

Research on Reinforced Non-ferrous Metal Materials Based on Composite Materials

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[Abstract] With the development of social economy, composite materials enhance the practical application of non-ferrous metal materials in production, meet the needs of current development, and better promote the development and progress of related industries. The application of composite reinforced non-ferrous materials is to add non-metallic reinforcing materials to non-ferrous materials, so that the properties of the original materials can be better changed to form a new composite material. This composite will have better performance than the original material and can meet deeper applications of non-ferrous materials. In this paper, the research on composite reinforced non-ferrous materials will focus on the analysis of the performance of non-ferrous materials. It is hoped that the research in this paper can provide some references and suggestions for the development of non-ferrous materials.

[Keywords] Composite materials; Non-ferrous materials; Performance analysis

1. Introduction

In terms of the development of non-ferrous metal materials, it has been widely used in aerospace, machinery manufacturing and transportation. With the development of social economy, the application of non-ferrous metal materials in related industries has become more and more extensive. Strengthening the performance of non-ferrous metal materials has certain positive significance for improving the progress of related industries. The development and progress of science and technology have laid a solid foundation for improving the performance of non-ferrous metal materials.

Further improving the performance of non-ferrous metal materials can better promote the development of machinery manufacturing and aerospace industry, and meet the actual needs of people for non-ferrous materials.

Therefore, research on improving the performance of non-ferrous materials and using composite materials to enhance their performance has become a hot topic in the development of non-ferrous metal materials. In this paper, the study of the properties of non-ferrous materials, it mainly analyzes the effect of composite materials formed by adding non-metallic reinforcing materials to non-metallic materials, and expounds the advantages of composite non-ferrous materials in related industries, in order to better promote the performance of non-ferrous materials.

2. Research on Reinforcement Effect of Composite Materials of Non-ferrous Metal Material SiC

In this paper, the enhancement of SiC, a non-ferrous metal material, mainly discusses the addition of non-metallic material ZA22 zinc-based alloy. The addition of ZA22 zinc-based alloy to SiC enhances its properties and provides better reinforcement.

2.1 Analysis of the Addition Amount and Addition Mode of SiC

Added ZA22 Zinc-based Alloy

SiC particles are domestic a-type grinding wheel abrasives, which have been widely used in the actual production process. The application of this non-ferrous metal material is mainly enhanced by adding ZA22 zinc-based alloy, so that SiC particles can be better applied to the grinding wheel abrasive. In the SiC reinforcement process, the amount of ZA22 zinc-based alloy should be 5%, 10%, 20% of the composite ingot. In the addition process, the alloy slurry formed by the ZA22 zinc-based alloy is evenly distributed in the alloy, and after the addition, the slurry is heated and cast to ensure that the strengthened SiC can have better performance. By adding ZA22 zinc-based alloy, SiC will form SiCp/ZA22 composite material, which has better performance for actual production and can better meet the actual needs of abrasive grinding.^[1]

