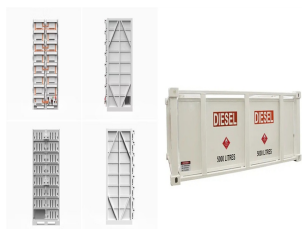
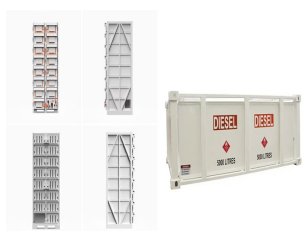


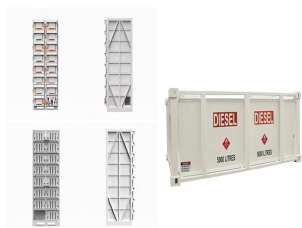
# ENERGY STORAGE ALLOY MATERIALS



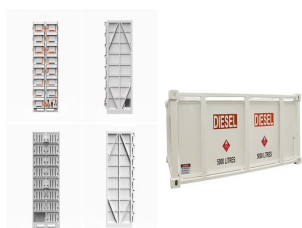
What is energy storage materials? Energy Storage Materials is an international multidisciplinary journal for communicating scientific and technological advances in the field of materials and their devices for advanced energy storage and relevant energy conversion (such as in metal-O<sub>2</sub> battery). It publishes comprehensive research ???Manasa Pantrangi, Zhiming Wang



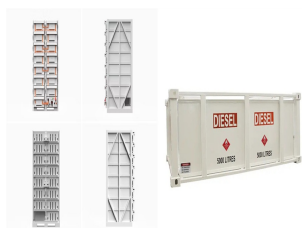
Why are advanced materials important for energy storage devices? Advanced materials play a critical role in enhancing the capacity and extending the cycle life of energy storage devices. High-entropy materials (HEMs) with controlled compositions and simple phase structures have attracted the interest of researchers and have undergone rapid development recently.



Which ionic materials can be used for energy storage? In this Perspective, we argue that HEMs have tremendous potential in fields such as energy storage, energy conversion and electronics (Table 1). We focus on promising ionic materials, including oxides, sulfides, carbides, nitrides, fluorides and metal???organic frameworks (MOFs).



What are high entropy materials? The emergence of high-entropy materials (HEMs) with their excellent mechanical properties, stability at high temperatures, and high chemical stability is poised to yield new advancement in the performance of energy storage and conversion technologies.

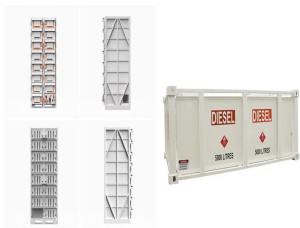


Why is electrochemical energy storage important? Improving electrochemical energy storage is crucial to the global transition to a greener and more sustainable future. In particular, the growing demand for next-generation batteries with superior energy and power densities and alternative mobile charge carriers (such as Na<sup>+</sup>) has stimulated research into substitute materials.

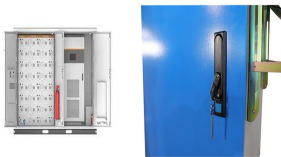
# ENERGY STORAGE ALLOY MATERIALS



What are high entropy alloys? The properties exhibited by high-entropy alloys (HEAs) have led researchers to modify non-metallic elements with ???high entropy???, resulting in a series of HEMs. In 2015, Rost et al. prepared the first entropy-stabilized crystals of  $(\text{MgCoNiCuZn})\text{O}$  and defined them as ???entropy-stabilized oxides???.



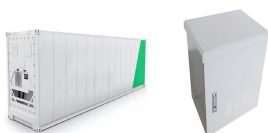
1 Introduction. Entropy is a thermodynamic parameter which represents the degree of randomness, uncertainty or disorder in a material. 1, 2 The role entropy plays in the phase stability of compounds can be understood in terms of the Gibbs free energy of mixing ( $\Delta G_{\text{mix}}$ ),  $\Delta G_{\text{mix}} = \Delta H_{\text{mix}} - T\Delta S_{\text{mix}}$ , where  $\Delta H_{\text{mix}}$  is the mixing enthalpy,  $\Delta S_{\text{mix}}$  is the mixing ???



Hydrogen is the energy carrier with the highest energy density and is critical to the development of renewable energy. Efficient hydrogen storage is essential to realize the transition to renewable energy sources. Electrochemical hydrogen storage technology has a promising application due to its mild hydrogen storage conditions. However, research on the ???



