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A REVIEW ON THE RECYCLING AND UTILIZATION OF NON-FERROUS METAL SMELTING WASTE RESIDUES

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Abstract: Rising energy costs and environmental constraints have forced researchers to focus on the reuse of large amounts of industrial by-products, such as smelting waste residues. In this regard, the purpose of this review study is to provide an overview and collective approach to the various uses of non-ferrous metal smelting waste residues in different applications and fields, with a view to providing an overview of the current Attempts to optimize or improve their use and new trends in potential uses of these waste materials provide insights.
Keywords: Smelting waste residue; Steel slag; Reuse; New trend

1 WASTE RESIDUE

As a product of the non-ferrous metal smelting production process, large amounts of slag and other By-products are produced [1]. Solid waste storage restrictions and other environmental issues Making the recycling of this waste a very important topic in protecting natural resources. In addition to these environmental problems, in recent decades, industrial waste has The purpose of utilization is to save energy and cost, and to recycle them into suitable by-products used.

Considering global steel production, waste slag is used as a value-added by-product or additional The need to utilize the energy output is not only a requirement of environmental issues, but also an industrial opportunities for cost savings in industrial applications. These applications include use in road construction as Filling material, used as additive in cement production and as iron in glass production Road ballast and used as an additive in the production of insulation wool.

Non-ferrous metal slag is mainly composed of SiO_2, Al_2O_3, CaO, MgO, $MgAl_2O_4$ It is composed of ceramic-based compounds. Compared with metal materials, the thermal conductivity of waste slag The number is significantly lower, so this oxide content makes blast furnace slag a candidate for thermal insulation. Choose materials. In recent years, these characteristics of slag have attracted the attention of researchers. Surface engineering technology is deposited or applied on the target surface to make it resistant to oxidation, corrosion, and thermal cycling. The application under harsh conditions such as environmental protection paves the way for its application in value-added applications. the way. This article proposes the current application of slag in waste heat recovery, cement production and other value-added Comprehensive utilization methods in various applications such as surface engineering, as well as possible and current applications of slag in value-added applications such as surface engineering.

Generally speaking, slag is a waste material from the smelting process and consists of a mixture of metal oxides, SiO_2, metal sulfides, and elemental metals that oxidize ions, SiO_2, metal sulfides and elemental metals accumulate in impure molten metal surface. Raw metals are often called ores because, in nature, they in the form of oxides, sulfides, and other compounds, or these gold A mixture of metallic compounds and non-metallic compounds. minerals in the form of chemical compounds The reduction of stone into pure metal form requires the addition of flux materials, which combine with impurities. combined to form and remove slag from molten metal. For this purpose, flux materials such as dolomite and quicklime (calcium oxide) are often used. accumulated during the ore melting process The layer of slag that accumulates on hot molten metal is removed from the surface and cooled by various Method solidification.

2 UTILIZATION OF SLAG

The recycling of industrial waste residues as industrial by-products depends to a large extent on On the properties of slag and the heat treatment of molten metals. In a furnace, from metal ore Remove gangue and non-metallic impurities to produce pig iron and slag as final products Taste.

Metal and slag collect in molten form in the center of the blast furnace, and then the slag Diffuses to the surface of the molten metal due to its lower density than the metal. The high viscosity of slag is The low temperature zone of the furnace reaches even higher values, which require additional processes to Remove from furnace [2].

When removed from the furnace, the slag is still in a high-temperature molten state. Cool and solidify The operation of melting slag for storage is effective for the composition of the slag.

2.1 Utilization of Waste Heat Recovery Slag

Molten industrial waste is one of the largest sources of energy in the production of non-ferrous metals. This offers significant potential for minimizing the energy required for metal production. However, This wasted energy is not typically used for heat recovery as smelters typically tend to The slag is rapidly quenched to obtain a glass-like structure used in cement production. Although Various methods have been developed to recover different forms of slag waste heat, but due to the thermal conductivity of slag The coefficient is small, which is a considerable challenge, except in cement production and other additional Except for applications where higher values are more desirable, most of these methods The processing process has not yet been commercialized [3].

2.2 Utilization of construction debris

The cement industry consumes a large amount of raw materials and energy and emits a large amount of greenhouse gases. body (such as carbon dioxide) And subject to serious environmental impacts, these greenhouse gases are Produced during clinker production and energy consumption. Rising energy costs and environmental constraints make it necessary to reduce emissions of industrial pollutants through the use of industrial by-products [4]. After rapid cooling by water quenching, the glassy and granular slag-like slag, making a by-product of steel production a potentially hydraulically active Porter Excellent alternative material for blue cement production [5]. However, it has been reported that water quenching in addition to In addition to releasing hazardous wastes such as hydrogen sulfide, heavy metals and sulfur dioxide, there are also Major disadvantages, such as inefficient waste heat recovery. These environmental factors make it necessary Development of new methods of handling slag, such as dry granulation, in addition to limiting vulcanization In addition to the discharge of harmful substances such as pollutants, the dry granulation method has higher waste emissions than the water quenching method. Heat recovery rate. The results show that dry granulated slag and water quenched slag have similar hydration properties able.

2.3 Utilization of slag in value-added applications and products

One of the latest trends in the utilization of industrial waste residues is as a green Source recycling in ceramic tile production. Especially electric arc furnace (EAF) slag The chemical composition makes this material an alternative source for ceramic tile production. according to Teo et al. people [6] newspaper road, by Al 2 O 3, CaO, MgO, Fe 3 O 4, FeO, SiO 2 The composition of electric furnace slag, which is mainly composed of oxides and other oxides, is similar to that of tile raw materials such as silica, feldspar and clay. The ingredients are very close. Due to misfire, flow button and phase analysis etc. Test, except that its composition is very similar to the appropriate raw materials for the production of ceramic tiles, the electric Arc furnace slag has also been reported as a harmless green raw material for ceramic tile production. Ground them in soil and limestone. The results show that the fire resistance strength increases by nearly 25%, thermal expansion system Number decreases. This method can be used as a means to reduce the use of expensive, high-quality minerals in ceramic production.

3 SUMMARIZE

This article reviews recent developments in the recycling and utilization of nonferrous metal smelting waste residues. Research progress. An overview of the slag production process and various characteristics of the slag are introduced and discussed. The scope of recycling of slag has been reduced. The main purpose is to propose a solution from waste heat recovery to high added value The application of waste residue mining has evolved, thus increasing people's unlimited ability to utilize this waste residue. Awareness of possibility.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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