2.2 SiC Enhancement Effect Analysis

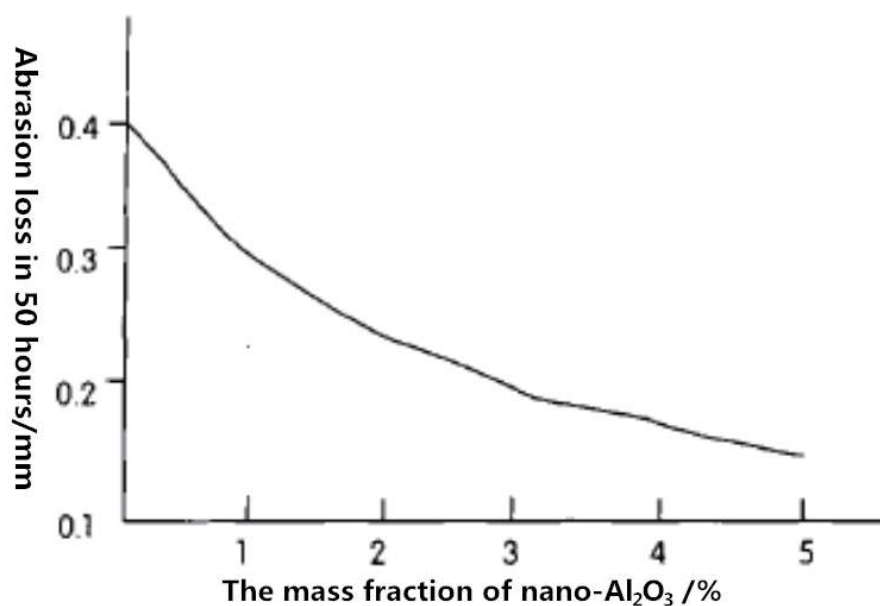
The SiC has more powerful properties after adding ZA22 zinc-based alloy, and its reinforcement properties are evenly distributed in the matrix, which allows the SiC particles to be better distributed in the composite and its strength is much higher than the tensile strength of the composite. According to relevant test data, the SiC composite with ZA22 zinc-based alloy has a tensile strength that is 47% higher than the original. At the same time, the compressive value of SiCp/ZA22 composite is 518, the compressive value of ZA22 zinc-based alloy is 352, the GPa of SiCp/ZA22 composite is 105E, and the GPa of ZA22 zinc-based alloy is 66E. In addition to the increased tensile strength of SiCp/ZA22 composites, their wear resistance has also been significantly improved. ZA22 Zinc-based alloy has a stronger wear-resisting performance after adding SiC, which can be better applied in actual production. The wear resistance test data for SiC shows that the quenching value of the grinding ring is GCr15, the wear test time is 40 minutes, and the forward pressure value is 392N. After the wear test, the composite material will change with the increase of the volume fraction of SiC. Compared with the wear data of ZA22 zinc-based alloy, the wear loss is only about half of that of ZA22 zinc-based alloy. It can be seen that the addition of non-ferrous metal materials to non-ferrous materials can better improve the material properties and form a reinforced composite material, which is more conducive to practical production applications.

3. Application Analysis of Nano- Al_2O_3 Reinforced Copper-Based Materials

Nano- Al_2O_3 reinforced copper-based materials have been widely used in mechanized production, and have improved hardness and flexural strength by improving the properties of nano- Al_2O_3 , which can well ensure that the performance of non-ferrous metal materials plays its due role in actual use, thus better promoting the development and progress of related industries in China.^[2]

3.1 Analysis of the Amount of Nano- Al_2O_3 Added and the Corresponding Way of Adding

Nano- Al_2O_3 mainly involves copper powder, nano-materials, graphite and other materials when selecting test materials. Among them, copper powder accounts for 70% of the test volume, nano-alumina is 1% to 5%, and the rest is graphite. During the actual test, the friction test was mainly carried out. The conditions of the friction test were as follows: Set the sliding speed of friction to $5 \times 10^{-3} \text{ m/s}$ and the load value is 5000N. In the actual test process, pay attention to the wear stability value. When the friction coefficient and the wear rate of the wear stability value are consistent, the bending strength test of the nano-alumina-reinforced copper-based material is carried out, and the test is performed on a 5000 N tensile tester. The experiment of nano-alumina reinforced copper-based materials is mainly to test the degree of wear on the tensile testing machine, compare the wear capacity of the composite material with a single material and the corresponding hardness and bending strength values.^[3] The wear value of the nanometer aluminum oxide mass fraction can be seen from the figure:



The Relationship between Abrasion Loss and the Mass Fraction of Nano- Al_2O_3

By comparing the relationship between the wear value and the mass fraction of nano-aluminum oxide, it is not difficult to see that under the load of 5000N, the nano-alumina-enhanced copper-based material has less wear and its performance is superior.

3.2 Analysis of Enhanced Properties of Nano-Al₂O₃

As for the analysis of the enhancement properties of nano-alumina, we can see from the above experiments that nano-aluminum silicate-reinforced copper-based materials have better hardness and flexural strength than conventional nano-alumina. During the test, when the volume fraction of nano-aluminum oxychloride is less than 4%, the strength of the nano-alumina-enhanced copper-based material increases with the increase of the mass fraction of nano-alumina; when the volume fraction of nano-aluminum oxychloride is less than 4%, the flexural strength of the copper-based composite material is also enhanced.

