the sector has grown 48-fold with an average annual increase rate of 47% (Kholkin, et al. 2019). According to various forecasts, by 2024-2025, the global market for energy storage ...

The rapid development of the global economy has led to a notable surge in energy demand. Due to the increasing greenhouse gas emissions, the global warming becomes one of humanity's paramount challenges [1]. The primary methods for decreasing emissions associated with energy production include the utilization of renewable energy sources (RESs) ...

Dielectric materials for electrical energy storage at elevated temperature have attracted much attention in recent years. Comparing to inorganic dielectrics, polymer-based organic dielectrics possess excellent flexibility, low cost, lightweight and higher electric breakdown strength and so on, which are ubiquitous in the fields of electrical and electronic engineering.

Here, we show that plants can increase their rate of photosynthetic CO<sub>2</sub> uptake when assimilating nitrogen de novo via the photorespiratory pathway by fixing carbon as amino acids in addition to ...

The Li metal anode had a high energy density, and instead of using an n-type polymer as the cathode, a p-type polymer with a more positive potential was combined with an electrochemically inactive ...

The results showed that the multiple stages of reheat for the liquid nitrogen cycle can increase energy efficiency from 28% to 47% during on-peak times. ... Wang et al. (2020) developed a liquid nitrogen energy storage structure using an air separation unit, nitrogen liquefaction cycle, and gas power generation plant. The results illustrated ...

The increase in pore structure ( Fig. 6e-g) led to the accommodation of more oxygen and water molecules by

hydrochars, which provides a portion of oxygen atoms to bond with nitrogen atoms to ...

T1 - Liquid air/nitrogen energy storage and power generation system for micro-grid applications. AU - Khalil, Khalil. AU - Ahmad, Abdalqader. AU - Mahmoud, Saad. AU - Al-Dadah, Raya. PY - 2017/6/30. Y1 - 2017/6/30. N2 - The large increase in population growth, energy demand, CO2 emissions and the depletion of the fossil fuels pose a threat to ...

Ensuring a stable power output from renewable energy sources, such as wind and solar energy, depends on the development of large-scale and long-duration energy storage devices. Zinc-bromine flow batteries (ZBFBs) have emerged as cost-effective and high-energy-density solutions, replacing expensive all-vanadium flow batteries. However, uneven Zn ...

A Nitrogen Battery Electrode involving Eight-Electron Transfer per Nitrogen for Energy Storage. Haifeng Jiang ... the battery showed a slight increase in the loading voltage from 1.58 V in the 35 th cycle to 1.72 V in the 500 th cycle and finally to 1.76 V ... LSV curves were recorded with automatic iR compensation by electrochemical ...

A study on the configuration of the liquid nitrogen energy storage system for maximum power efficiency was conducted by Dutta et al. (2017). The results showed that the multiple stages of reheat for the liquid nitrogen cycle can increase energy efficiency from 28% to 47% during on-peak times. Wang et al. (2015) compared liquid fluid energy ...

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