

What are the recent advances in metal-N<sub>2</sub> batteries?

Herein, recent advances in metal-N<sub>2</sub> batteries are summarized. First, the electrochemical reaction mechanisms for all types of metal-N<sub>2</sub> batteries, including organic Li/Na/Al-N<sub>2</sub> batteries and aqueous Zn/Al-N<sub>2</sub> batteries are discussed, and then, a critical assessment of current challenges and future applications is provided.

Are heterogeneous electrocatalysts suitable for metal-CO<sub>2</sub> batteries and CO<sub>2</sub> electrolysis?

Although both research areas rely upon efficient electrochemical reduction of CO<sub>2</sub>, to date the respective research has been largely carried out independently. This Focus Review introduces the latest innovative design strategies toward heterogeneous electrocatalysts applied for both metal-CO<sub>2</sub> batteries and CO<sub>2</sub> electrolysis.

What are the types of electrocatalysts for post-Li M||S batteries?

Electrocatalysts for post-Li M||S batteries can generally be categorized into heterogeneous and homogeneous catalysts. Heterogeneous catalysts typically manifest a solid state within S electrode and comprise metals, metal compounds, as well as emerging inorganic and organic complexes.

What happens if a battery is combined with a S electrode?

Coupling these materials with S electrodes delivers high theoretical specific energy, such as 1682 Wh kg<sup>-1</sup> for Mg||S batteries and 1802 Wh kg<sup>-1</sup> for Ca||S batteries at room temperature [3,4]. In Na/K||S batteries, the shuttle effect leads to low sulfur-based electrode utilization and inadequate cell Coulombic efficiency (CE).

Can metal nitrides be used as electrocatalysts in Li-S batteries?

In this context, some metal nitrides, such as vanadium nitride (VN), cobalt nitride (Co<sub>4</sub>N), and molybdenum nitride (Mo<sub>2</sub>N), have been employed as electrocatalysts in Li-S batteries. In this part, we will review the progress made on the catalytic effect of metal nitrides in Li-S batteries.

How does catalytic effect affect Li-S battery performance?

The catalytic effect has been proved to play an important role in mitigating LiPS shuttling. Through searching for more highly efficient catalysts, the performance of Li-S batteries is expected to be further improved.

storage batteries that is dictating our daily lives. Almost every portable device or sensor we use comes with a battery! Electrocatalysis has taken center stage to develop new technologies for reducing the carbon footprint. One such industrial-scale effort is the introduction of large-scale electrolyzer stacks employed for hydrogen generation ...

Li-S batteries have attracted considerable attention because of their high energy density; however, the poor electrochemical reaction kinetics of sulfur and polysulfides limit their high-power output. Besides, the capacity fade caused ...

Heterogeneous electrocatalysis is one of the most promising ways to advance the development of metal-CO<sub>2</sub> batteries and CO<sub>2</sub> electrolysis technologies. Although both research areas rely upon efficient electrochemical ...

Bifunctional electrocatalysts used for oxygen reduction and evolution reactions (ORR/OER) are of great significance for metal-air batteries. Metal-organic frameworks (MOFs), after undergoing a high-temperature calcination process, emerge as promising precursors for preparing efficient metal-nitrogen-carbon (

In addition, as a new idea, the electrocatalysis of Li-S batteries has been proposed and realized. Various metal compounds, heterostructures and single atoms have been used in heterogeneous electrocatalysis of Li-S batteries, and various homogeneous catalysts that can be dissolved in electrolytes have been developed.

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While searching for new nanoelectrocatalysts with outstanding performance, researchers often disregard the complexity and true usability of such materials. ... Looking at the two fields-electrocatalysis and batteries-one may notice that the battery community has a principal focus on the applied research and engineering, with clear goals and ...

Even in electrochemical energy storage in batteries, electrocatalytic processes occur, in particular in metal-air batteries. <sup>3</sup> Hence electrocatalytic processes are of an immense technological relevance in the context of our future sustainable energy technology. <sup>4</sup> However, in spite of their relevance, our knowledge about the fundamental atomistic mechanisms underlying ...

In electrocatalysis, self-supported catalysts (CoNi organic frameworks@Fe foam for OER and MoP/Co<sub>2</sub> ...

This review is anticipated to shed some new light on in-depth understanding cathodic electrocatalysis and exploiting prominent electrocatalysts. Graphical abstract This review summarizes in-situ electrocatalyst reconstruction in electrocatalytic H<sub>2</sub> evolution, and CO<sub>2</sub> and N<sub>2</sub> reduction, focusing on the correlations between reconfigured surface and performance.

Electrochemical carbon dioxide (CO<sub>2</sub>) conversion technologies have become new favorites for addressing environmental and energy issues, especially with direct electrocatalytic reduction of CO<sub>2</sub> (ECO<sub>2</sub> RR) and alkali metal-CO<sub>2</sub> ...

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