EUROPEAN JOURNAL OF LIFE SAFETY AND STABILITY (EJLSS)
ISSN2660-9630
www.ejlss.indexedresearch.org Volume 25, January-2023 ||

Fibers of Basalt used to Reinforce Gypsum Products

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Abstract: *Currently utilized gypsum materials' nano-laboratory testing features are described. Basalt is added to gypsum by pouring it into the dry material and mixing it thoroughly. Therefore, basalt reduces shrinkage deformations and improves the technical properties of dry mixtures.*

Keywords: *basalt, dry mix, gypsum, crack, composite.*

Date of Submission: 22-12-2022 ***Date of Acceptance: 23-01-2023***

Introduction:

Micro-reinforcing qualities of basalt, whose silica (SiO2) content ranges from 42 to 52-53%, the amount of Na2 + K2 alkalis up to 5%, and in alkaline basalts up to 7%, enable it to be utilized efficiently in the creation of paints and dry mixes. As micro-reinforcing qualities of basalt give dimensional stability made with its usage of materials, which is the most sought property in the manufacturing of dry building mixes (DBM) for a variety of applications, the problem of various-shrinkage is very severe. Basalt is a natural mineral consisting of a white or light gray silicate with the chemical formula SiO2. Basalt - produced in the presence of SiO2 residue that is insoluble (fig.1).

Materials:

With its excellent adsorption characteristics, it prevents the formation of high, which is particularly significant when employing combinations of mineral and organic pigments for ornamental purposes. Micro-reinforcing qualities of basalt and high adhesion to surfaces enhance the strength of gypsum construction mixtures and the value of their surface adhesion strength [1].

On multiple studies and in modern practice in the construction industry, different types of inorganic (organic) reinforcing fibers are used to improve dimensional stability, minimize cracking, give dimensional stability, and enhance the mechanical performance of various products and composite materials based on Portland cement, aluminous cement, and anhydrous gypsum.

Developing basalt technology necessitates a variety of pressing scientific endeavors: 1. study of the operational stability of basalt fibers under normal climatic conditions and at elevated temperatures, as well as under thermal cycle conditions; 2. analysis of the problem of utilization of basalt fibers after completion of operation; 3. The problem of the danger of basalt fibers for an individual in the workplace and the home. The results of previously conducted investigations permit us to draw the following conclusions: o Basalt fibers are composed of an amorphous material with varied composition and have a surface with varying degrees of abrasion. Using a certain technology, it is

required to examine the qualities of the fibers produced from this raw material. Current regulation guidelines for measuring the hydrolytic resistance of vitreous materials do not account for the structural and morphological characteristics of basalt fibers, nor their heterogeneity. o Regarding occupational safety, basalt fibers should be categorized as an airborne variable chemical.

Fig.1. Type of basalt

It does not dissolve in water or organic solvents, yet it reacts with hydrochloric acid. This is basalt's defining characteristic. For natural basalt, the crystal structure is stretched throughout the length, and the production of acicular grains involves cracking the grains.

Methods: The major direction of basalt's use as a microreinforcing filler is determined by the grain's needle and porosity shape [4]. Basalt is the only pure white filler with columnar oblong crystals and a fiber length-to-diameter ratio (L:D) of 3:1 or greater, depending on the brand (tabl.1.).Technological parameters of basalt [1-5]

Table 1

№	Characteristic	Factor
1	Hardness on scale Moos	3,5-4,1
2	Density, g/sm^3	2,7-2,81
3	The Alkaline factor, pH. 10% water suspension	7,6-10,1
4	Natural moisture, %	0,2-0,5
5	Bulk mass, kg/m^3	1100-1460

Acicularity is the distinguishing characteristic for the hardening of coating films and coatings to increase their durability and wear resistance. In relation to the deteriorating environmental situation, it is also important to mention that basalt can be used as a substitute for asbestos and fibrous talc [3]. Represents fiberglass or basalt-plastic rods with a diameter between 2.5 mm and 32.0 mm, up to 12 meters in length (or wound into coils), and a variety of finishes.

