

Herein, instead of preparing nanoparticles, we report a new approach for creating high-capacity sub-micrometer core-shell structure nanocrystal-FeSi-embedded Si/SiO_x (FSO) anode materials according to phase diagram, using the abundant and inexpensive metallurgical Fe-Si alloy as Si/SiO_x source. The SiO_x shell for the buffer layer is obtained by the oxidation ...

Khare et al. (2012) [26] used a materials selection procedure and found that metals such as Al, Mg, Si and Zn, and their eutectics 88Al-12Si and 60Al-34Mg-6Zn were highly suitable as a PCM for the duty considered in their research (steam generation from 400 to 750 °C). Their properties, heat of fusion, thermal conductivity, etc. have advantages in the ...

Thermal energy storage using phase change materials (PCMs) has been world-widely accepted as an effective technology for energy saving. In this study, Micro-Encapsulated PCMs (MEPCMs) were developed from Al-Si alloys, in which four kinds of Al-Si microspheres with different Al-Si compositions: Al-12%Si, Al-17%Si, Al-20%Si, and Al-30%Si (mass%) were ...

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 (ΔG_{mix}), $\Delta G_{mix} = \Delta H_{mix} - T\Delta S_{mix}$, where ΔH_{mix} is the mixing enthalpy, ΔS_{mix} is the mixing ...

Fig. 1 describes the overall synthesis method for the PFe-Si@NCNS composite. Typically, our strategy for the PFe-Si part is that the bulk Fe-Si alloy (SEM, as shown in Fig. S1 in the Supporting Information) is transformed into nanoscale Fe-Si by ball milling and then etched in a 1 M HF solution to obtain the nano/porous Fe-Si material. Thereafter, the outer surface of ...

The corrosion tests revealed that Al₂O₃, AlN, and Si₃N₄ showed high corrosion resistance to molten Al-Si alloys; therefore, these ceramics were suitable as structural materials for a latent heat storage (LHS) system using Al-Si alloys. These results demonstrate the feasibility of high-temperature LHS systems using Al-Si alloys as ...

1.2 Mg alloys with p-elements (X = Al, Si, Ge, Sn) 1.2.1 Silicon. Silicon has a very low solubility in magnesium of 0.003 %. When MgH₂ mixed with Si is heated until the hydrogen is released, it forms the intermetallic Mg₂Si [1]. While the reaction is reversible in a ball-mill environment with hydrogen [14-16], application of pressures of hydrogen to Mg₂Si up to ...

In this study, four binary Al-Si materials with different Al and Si ratios and two ternary materials with Fe or Ni added were studied as medium to high temperature PCMs for thermal energy storage applications. The

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results indicated that these Al and Si based materials are potentially good candidates for TES applications.

Among current hydrogen storage systems, solid-state hydrogen storage systems based on metal/alloy hydrides have advantages with respect to their high volumetric hydrogen storage capacity and safety [40]. The volumetric capacity of compressed hydrogen and liquid hydrogen is 40 g/L (at 70 MPa) and 71 g/L, respectively [41, 42]. For complex hydrides, ...

The datasets of the enthalpy of mixing [53,54,55], the activities of Si [38,56], and Fe together with the optimised data of the excess Gibbs free energy of mixing of liquid Fe-Si alloys and the Gibbs free energy of mixing [37,39], all obtained at $T = 1823$ K or close to this temperature, have been used as input data in the CFM to calculate the ...

Silicon (Si) is widely considered to be the most attractive candidate anode material for use in next-generation high-energy-density lithium (Li)-ion batteries (LIBs) because it has a high theoretical gravimetric Li storage capacity, relatively low lithiation voltage, and abundant resources. Consequently, massive efforts have been exerted to improve its ...

Fe-26Si-9B alloy was selected as a potential phase change material (PCM) to store energy at temperatures up to $1300\text{ }^{\circ}\text{C}$. A suitable refractory material is crucial to building a PCM container for Fe-26Si-9B alloy in thermal energy storage systems. The refractory material should have the ability to withstand corrosion from liquid Fe-26Si-9B alloy and should not ...

The authors also pointed out that thermodynamic calculation is valuable in seeking new potential solar energy thermal storage materials for solar thermal power generation systems. Gokon et al. [103] studied the eutectic and hypereutectic compositions of the Fe-Ge alloys as a promised candidate for the next generation of solar thermal ...

Silicon (Si)-based anode materials can increase the energy density of lithium (Li)-ion batteries owing to the high weight and volume capacity of Si. However, their electrochemical properties rapidly deteriorate due to large volume changes in the electrode resulting from repeated charging and discharging. In this study, we manufactured structurally stable Fe-Si ...

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.

New miscibility gap alloys with a ceramic matrix have been explored in the ZrO_2 -Al, AlN-Al, AlN-(Al-Si), Al_2O_3 -Al and MgO-Al systems with a view to creating oxidation-resistant macroscopically solid, phase change-enhanced, thermal energy storage materials. Materials were manufactured by mixing the components, pressing and firing at $700\text{ }^{\circ}\text{C}$ under ...

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Compared with Li, Mg-based materials show great potential as new energy sources, meanwhile, exhibiting higher mechanical strength than aluminum (Al) alloys and steel [16], [17], [18]. They are known for their efficiency and safety in H₂ production and storage, as well as their environmental-friendly nature and high energy density. Mg resources are abundant in nature and its H₂ ...

Development of advanced materials for high-performance energy storage devices, including lithium-ion batteries, sodium-ion batteries, lithium-sulfur batteries, and aqueous rechargeable batteries; ... we optimized the composition of a Si-Ti-Al ternary alloy to achieve excellent electrochemical performance in terms of capacity, cyclability ...

The in situ alloying formation route involved using Al and Si powders as raw materials and forming the target Al-Si alloys during the high-temperature sintering which also consolidated the external alumina shell. ... Shape-remodeled macrocapsule of phase change materials for thermal energy storage and thermal management. Appl. Energy, 247 (2019)

SAM provides the highest quality Ferro Silicon (FeSi) Alloy at competitive prices. ... & Pharmacy Pharmaceutical Industry Aerospace Agriculture Automotive Chemical Manufacturing Defense Dentistry Electronics Energy Storage & Batteries Fuel Cells Investment Grade Metals Jewelry & Fashion Lighting ... WM0125 Tungsten Nickel Iron Alloy (W-Ni-Fe ...

Energy Storage is a new journal for innovative energy storage research, ... Enhanced energy density of high entropy alloy (Fe-Co-Ni-Cu-Mn) and green graphene hybrid supercapacitor ... for the silica-combined graphene nanocomposite along with peaks that mimic the potential presence of crystalline Si and materials based on graphene. 47 In case of ...

Phase change materials (PCMs), which are a specialized class of energy-saving materials absorbing or releasing huge latent heat across reversible phase transition upon thermal action, have attracted prominent attention and have been widely investigated owing to their unique feature of high energy storage/release capacity within a narrow temperature range ...

The accumulated energy storage in Fe-6.5 wt% Si alloy prepared by SLM is low, so it is difficult to promote the grain growth behavior during annealing at 1000 °C. ... properties of the Fe-6.5 wt% Si alloy annealed at 1100 °C for 1 h in this work and some other soft magnetic materials. Compared to the Fe-3.0 wt% Si alloy, Fe-Ni alloy, and Fe ...

Si is being intensively developed as a safe and high-performance anode for next-generation Li-ion batteries (LIBs); however, its battery application still remains challenging because of its low cycling Coulombic efficiency. To address this issue, we chose a conjugated polymer, polynaphthalene, as a carbon precursor and a low-cost commercial ferrosilicon ...

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