

APPLICATION OF WASTE IN THE COMPOSITION OF MATERIALS BASED ON MINERAL FIBERS

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***Abstract.** In this article, using waste paper, its chemical processing and restoration of its properties were studied. In addition, in order to expand its strength and fields of use, it was exposed to natural mineral fibers and the properties of composite materials were studied.*

***Keywords:** waste paper, cardboard, organic and inorganic fibers, basalt fibers.*

Introduction. Paper waste paper is widely used in the production of many technical types of cardboard: roofing, binding, auto upholstery and others, making up the bulk of the composition. Thanks to the use of waste paper and manufacture on round-grid or Papermaking machines, these types of cardboard have a low cost, which is their main advantage.

On the contrary, such types of technical cardboard as filtering for fine and ultrafine air purification at the enterprises of the electronic and nuclear industries, modern electrical, heat and noise insulation materials are made from 50-100 % organic and inorganic fibers (basalt, cellulose from *Heliánthus tuberósus*, cellulose from cotton lint, etc.). Usually manufactured in the form of canvases, mats and fabrics on special equipment, and then subjected to impregnation or other processing of special resins, mainly to impart strength. Recently, the production of such materials by paper production methods on machines of the "Packing Industries" type

with an inclined mesh table and a mass concentration at low tide of 0,01-0,05 % has been growing all over the world.

It is very important to choose the right binder, which would work in a wide temperature range from 20 to 1200 °C. As such a binder, the most interesting are cheap and accessible aluminum compounds that form complex poly-nuclear complexes, especially effective in a neutral and slightly alkaline medium.

Despite the great need of various industries in insulating materials from mineral fibers, their high penetration is hindered by high cost.

In this regard, the search for solutions aimed at reducing costs and increasing the competitiveness of paper-like materials from mineral fibers is a very urgent task.

Additional raw materials for mineral fibers are cellulosic semi-finished products. The choice of waste paper as an object of research is explained by its low cost, as well as by the absence of the need for high paper-forming properties to be presented to fibrous materials in the composition, since the strength of the material is provided by special binders.

Images of heat- and noise-insulating materials based on basalt fibers were produced on a LOA-2 sheet letter at a concentration of 0.05% (successively superimposing wet castings with a mass of 1m^2 -200 g), bringing the total mass to 600 g/m^2 . Drying of the samples was carried out on the cylinder at the maximum weakened cloth, which made it possible to obtain samples with a low density (about 150 kg/m^3), even in the model version I use a composition of 100 % recycled paper. As a binder, additions of sodium aluminate in an amount of 10 % by weight were used.

As a result of the hydrolysis of these compounds, complex polynuclear complexes of aluminum are formed, capable of involving surface hydroxyls of basalts and cellulose fibers in their structure. The resulting coordination bonds such as "cellulose fiber-aluminum-basalt fiber complex" contribute to a significant increase in the strength of materials. Under the influence of temperature of 150 -200 °C these bonds become not destroyed by water, passing from "al-bond" through

hydroxyl in the "dioxo-bond" through oxygen. The desired pH value of 8.5-9.0 was determined with 0.1 N hydrochloric acid. The content of waste paper of grade MS-6 and MS-7 was varied in the samples from 0 to 100%. The influence of the fraction of waste paper in the composition on the heat and noise insulation properties of the samples was determined. Tests of the samples were carried out at the Architectural Institute (Tashkent) according to the special techniques developed by them.

The relative heat loss in percent at a temperature drop rate of 10 C/h and the noise reduction obtained during the testing of the samples are shown in table 1.

Table 1

Influence of the content of waste paper in basalt fiber samples on their heat and noise insulation properties

The name of indicators	Wastewater, %						
	0	5	10	15	25	50	100
Heat loss coefficient, %	0,17	0,20	0,32	0,85	2,05	13,00	22,00
Coefficient of noise absorption, %	62	59	56	53	45	22	12

Increasing the fraction of waste paper in the composition up to 100 % leads to a significant reduction in the heat and noise insulation characteristics of the samples. However, the content of waste paper to 15-25 % can be considered quite acceptable. Economic efficiency from the use of waste paper and the composition of the studied materials is unquestionable. The cost of waste paper, in comparison with mineral fibers, is so low that one can consider every percent of its increase, the percentage reduction in the cost of materials. The addition of waste paper material to the composition in the amount of 15-25% of a significant reduction in its cost price, also calling for an increase in its elasticity.

Conclusion. The expediency of using waste paper and aluminum compounds is shown to reduce the prime cost and improve the physico-chemical properties of composite materials from basalt fiber.

Thus, based on the above studies on the selection of binders, manufacturing technology and testing, consumers have demonstrated the possibility of using mineral fibers with an inorganic binder to produce composites that have the necessary insulating properties.

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