Metal hydrides (MH) are known as one of the most suitable material groups for hydrogen energy storage because of their large hydrogen storage capacity, low operating pressure, and high safety.



Phase change material (PCM)-based thermal energy storage significantly affects emerging applications, with recent advancements in enhancing heat capacity and cooling power. This perspective by Yang et al. discusses PCM thermal energy storage progress, outlines research challenges and new opportunities, and proposes a roadmap for the research community from ???

# ENERGY STORAGE ALLOY MATERIALS



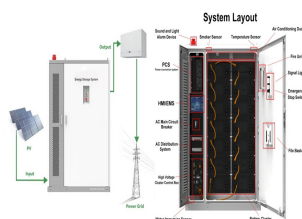
1 INTRODUCTION. Hydrogen is a clean, high-energy density, and renewable energy source that is expected to help mankind move away from fossil energy. 1-4 At present, widely-used hydrogen storage technologies include compressed gaseous hydrogen in tanks and liquid hydrogen. But these physical solutions are not ideal for onboard applications. 3-5 The high-pressure tanks at ???



The thermal analysis results demonstrate that the Al-Si alloy particles prepared in this study have high melting latent heat (approximately 500.87 J/g) and solidification latent heat (approximately 467.26 J/g), showcasing their potential as high-efficiency phase change materials for high-temperature thermal energy storage.



This study focuses on the preparation of a Mg 2 Ni hydrogen storage alloy through high-energy ball milling, further enhanced by composite graphene and multi-walled carbon nanotubes (MWCNTs) modification. It is evident that high-energy ball milling successfully incorporates graphene and MWCNTs onto the surface of Mg 2 Ni particles. This process not ???



All these factors combine to make alloy anodes an intriguing topic with potential for LIB advancement. To add to this, there is also a concept in the field of alloy anodes known as alloy negative materials. They are simply metals with high purity or multi-component alloys which possess a significant storage capacity for lithium ions.



High entropy alloys (HEAs) have attracted substantial attention in diverse fields, including hydrogen storage, owing to their unique structural and functional properties. The diverse components of HEAs have made them a focal point in research, aiming to develop new hydrogen storage materials with exceptional comprehensive properties.

# ENERGY STORAGE ALLOY MATERIALS



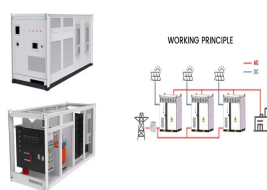
Although the large latent heat of pure PCMs enables the storage of thermal energy, the cooling capacity and storage efficiency are limited by the relatively low thermal conductivity ( $\approx 1/4 \text{ W/(m K)}$ ) when compared to metals ( $\approx 1/4 \text{ } 100 \text{ W/(m K)}$ ). 8, 9 To achieve both high energy density and cooling capacity, PCMs having both high latent heat and high thermal conductivity are required.



This review covers the recent developments in catalysis, water splitting, fuel cells, batteries, supercapacitors, and hydrogen storage enabled by HEMs covering metallic, oxide, and non-metallic materials.



In this paper,  $\text{Mg}_2\text{Ni}$  hydrogen storage alloy powder was prepared by high-energy ball milling mechanical alloying method, and the influence of stirring shaft rotation speed, ball milling time, and



Rare-earth-metal-based materials have emerged as frontrunners in the quest for high-performance hydrogen storage solutions, offering a paradigm shift in clean energy technologies. This comprehensive review delves into the cutting-edge advancements, challenges, and future prospects of these materials, providing a roadmap for their development and commercialization.



The addition of rare earth elements lanthanum and samarium to  $\text{Mg}_{99}\text{Ni}$ -type alloys enhanced the hydrogen absorption and desorption kinetics. The microstructures of these alloys were characterized by using XRD, SEM, TEM, HTREM, and SAED methods. PCT equipment was employed to test the hydrogen storage performance. It was observed that the addition of rare earth elements significantly improved the hydrogen storage capacity and kinetics of the alloys.

# ENERGY STORAGE ALLOY MATERIALS



Scandium is also a vital component for fabricating high-strength alloys [21]. Ceria is a star material in catalysis which is of great significance in industrial catalysis as well as fuel cells and Potential use of RE element in electrode material for energy storage: (a), (b) concept of using ultrathin RE nanowires for alkali metal anode



Read the latest articles of Energy Storage Materials at ScienceDirect , Elsevier's leading platform of peer-reviewed scholarly literature. Skip to main content. ADVERTISEMENT Nano high-entropy alloy with strong affinity driving fast polysulfide conversion towards stable lithium sulfur batteries. Hongfei Xu, Riming Hu, Yongzheng Zhang



Advanced materials play a critical role in enhancing the capacity and extending the cycle life of energy storage devices. High-entropy materials (HEMs) with controlled compositions and simple phase structures have attracted the interest of researchers and have undergone rapid development recently.



