

Can steel slag be used as a heat storage medium?

Using steel slag to prepare high-temperature ($>500\text{ }^{\circ}\text{C}$) PCMs was an effective way to achieve its high value-added utilization as a potential heat storage medium in a variety of applications, such as solar energy storage, power peak shaving, and industrial waste heat recovery.

Why is steel slag important?

Steel slag meets the high thermal stability of matrix materials and has a low cost. Suppose steel slag is used as the carrier of phase change materials. In that case, it is of great significance to improve the utilization rate of resources, protect the environment and reduce the preparation cost of heat storage materials.

Does modified steel slag improve thermal conductivity of pure NaCl-KCl salt?

Therefore, the modified steel slag could greatly improve the thermal conductivity of pure NaCl-KCl salt, which was greatly beneficial to shortening the heat charging and discharging process in their practical applications.

Fig. 9. Thermal conductivity of M-3/salt and M-5/salt C-PCMs. 3.2.3. Thermal cycling stability

Is steel slag a potential matrix material?

Moreover, steel slag also uses its porous surface structure to prepare adsorbents to remove phosphate, sulfate, or heavy metals in an aqueous solution. Therefore, steel slag is a potential matrix material. At present, the coverage of C-PCMs phase transition point is very narrow.

Does steel slag have a good chemical compatibility with salts?

The results indicated that steel slag had a good chemical compatibility with the above two salts. Additionally, the skeleton material of steel slag helped to reduce the sub-cooling of NaNO_3 and Na_2SO_4 by $4.53\text{ }^{\circ}\text{C}$ and $0.79\text{ }^{\circ}\text{C}$, respectively, and improve their thermal conductivity by 54.9 % and 82.4 %, respectively.

What is CFA modification in steel slag?

CFA modification ($1100\text{ }^{\circ}\text{C}$) could help to transform the amorphous phase, lime, and wustite in steel slag into the stable phase of gehlenite, anorthite, magnetite, thus greatly improving the chemical compatibility between steel slag and eutectic salt. Steel slag modified with 30 wt% CFA was proved to be the optimum skeleton material.

The concept of mineral carbonation for reducing CO_2 emissions was first proposed by Seifritz in 1990 [12]. Mineral carbonation is considered as a promising large-scale CO_2 storage application technology [13]. As a raw material for mineral carbonation, steel slag has advantages such as proximity to CO_2 emission sources, significant cost savings in ...

There are several works reported on thermal cycling resistance of slag as energy storage material. [2] Allen ... Valorisation of electric arc furnace steel slag as raw material for low energy belite cements. J. Hazard. Mater., 196 (2011), pp. 287-294. View PDF View article View in Scopus Google Scholar

Phase change thermal storage composite synthesized by impregnating steel-slag-derived porous ceramics with the molten solar salts. Author links open overlay panel Wen-jie Liu a, Shi-dong Zhang a, Liu Yang b, Bao-rang Li a. Show more. ... Thermal stability is an important parameter for thermal energy storage materials. A higher thermal stability ...

This paper proposes using steel slag as a sensible heat storage material and experimentally studies the sinter bed's airflow resistance and energy storage characteristic. The main conclusions are as follows: 1. Steel slag, a by-product of the steel industry, is characterized by its low cost, high density, and high-temperature resistance.

1 Introduction. The basic oxygen steelmaking (BOS) process produced over 70% of the global crude steel in 2018, [] generating 100 to 150 kg of slag ("BOS slag") for every tonne of crude steel produced. BOS slag, a product of hot metal element (e.g., Si, Mn, Fe, P) oxidation and flux (e.g., lime, dolomite) dissolution, plays a critical role in the production of high-quality crude steel.

When the heat storage material rises to 900 °C, the heat storage density can reach 905 J/g, with good heat storage performance and thermal cycle stability. The objective is to develop sustainable and low-cost thermal energy storage material for industry waste heat recovery and in renewable energy applications.

This paper details the development process of ceramics made out of 100% electric arc furnace (EAF) steel slag, to be used as a shaped homogenous thermal energy storage (TES) media in packed-bed thermocline systems for high-temperatures industrial waste heat recovery, concentrated solar power (CSP), and Carnot batteries applications, among others.

Real-environment experiments conducted in a testing chamber over 5 days demonstrated that the energy-storage gypsum-based material effectively reduced the indoor temperature difference by 2-3 °C. Xiong et al. [23] prepared shape-stabilized PCM using steel slag/calcium carbide slag/nano-potassium nitrate. They found that the optimal content ...

