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BUILDING MATERIALS PREPARED ON THE BASIS OF MULTIPLY VERMICULITE

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Annotation: This article examines the study of physical and mechanical properties of vermiculite, building materials made on the basis of vermiculite, and the process of their use.

Key words: vermiculite, concentrate, construction, multiplication, vermiculite plate.

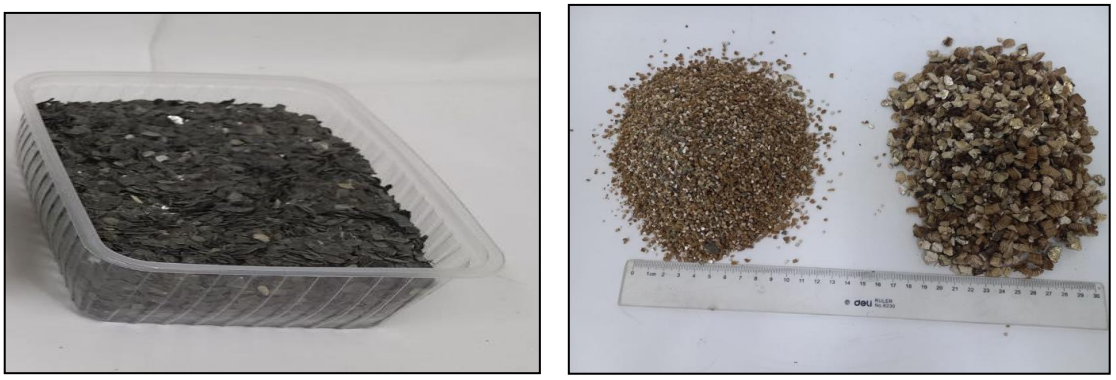
A lot of attention is being paid to the construction of modern housing and buildings in our country. In addition, it should be noted that great opportunities have been created for the production of various traditional and modern construction materials and their further improvement. One of the main problems of the current development of housing construction is to reduce the consumption of fuel and energy sources, and in this regard, saving the energy spent not only in the production of building materials, but also in the operation of buildings and structures for their heating remains the main issue.

There are many types of modern materials in modern house construction. Nowadays, it is very important to be able to choose the most basic and qualitatively useful ones. Today, the demand for energy-efficient, economically affordable materials and products in the world of construction is increasing. In this process, the use of construction materials made from local raw materials in public and industrial buildings is gaining urgent importance. At a time when the need for heat-insulating materials is increasing every year, the production of high-performance composite materials based on local raw materials can be one of the solutions to this problem. One type of these materials is expanded vermiculite.

Vermiculite raw material deposits In the 50s, according to extensive geological prospecting, deposits of various capacities were opened in many regions. In 1957, powerful deposits of vermiculite were found on the Kola Peninsula (Kovdor and Africa). The largest mine of vermiculite is the Potanin mine in the Chelyabinsk region, and large deposits of vermiculite are found in Kazakhstan (Barchin), Russia (in the Urals, Sakha-Yakutia), the USA, and Australia. In Uzbekistan, vermiculite deposits were found in the mountains of Sultan

Uwais, Nurota (Langar mine). The vermiculite mine is located 75 km southwest of Nukus in the Sultan Uwais mountains belonging to the Republic of Karakalpakstan. Vermiculite mine was recorded in 1937 and the reserve of vermiculite mine is more than 1 million tons.

The Tebinbulok vermiculite mine belongs to the Lower Carboniferous period. The gabbro periodite developed continuously along the strongly biotitized western and eastern margins of the pyroxenite intrusive massif. The length of the territory is 1.2 km, the mining depth is 40 m. Individual ore bodies are 120–450 m long and 18–220 m wide, with an average vermiculite content of 10–15%. Vermiculite is formed by the weathering of biotite pyroxenites in the form of yellowish-brown flakes, veins, veinlets and their collections. According to its genesis, the mine is related to completed magmatic processes.



