

AP23487471. Research and development of technology for obtaining lining from technogenic waste of steelmaking production for furnaces of the metallurgical industry. sc.sp. – Arinova S.K.

Relevance: Today, more than 500 thousand tons of refractory materials are required per year in the Republic of Kazakhstan to ensure foundry and metallurgical production. The main reason for the failure of refractory metallurgical materials is their low heat resistance, density and destruction due to impregnation with melts. Currently, waste from steelmaking is increasingly used as an additive to increase the heat resistance of refractories. Today, 32 billion tons of industrial waste have been accumulated in the country and this amount is increasing every year. And these are mainly technogenic mineral formations (70% of the total volume). In the Karaganda region, the volume of waste is 110,707,750 thousand tons, of which 42% are utilized, the rest is stored in dumps on the territories of production. The solution to this problem is recycling, the use of man-made waste in metallurgical production, namely for lining metallurgical furnaces, will make it possible to reduce the anthropogenic load on the environment in the territory of metallurgical enterprises and reduce the resource and energy intensity of technological processes, while increasing environmental and economic efficiency. However, to date, this method has not been practically developed, but the theoretical and practical studies conducted have made it possible to approach the solution of this problem from new positions.

The project objective is development of the composition and technology for obtaining lining based on waste from the metallurgical industry with increased strength and density based on mineral raw materials of the Republic of Kazakhstan.

Expected and achieved results:

- carrying out basic experiments to develop a pilot composition of the refractory material;
- monitoring the market of the Republic of Kazakhstan in order to select raw materials;
- carrying out comprehensive studies and mechanisms of refractory destruction;
- determining physical and chemical and mineralogical properties of industrial waste from metallurgical enterprises of the Karaganda region.

Basic experiments were carried out to develop a pilot composition of the refractory material. For this purpose, the following basic experiments included:

- chemical and phase analysis of clay deposits in the Karaganda region to determine the main raw material - the clay component;
- chemical and phase analysis of anthropogenic waste from enterprises of the Karaganda region - the main sources of anthropogenic waste.

Based on the data obtained, anthropogenic waste from the Karaganda Ferroalloy Plant and the Karaganda Plant for the Processing of Secondary Materials were determined as the object of research. Slags from these enterprises contain a high level of calcium silicates and magnesia silicates. These components are the key factors that ensure high refractory properties. The compositions of these slags are also optimally balanced in terms of magnesia and silicon content, which further improves the heat resistance of refractories. Man-made waste from the Karaganda Metallurgical Plant and the Karmet JSC has a lower magnesia content and a higher FeO content, which can limit their use for refractory materials. Studies have shown that a high FeO content negatively affects heat resistance, and a lack of magnesia reduces durability of refractory materials.

Research team

Includes 6 performers, including 3 people under 40 years old, 5 people have an academic degree.

The consultant is as follows:

- Ph.D. (Eng.), Assoc. Prof. P.V. Kovalev (Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russia)

Information for potential consumers:

The obtained scientific results can be applied in the development of new production facilities and sections of metallurgical and foundry production.

Scope:

This program can be used at foundry, metallurgical, and machine-building enterprises.

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