

Construction materials from waste polymetallic ores of Kazakhstan

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Keywords:

Technogenic raw materials, building materials, building products



Aktogay Processing Plant, KAZ Minerals

As a result of the operation of processing and metallurgical plants that process polymetallic ores, a large amount of waste is generated.

The reason for this is the low content of non-ferrous metals in them, a decrease in the quality of processed ore.



Ridder Ore Mining and Processing Plant, LLC Kazzink

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Long-term storage of waste leads to geochemical transformations which can last for many years :

- the composition of components changes;
- new technogenic minerals are formed;
- valuable metals are depleted;
- elements are removed from storage;
- environmental pollution occurs;
- dust formation;
- migration of natural leaching products of the material into underground water.

The storage of solid waste as a potential mineral resource is associated with the cost of taking certain measures to protect it from storage, as well as with the occupation of land, in some cases fertile ground.



The study of technogenic deposits for development is significantly different from the study of natural objects. They are located compactly, directly in the zone of industrial.

Processing tailings is more convenient for disposal and use than dumps, because it is more homogeneous, and is already crushed and sometimes fractionated material. Slags acquire a stable composition after 3-5 months of storage in dumps.

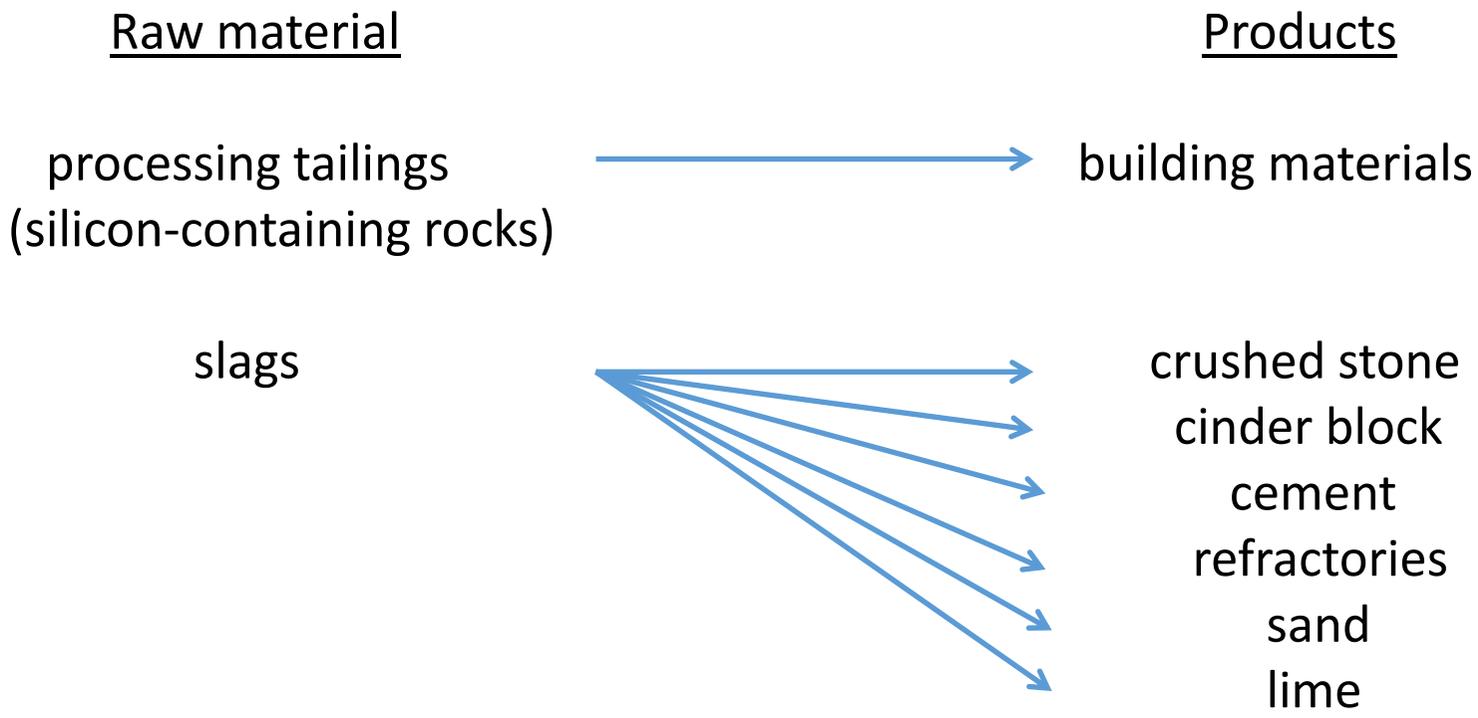
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Technogenic waste processing



There are also more advanced compositions that allow obtaining materials with the controlled-quality properties (heat-insulating material with increased strength).

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Research Objective: Research of opportunities for the production of safe building products using technogenic raw materials of mining and metallurgical industries.

Modern building materials are multicomponent systems containing a complex of additives for various functional purposes and having a high cost. One of the ways to reduce the cost of building materials is the use of technogenic raw materials, which makes it possible to exclude a number of additives from building compositions, as well as to provide the required physical, mechanical and rheological properties. Technogenic raw materials can be used in the production of such widely used building materials and products as dry building mixtures, concrete and products from them, wall products and a number of others.

The problem of organizing the industrial production of building materials and products using man-made waste is closely related to the lack of unified methodological approaches to optimizing technological processes for processing solid waste. This is explained by the traditional ideas about the physical essence of the processes of obtaining and operating materials, products and the use of technogenic raw materials, the lack of a clear regulatory regulation of their physical and chemical properties. Taking into account the negative impact of waste components of mining and metallurgical enterprises on the environment, it is urgent to develop integrated approaches to determine the possibility and justify the feasibility of involving such waste in the resource cycle in order to obtain safe building materials and products with specified characteristics at a level not lower than the normative ones.

Results

The analysis of the theory and practice of development and modeling of safe building materials and products based on natural raw materials and waste from mining and metallurgical enterprises is carried out.

A complex of physicochemical methods was used to study samples of tailings, stale waste from sludge collectors of titanium - magnesium production, samples of fluorinated acidic and neutralized products of hydrofluoric acid production.

Variants of technological schemes for additional recovery of valuable metals from waste and their further use in industry have been developed.

As a result of research on the utilization of industrial effluents from the production of a titanium-magnesium plant, a technology for obtaining a construction mixture with specified strength characteristics has been proposed.

Preliminary compositions of dry building mixtures on cement and gypsum fluoride-containing binders, cellular concrete blocks, small-piece concrete products, fine-grained concrete for 3D printing of architectural forms have been developed.

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Conclusions

Most industrial waste is similar in composition and properties to natural raw materials and can become a source of secondary resources. When obtaining building materials from recycled materials, economic efficiency will be in the prevented environmental damage. The use of secondary raw materials will reduce the need for primary mineral resources. The development of digital production, in particular, additive technologies, implemented in various areas of construction using construction printers that print houses using a digital 3D model, poses new challenges in terms of obtaining thin bulk materials of natural or artificial origin used as raw materials. The main goal of additive technologies in construction is the rapid construction of cheap housing. The use of man-made waste from mining and metallurgical enterprises can be one of the solutions to this problem. Subject to a positive assessment of the ecological and economic efficiency of the development of these raw materials, prerequisites are created for the formation of new approaches to the development and modeling of safe building materials and products based on natural raw materials and man-made waste of metallurgical enterprises.

Thank you for your attention!

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