1-pictures. Vermiculite concentrate and expanded vermiculite mined from Tebinbulok vermiculite mine

Expanded vermiculite is obtained by heating and multiplying natural rock vermiculite at a temperature of 900-1100 ^{o}C. Due to the fact that the volume of such fillers increases 10-20 times during heat treatment, the pile density is very small. The average density of expanded vermiculite varies from 80 to 200 kg/m^3, depending on the size of the granular particles, with a thermal conductivity of 0,05 to 0,9 W/m ^{o}C. The mineral vermiculite is present in different amounts in different rocks. It is found in pegmatite, pyroxene, serpentine, talc, apatite and other rocks. Expanded vermiculite is a dispersive material in the form of fine particles (grains) obtained by grinding and baking the mineral vermiculite of silver-brass color. Natural vermiculite is a complex highly hydrated magnesium aluminosilicate, characterized by the variability of its chemical composition. The most remarkable feature of vermiculite is the ability to separate partially interlocked individual mica plates when heated rapidly. As a result of such division, vermiculite grains multiply strongly.

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The process of dehydration of vermiculite when heated can be divided into 3 stages: 1st stage - up to -200 ºC - hygroscopic moisture is lost, that is, it dries by essence; Stage 2 is characterized by the loss of interpackage water in the range of 200-275 ºC, which is associated with strong expansion; Stage 3 is in the range of 700-1100 ºC - constitutive water is lost, which leads to further increase in the size of vermiculite grains. Lightweight fillers should meet the technical requirements for these materials in terms of size, bulk density, porosity and other parameters. In terms of size, light aggregates are divided into large and small types, just like dense aggregates.

2-pictures. Small and large fractionated vermiculite concentrates in the form of small grains and their bulk samples

Expanded vermiculite grains are divided into 2 fractions according to their size: small - from 0,15-0,25 to 3 mm and large - from 5 to 10-15 mm. Expanded vermiculite by volume weight is divided into the following brands: 100, 150, 200, 250 and 300. Expanded vermiculite grains have a large deformation: they are easily compressed, as a result, vermiculite becomes denser. Accordingly, expanded vermiculite in a calm state, as a rule, does not settle in heat-insulating building structures. Vermiculite bulk density and grain strength depend on its cooking and cooling conditions: when vermiculite is heated to 700-800 ºC C, grain strength decreases. Expanded vermiculite is a heat-insulating material characterized by its high porosity, lightness and a certain degree of temperature resistance.

3-pictures. Vermiculite plates obtained on the basis of increased vermiculite

Application of expanded vermiculite and its products. The sphere of application of vermiculite in the national economy is wide and diverse. Currently, the main consumers of vermiculite are construction and industrial thermal insulation. Expanded vermiculite is distinguished by high temperature resistance compared to other diffuse heat insulation materials. According to these qualities, it is used for thermal insulation of chemical equipment and other high-temperature objects. Expanded vermiculite is used as a highly effective filler in acoustic plaster mixes and heat-insulating concrete.

Vermiculite products are used in industrial and civil construction due to their thermal insulation, acoustic and decorative properties. Vermiculite plates are used for roofless equipment of industrial buildings, for heating walls and fences in basements of residential buildings. They also serve as sound insulation in inter-floor partitions of prefabricated reinforced concrete slab houses. Such plates are used in fire barriers and theater fire barriers. Vermiculite tiles were used in the Central Stadium (Luzhniki) in Moscow and the Palace of Culture in Warsaw.

Vermiculite plates, shells and segments serve for the insulation of various industrial equipment and pipes. Vermiculite products with an inorganic binder insulate hot aggregate hot surfaces. In the construction of factory furnaces, for example, vermiculite sheets are more effective than other heat-insulating materials compared to diatomite ceramics and fireclay light bricks.

Vermiculite plaster is used to cover metal structures of buildings to protect them from high temperatures during fires. Addition of increased vermiculite in the production of wood-fiber and wood chipboards improves their decorative and fireproof qualities: they give them a

beautiful appearance and make them a hard-to-burn building material. In addition, adding increased vermiculite to such plates increases its heat and sound insulation properties.

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