High-entropy alloys (HEAs), also known as "multi-principal element alloys", expand the library of advanced materials and demonstrate potential applications in energy storage and catalysis because they possess unique crystallographic and electronic structures, high mechanical properties, and special physical characteristics.



Read the latest articles of Energy Storage Materials at ScienceDirect , Elsevier's leading platform of peer-reviewed scholarly literature. Skip to main content. ADVERTISEMENT Insights into dendrite suppression by alloys and the fabrication of a flexible alloy-polymer protected lithium metal anode. Rui Wang, Jin Yu, Juntao Tang, Ruijin



For electrode materials, especially composed of late transition metals such as Mn, Co, and Ni, which are well-known in common secondary battery materials like  $\text{LiCoO}_2$  (LCO) or  $\text{Li}(\text{NiCoMn})\text{O}_2$ , are reasonable choices for the design of high-entropy active materials for electrochemical

# ENERGY STORAGE ALLOY MATERIALS

---

energy storage applications. Both the "trial and error" and

# ENERGY STORAGE ALLOY MATERIALS

---



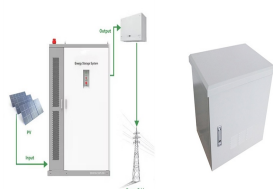
The aim of this Special Issue entitled "Advanced Energy Storage Materials: Preparation, Characterization, and Applications" is to present recent advancements in various aspects related to materials and processes contributing to the creation of sustainable energy storage systems and environmental solutions, particularly applicable to clean



As a kind of new materials, high-entropy alloys (HEAs) avoid the traditional "base element" concept and display a variety of interesting and unusual properties. HEAs have been considered promising electrode materials for energy storage and conversion technologies due to their excellent mechanical, chemical, and physical properties.



Energy storage material discovery and performance prediction aided by AI has grown rapidly in recent years as materials scientists combine domain knowledge with intuitive human guidance, allowing for much faster and significantly more cost-effective materials research. And Yao et al. screened calcium metal alloy anode materials suitable for



Energy Storage Materials is an international multidisciplinary journal for communicating scientific and technological advances in the field of materials and their devices for advanced energy storage and relevant energy conversion (such as in metal-O<sub>2</sub> battery). It publishes comprehensive research articles including full papers and short communications, as well as topical feature ???



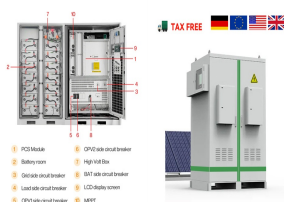
Energy Storage Materials is an international multidisciplinary journal for communicating scientific and technological advances in the field of materials and their devices for advanced energy ???



# ENERGY STORAGE ALLOY MATERIALS



Bismuth (Bi) has been prompted many investigations into the development of next-generation energy storage systems on account of its unique physicochemical properties. Although there are still some challenges, the application of metallic Bi-based materials in the field of energy storage still has good prospects. Herein, we systematically review the application ???



Read the latest articles of Energy Storage Materials at ScienceDirect , Elsevier's leading platform of peer-reviewed scholarly literature. Skip to main content. ADVERTISEMENT. Journals & Books Rationally designed alloy phases for highly reversible alkali metal batteries. Junxiong Wu, Xiaochuan Chen, Wei Fan, Xiaoyan Li, Yuming Chen



Abstract Among metal-based phase change materials (PCMs), Al and its alloys have garnered significant attention due to their high latent heat and high thermal conductivity. Additionally, the applications of Al and its alloy PCMs in solar thermal energy storage, catalysis, and electric vehicles are reviewed. Finally, current challenges



However, the high-cost hydride-storage metal alloys make Ni???MH systems expensive. Some elements of hydride-storage materials are less abundant in nature. are required to harness the high energy density and the high elemental abundancy of these two interesting anode materials for real energy-storage applications.



Energy Technology is an applied energy journal covering technical aspects of energy process engineering, including generation, conversion, storage, & distribution. High entropy alloys (HEAs) have attracted substantial attention in diverse fields, including hydrogen storage, owing to their unique structural and functional properties.