4. Research on the reinforcement properties of aluminum alloy composites

Aluminum alloy is no stranger to this composite material. In practical applications, aluminum alloy has a wider range of applications. With the development of social economy, the requirements for aluminum alloy materials have also increased, and the improvement of the overall performance of aluminum alloy composites is of great significance for promoting the development of related industries.

In the actual application process, the tensile strength of aluminum alloy materials has obvious changes under different temperature conditions. In order to better apply aluminum alloy and understand the material properties, it is necessary to strengthen the tensile strength of aluminum alloy materials. Make it more powerful, so that you can better meet the actual production needs. The relevant data experiments show that the tensile strength of the three aluminum alloy composites at 100 degrees is as follows:

The tensile strength of aluminum alloy (ZL109) is 294MPa, the tensile strength of K₂O·6TiO₂/ZL109 is 296MPa, and the tensile strength of Al₂O₃/ZL109 is 311MPa. It can be seen from this that it is not difficult to see that the tensile strength of aluminum alloy composites is significantly stronger than that of aluminum alloy materials.^[4]

5. Analysis of Enhanced Properties of Magnesium-based Composites and Aluminum-silicon Alloys

The enhancement of magnesium-based composite materials and aluminum-silicon alloys enables them to have better performance in practical applications, and can meet actual needs in actual production and better promote the development and progress of related industries.

5.1 Analysis of Reinforcing Properties of Magnesium Matrix Composites

The application of magnesium-based composite materials is mainly a combination of a magnesium alloy matrix and a non-ferrous metal material, and the composite material better enhances the strength of the magnesium alloy. In general, magnesium-based composite materials mainly include carbon fiber, alumina, and boron carbide particles in the application process. Magnesium-based composites have been widely used in the manufacturing industry. Regarding the properties of the magnesium-based composite material, the shear strength of the magnesium alloy can be enhanced by adding a carbon fiber having a volume fraction of 30%. The strength of the magnesium-based composite material is 40 MPa, while the strength of the magnesium alloy material is 20 MPa. Comparing the two data, it is not difficult to see that the performance of the magnesium-based composite material is much higher than that of the magnesium alloy.

5.2 Analysis of Enhanced Properties of Aluminum-silicon Alloy

The enhanced properties of aluminum-silicon alloy mainly utilize the damping properties of graphite composites, enhance the self-slip property of aluminum-silicon alloys, reduce the friction of aluminum-silicon alloys, and enable aluminum-silicon alloys to be widely used in pistons and bearings of internal combustion engines. What's more, according to the research and analysis of the enhanced properties of Al-Si alloys, 7.5% of Al-Si alloys were selected as test materials, and graphite was added, and the particle size was 60~200um. In the actual experiment, graphite was uniformly added into aluminum silicon, and it was cast and molded and the damping performance and related chemical properties were effectively detected. The experimental results on the enhanced properties of Al-Si alloys are as follows:

The internal friction of 7.5% aluminum-silicon alloy is 0.83×10^{-2} , the internal friction of GA-1 is 2.26×10^{-2} , and the internal consumption of GA-2 is 3.17×10^{-2} . It can be seen that when the graphite content in the aluminum-silicon alloy is increased, the aluminum silicon-stone, the internal friction of the ink composite material is increased, and the shock absorption target can be better achieved.

6. Conclusion

In summary, we can see that the performance of non-ferrous metals after adding non-ferrous materials to composite materials has been greatly improved, and can be better applied in actual production. The improvement of the performance of non-ferrous metal materials is an inevitable requirement for the development of the current machinery manufacturing industry, aerospace industry, etc. In the actual work process, it is necessary to pay attention to adopting a reasonable method and using composite methods to change the performance of non-ferrous metal materials. At the same time, we must also pay attention to the problems encountered in the treatment of non-ferrous metals.

For example, to strengthen the length-to-length and non-ferrous metal materials between the non-ferrous metal materials, the design of composite materials must adhere to the practicality as the development goal, strengthen technological innovation to better ensure the production cost of composite materials. Only in this way can we better promote the development and progress of composite materials.

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