STUDY OF STRUCTURAL PROPERTIES AND FIRE HAZARD REDUCTION OF THE CELLULOSE BUILDING MATERIALS BASED ON LOCAL RAW MATERIALS

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Abstract: *This research paper analyzes the structural properties of vermiculite, including its bulk density, grain size composition, porosity and intergranular voidness. In addition, the results of relevant scientific experiments are presented, proving a higher degree of thermal insulation of vermiculite in comparison with other thermal insulation materials.*

Key words: *vermiculite, bulk density, grain structure, porosity, intergranular voidness, heat-insulating property, experiment.*

In order to describe the structural properties of vermiculite, it is necessary first of all to pay attention to its bulk density, grain size composition, porosity and intergranular voidness. Bulk density is the main technical characteristic of expanded aggregates and is mainly determined by the porosity of these materials. The value of the bulk density of expanded vermiculite obtained in industrial installations by firing raw vermiculite is shown in Fig. 1.

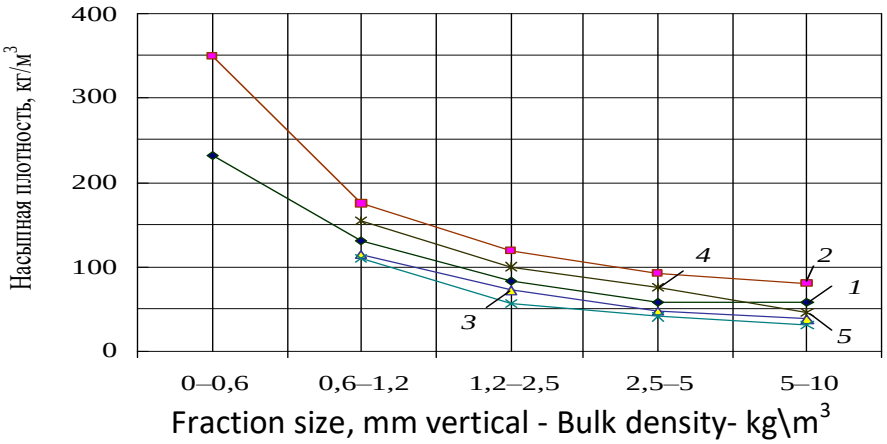

Figure: 1. Dependence of the bulk density of expanded vermiculite on the fractional composition:

1 - Kovdor hydrophlogopite, fired in a shaft furnace; 2 - inaglinsky vermiculite, fired in a shaft furnace; 3 - Kovdor hydrophlogopite, fired in a drying and kiln unit; 4 - inaglinsky vermiculite, fired in a drying-oven unit; 5 - Inaglinsky vermiculite, fired in a tube furnace.

Study of the effect of hardly flammable cellulose-containing tile building materials made on the basis of local raw materials on the thermal properties, as well as their fire hazard reduction properties;

Development of fire-resistant wood-tile materials with a new composition by studying the effect of highly dispersed inorganic minerals on the thermal properties of various wood materials milled to different sizes;

Study of the effect of newly obtained tile building materials on the degree of combustibility, oxygen index and smoke generation coefficient;

Determining the effect of newly obtained tile building materials on the structure, physical-mechanical and thermal properties;

Expanded perlite and vermiculite, obtained by us by roasting in industrial conditions (Tables 1.1 and 1.2), belong to especially light, highly porous bulk materials. A characteristic feature of the grain size composition of perlite is the high stability of the bulk density by fractions in comparison with vermiculite.

The bulk density of fractions less than 0.315 mm in this material exceeds the regulatory requirements (ρn = 200 kg / m3), which is associated with the presence of a significant amount of waste rock. For the device of highly efficient backfill and heat-insulating materials based on it, it is recommended to screen out especially light fractions of expanded vermiculite.

Table 1

Dependence of the bulk density of expanded aggregates on their grain size composition

Aggregate	**Index**	**Bulk density, kg / m³**	**Fractions, mm**						
			5–10	**2,5–5**	**1,25–2,5**	**0,63–1,25**	**0,315–0,63**	**0,16–0,315**	**< 0,16**
Expanded Aragatsky perlite	Private residues on sieves,% by weight	–	–	1	26	18	35	15	5
	bulk density, kg / m³	120	140	113	87	70	65	125	135
Swollen inaglinsky vermiculite	partial residues on	–	–	15	30	15	18	16	6

	sieves,% by mass								
	bulk density, kg / m^3	145	120	126	160	130	140	250	450

In fig. 2 shows integral and differential programs of expanded vermiculite and perlite obtained by the method of mercury porosimetry.

As follows from Fig. 2, expanded vermiculite has a large volume of large pores (more than 10 μm). Expanded pearlite is characterized by a more uniform pore diameter distribution.The test data indicate that both materials have a similar pore volume at sizes over 100,000 E, at 10,000 E for vermiculite the pore dispersion is 3.6–4.5 versus 0.5–0.6 cm3 / g for perlite at 1000, respectively 4.3–4.5 and 1.2–1.3 cm3 / g. Finally, at 100 these values are 4.1–4.4 and 2.0–2.15 cm3 / g.

Determining the effect of newly obtained tile building materials on the structure, physical-mechanical and thermal properties; Improving the production technology of fire-safe wood-based tile materials. The results confirm that the provisions according to which the bulk density of expanded vermiculite increases with decreasing grain size.

A series of experiments were conducted on the composition of mineral raw materials based on vollastanite, dolomite, vermiculite. Based on the experiments, the wood materials were treated with a new composition and thermally exposed in a special furnace for 50 minutes. While the newly obtained composition made it possible to increase the flammability of wood samples from the current temperature of 350-400 ° C to 880-900 ° C, and the steel composition samples when exposed to 90 minutes of thermal exposure from 1200-1600 ° C, the new composition effective flammable heat-resistant coating was achieved by increasing the value of the critical time (500 ° C) for the metals in use to 1200-1670 ° C.

Fire risk testing of building structures has shown that when the concrete structure is reinforced with wollastonite ceramic fiber and refractory perlibeton, the facility is more resistant to combined seismic and thermal effects to the maximum. It has been experimentally proven that wollastonite is the most effective flammable material proposed. In the course of the experiment, it was scientifically proven that the proposed new composition of flammable and heat-protective coatings is highly effective. The main scientific achievements of the study of the structural properties of wollastonite, dolomite, vermiculite minerals are the flammability of wollastonite mineral 1800 ° C, 0.1-0.3 μm crushed fraction of dolomite + kaolin powder mixture 1750-1810 ° C, expanding the scope of production found to be extremely important for.

In the second phase of the experiments, a convenient method of developing high-quality, hard-combustible wood chipboard based on local raw materials using vollastanite, dolomite, vermiculite, kaolin, liquid liquid glass and wood shavings based on flame retardant coatings and low viscosity carboxymethylcellulose was selected. detected. The physical and mechanical properties and flammability of the samples were examined. Preliminary positive results were obtained. These obtained scientific results are being processed.

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