Chemical composition of basalt in countries of Asia and in other countries [1-5] **table 2**

Oxids	Uzbekistan			Kazakhstan		
	Djizakh field	Change field	Langar field	Surpriz field	Alaygir field	Bosagin field
SiO_2	48—55	47,28	51,50	51,70	49,36	52,0
TiO_2	1—2,5	46,10	46,90	47,38	45,81	39,9
Al_2O_3	14—18	1,00	0,05	0,10	0,58	2,97

Fe_2O_3	2—5	0,74	0,16	0,06	1,22	0,52
FeO	6—10	-	-	-	-	-
MnO	0,1—0,2	-	-	-	0,50	0,60
MgO	5—7	0,14	0,1	-	0,44	0,14
CaO	6—17	1,09	0,03	-	-	0,40
Na_2O	1,5—3	1,36	-	-	0,35	0,40
K_2O	0,1—1,5	2,29	1,26	0,76	1,74	3,07
P_2O_5	0,2—0,5	0,1	0,1	0,1	0,1	0,1
total	100	100	100	100	100	100

The majority of the world's basalt reserves are located in Asia, primarily in China, the United States, and India. In Mexico, Canada, Finland, Australia, Kenya, Japan, New Zealand, Sudan, South-West Africa, and the former Yugoslavia, there are significant basalt scarn deposits. China and the United States are the primary wollastonite manufacturers (table 2). According to China National Non-metal Minerals Industry Corporation, Li-Shi Basalt Mining Company and Pan Shi Basalt Mine are responsible for basalt production in China. The material is primarily exported to Japan.

Based on the compositions, characteristics, and shapes of basalt particles, the following application areas are identified: -Housing, civil, and industrial construction

- Mining industry
- Road construction
- Bridge construction
- Reinforced concrete tanks, wastewater treatment plant storage facilities, and chemical plant storage facilities
- Housing and utility infrastructure
- Sewerage, improvement, and water disposal
- Coastline reinforcement
- Offshore and port infrastructure
- Subterranean foundations -Contact network supports

Results:

Basalt-containing dry mixes are suitable for all types of foundation repair and finishing work, including concrete, brick, plaster, drywall, asbestos cement, etc.

It should be mentioned that a reasonable selection of formulations of raw materials and technological parameters of the production process is essential, taking the normalized qualities of finished materials and products into consideration.

The presence of basalt in these combinations is largely responsible for their wide variety of applications. The usual quantity of basalt supplementation in CCC varies between 5 and 10 percent of their weight, depending on the purpose and type of material. In their closed shape, they are very flexible, easy to apply, and adhere well to a variety of surfaces. Basalt boosts the water-holding capacity of closed mixtures, improves the construction of their structures, and eliminates all shrinkage during solidification. It eliminates the production of, which is particularly significant in the application of mineral-colored and organic pigment mixtures, due to its excellent adsorption

capabilities. Microreinforcing qualities of basalt and its excellent adherence to surfaces boost CCC's strength features and adhesive strength to the surface [6].

These solidified combinations possess a minimum compressive strength of 15.0 MPa. They are completely weather- and frost-resistant, allowing them to be utilized effectively for external repair and finishing work, as well as for the repair of facades. These works developed guidelines for determining the consumption rate of additives to prepare quality mixes, including: -Manufacture of gypsum products (facade cladding, decorative artificial stone) – 0.39-0.78 kg/m3; -Dry mixes and plasters – 0.6-0.8 kg/m3; -Cement-sand screed, paving slabs, and other coatings with high loads – 1.6-2.7 kg/m3.

The addition of basalt to the mortar is accomplished by pouring it into the wet mortar and combining it. Thus, adding basalt to gypsum mixes decreases shrinkage deformations and improves their technological qualities.

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