

APPLICATION OF EXPANDED VERMICULITE IN THE CONSTRUCTION INDUSTRY

Turgaev J.A

*doctor of philosophy of technical sciences (PhD) Karakalpak State University
named after Berdakh*

Bekkulov V.K Takhirjanov N.K

Tashkent State Transport University

Annotation This article is devoted to porous aggregate, which has found application in construction in various fields. Varieties of porous aggregates of organic and mineral origin are given. The technology for producing plaster mixtures and self-leveling floors using expanded vermiculite is considered.

Key words: vermiculite, porous aggregate, binder, strength, thermal conductivity, building material.

It is difficult to imagine a material with which it would be possible to successfully and effectively satisfy the thermal insulation characteristics of building materials.

Expanded vermiculite from the Tebinbulak deposit, Republic of Karakalpakistan, is a loose porous material in the form of scaly particles of silver, golden or yellow color, obtained by accelerated firing of vermiculite concentrate - hydromica containing bound water between the elementary layers. Swelling occurs as a result of the splitting of vermiculite particles under the influence of water vigorously evaporating from them into very thin scales, which only retain adhesion to each other at certain points.

Expanded vermiculite has a peculiar lamellar porosity, which determines the volumetric weight of 100–300 kg/m³ and thermal conductivity of 0.065–0.09 kcal/m/hour deg and, at the same time, the elasticity of the grains, due to which it does not settle in heat-insulating backfill structures.

Chemical composition of vermiculite %: Na₂O 1,67; MgO 19,00; Al₂O₃ 13,10; SiO₂ 37,91; K₂O 5,53; CaO 3,13; TiO₂ 1,87; Fe₂O₃ 11,02; ZnO 0,01; BaO 0,54; NiO 0,03; SO₃ 0,2; Cr₂O₃ 0,08; MnO 0,07; SrO 0,03; Co₂O₃ 0,04.%. [1]

The most effective use of expanded vermiculite is considered to be its use as a thermal insulation material.

The manufacture of products from vermiculite, shells and segments for insulating heat pipelines involves the formation of a mixture of expanded vermiculite and chrysotile asbestos with various additives, such as bitumen-bentonite or bitumen-diatomite paste, synthetic resins, starch, liquid glass and others.

Vermiculite board is an inorganic fire retardant material that not only has high fire resistance, but also provides excellent sound absorption and thermal insulation performance. In addition, it has attractive decorative properties and has a long service life. [2]

In hot climates, vermiculite backfills are used in wall structures to prevent overheating of rooms. In the northern regions, they serve to preserve heat, insulate refrigerators, open-hearth furnace roofs, and sound insulate test chambers for aircraft and automobile engines.

In addition to vermiculite backfills, dry construction mixtures and mortars containing vermiculite as a filler are widely used in construction.

Vermiculite plaster mortars include expanded vermiculite and cement or gypsum. [3]

Compared to conventional (sand) mortars, vermiculite mortars, due to their high porosity, have a significantly lower volumetric weight (2-4 times) and a low thermal conductivity coefficient (4-6 times), which makes them lightweight and thermally insulating.

Thermal insulating heat-resistant vermiculite concrete is produced by mixing a dry mixture with water; after curing for three days, it acquires fire-retardant, heat-insulating and heat-resistant properties.

Vermiculite concrete has excellent thixotropic properties, which allows it to be used both for pouring into complex forms and for application to vertical surfaces using standard mortar mixers.

The thermal conductivity coefficient of vermiculite concrete, depending on the volumetric weight, cement consumption and humidity, varies from 0.08 to 0.35 kcal/m-deg-hour. Cement-based vermiculite concrete is used for thermal insulation and sound insulation in the construction of building envelopes, such as wall panels, floors and coatings. [4]

The manufacture of very lightweight thermal insulation products from expanded vermiculite involves the use of synthetic resins, bitumen, liquid glass and other materials as a binding agent.

Expanded vermiculite is used for thermal insulation of various elements of building structures, such as walls, roofs, floors, foundations, attics, floors and basements of buildings, as well as for insulation of pipelines. It is also used for sound insulation of buildings for various purposes, including civil and industrial facilities, cinemas, special laboratories and chambers for testing aircraft and automobile engines.

Vermiculite provides long-term fire protection (up to 10 hours) for metal and wood structures such as buildings, structures, doors and safes. Additionally, it prevents the development of mold and mildew by regulating humidity.

Conclusions

By using expanded vermiculite in construction, it is possible to significantly reduce the heat loss of civil buildings, which is very important in areas with a dry, hot climate, which includes our republic. Thermal insulation of buildings from expanded vermiculite increases the thermal and sound insulation characteristics of the building.

In this regard, the use and development of new types of materials based on it is an urgent scientific and practical task.

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