Development of thermal storage material from recycled solid waste resources can further enhance the economic and environmental benefits of thermal energy storage system. Thermal properties of steel slag as sensible heat storage material are examined and further enhanced by Na₂CO₃ activation. The steel slag remains stable until 1200 °C in TG ...

The aim of this study is to investigate the utilization possibilities of steel slags, basic oxygen furnace (BOF) and electric arc furnace (EAF) slags, as backfill material in coastal structures.

As widely used in building materials, blast furnace slag (BFS) has the potential to prepare composite phase change materials (C-PCMs), which can be applied in thermal energy storage field.

The authors investigated the potential of utilizing recycled solid waste resources, specifically steel slag, as a sensible heat storage material for thermal energy storage. Moreover, it introduces a ...

DOI: 10.1016/j.nbuildmat.2019.117717 Corpus ID: 212817974; Preparation of low-temperature composite phase change materials (C-PCMs) from modified blast furnace slag (MBFS) @article{Zhang2020PreparationOL, title={Preparation of low-temperature composite phase change materials (C-PCMs) from modified blast furnace slag (MBFS)}, author={Yuanbo Zhang ...

DOI: 10.1016/j.jclepro.2023.136289 Corpus ID: 256686161; Exploration of steel slag for thermal energy storage and enhancement by Na₂CO₃ modification @article{Wang2023ExplorationOS, title={Exploration of steel slag for thermal energy storage and enhancement by Na₂CO₃ modification}, author={Junlei Wang and Yun Huang}, journal={Journal of Cleaner Production}, ...

DOI: 10.1016/j.est.2022.106309 Corpus ID: 254429316; Preparation and characterization of steel slag-based low, medium, and high-temperature composite phase change energy storage materials

Study on CaO-based materials derived from steel slag for solar-driven thermochemical energy storage. ... The energy storage density for 30 cycles was reduced by 10.26 % for the pellets compared to the powder material, but the average light absorption rate was improved. ... Modified Ca-Looping materials for directly capturing solar energy and ...

Semantic Scholar extracted view of "Phase change thermal storage composite synthesized by impregnating steel-slag-derived porous ceramics with the molten solar salts" by Wen-jie Liu et al. ... Published in Journal of Energy Storage 1 July 2024; Materials Science, Environmental Science, Engineering ... More Filters. More Filters. Filters. Novel ...

For recycling steel slag and carbide slag, improving the efficiency of solar energy utilization, and reducing the thermal energy storage system costs, this work innovatively proposes the mixture of steel slag and carbide slag as skeleton material and NaNO₃ as phase change material to prepare the shape-stable phase change materials and the ...

A form-stable solar salt/steel slag composite phase change material (PCM) was developed in this work for solving the problems of leakage, poor heat transfer performance and ...

DOI: 10.1002/ceat.202000173 Corpus ID: 225374818; Thermochemical Energy Storage Performances of Steel Slag-Derived CaO-Based Composites @article{Bai2020ThermochemicalES, title={Thermochemical Energy Storage Performances of Steel Slag-Derived CaO-Based Composites}, author={Shengbin Bai and Yue

Zhou and Yuning ...

@article{LopezFerber2022DevelopmentOA, title={Development of an electric arc furnace steel slag-based ceramic material for high temperature thermal energy storage applications}, author={Nicolas Lopez Ferber and Kholoud M. Al Naimi and J.-F. Hoffmann and Khalid Al-Ali and Nicolas Calvet}, journal={Journal of Energy Storage}, year={2022}, url ...

Effect of carbon capture on carbide slag-steel slag shape-stable phase change materials for thermal energy storage. 2024, Renewable Energy. Show abstract. ... Steel slag modified with 30 wt% CFA at 1100 °C was identified as the optimum skeleton. The prepared C-PCMs containing 50 wt% salt showed a phase transition temperature of 653 °C with a ...

In 2019, the world's crude steel production was 2.196 billion tons [].According to the main smelting process, steel slag can be divided into basic oxygen furnace (BOF) slag (also known as converter slag) and electric furnace (EAF) slag [].The molten steel slag produced from the steelmaking furnace goes through different means of processing, such as hot steel slag ...

For resource utilization of industrial solid waste, a 1:1 mixture of carbide slag-steel slag was innovatively selected as the carbon sequestration material for CO₂ sequestration in this work, and the carbon sequestered carbide slag-steel slag material was used as skeleton material to make carbon sequestered carbide slag-steel slag/NaNO₃ phase change composites.

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