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ASSESSMENT OF THE SUBJECT OF BASALT RAW MATERIALS FOUND IN THE TERRITORY OF THE REPUBLIC OF UZBEKISTAN

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ABSTRACT

The article compares the usefulness of the use of basalt raw materials with the requirements of the world's leading basalt processing enterprises and the acid modulus and chemical composition using data from the Berkuttau, Madaniyat and Aktash sites.

Keywords: *Acid modulus, basalt, basalt fiber, geology*

ЎЗБЕКИСТОН РЕСПУБЛИКАСИ ҲУДУДИДА УЧРАЙДИГАН БАЗАЛЬТ ХОМАШЁЛАРИНИНГ ЯРОҚЛИЛИГИНИ БАҲОЛАШ

АННОТАЦИЯ

Мақолада базальт хомашёсининг турлари ишлатишдаги фойдалилиги шунингдек Беркуттау, Маданият ва Акташ участкаларидан олинган маълумотлардан фойдаланиб Кислоталик модули ва химик таркиблари ўзаро ва жаҳондаги етакчи базалтни кайта ишловчи корхоналарининг талаблари билан таққосланган.

Калит сўзлар: *Кислоталик модули, базальт, базальт толаси, геология ,*

ОЦЕНКА ПРИГОДНОСТЬ БАЗАЛЬТОВ, ОБНАРУЖЕННЫХ НА ТЕРРИТОРИИ РЕСПУБЛИКИ УЗБЕКИСТАН

АННОТАЦИЯ

В статье сравнивается целесообразность использования базальтового сырья при использовании данных участков Беркуттау, Маданият и Акташ, кислотного модуля и химического состава друг друга и требований ведущих мировых заводов по переработке базальта.

Ключевые слова: *модуль кислотности, базальт, базальтовое волокно, геология.*

INTRODUCTION

Basalt is an igneous volcanic rock of the basic composition of the normal alkalinity series from the basalt family. The name probably comes from the Greek word βασικός - "basic", or, according to another version, from the Ethiopian basal (bselt, bsalt) - "boiling", "iron-containing stone", since the manuscripts of Pliny the Elder mention that the first basalts appeared from Ethiopia. The plutonic analogue of basalts is gabbro, and the hypabyssal analogue is dolerites. Trapps are a type of basalt. They predominate among other cainotype (weakly altered) volcanic rocks. Coloring dark: black, dark gray. Structure: dense structure, fine-grained. The texture is porous, almond-shaped or massive. The specific gravity is 2.6-3.11 g/cm3. Hardness on the Mohs scale from 5 to 7. Melting point 1100 -1450ºC. The compressive strength of the rock reaches 400 MPa. The form of occurrence of the rock is most often: flows, sheets, domes, dikes. Forms separately columnar or platy. Under the microscope, a composition similar to that of gabbro is observed. Basalt is composed of olivine, augite and feldspar (plagioclase). The groundmass is composed of plagioclase, clinopyroxene, magnetite or titanomagnetite microlites, as well as volcanic glass. Phenocrysts, as already mentioned, are usually represented by olivine, clinopyroxene, plagioclase, rarely orthopyroxene, or hornblende. The most common accessory mineral is apatite.

At present, more and more attention is being paid to the issues of saving metal and replacing it in a number of industries with less scarce and more resistant materials. Saving metal provides for the widespread introduction of its substitutes into production. One of its substitutes is stone casting, from which more than 800 types of wear-resistant and acid-resistant industrial products are made.Помимо этого, камнелитейная продукция практически противостоит воздействию всех кислот,

щелочей и солей и замещает такие защитные материалы, как железо, свинец, другие цветные металлы и их сплавы.

Recently, the demand for CBF (continuous basalt fiber) has increased dramatically. Basalt fibers are distinguished by unique technological properties, the use of which only in the construction industry gives a huge economic effect. The service life of basalt-plastic pipes is approaching a century, i.e. an order of magnitude more steel pipes. The use of 1 kg of basalt plastic reinforcement allows saving 9 kg of steel. In the future, it is planned to use basalt fiber as a substitute for asbestos in all industries and construction.

It should be noted that recently basalts have been in demand many times and, in addition to the usual use of basalt raw materials in building materials, are used as raw materials for the production of basalt fiber. And depending on the diameter of the fibers, the fiber is divided into:

- microthin, less than 0.6 mcm in diameter;
- ultra-thin, with a diameter of 0.6 to 1.0 mcm;
- super-thin, with a diameter of 1 to 3 mcm;
- thin fibers from rocks, which are a layer of randomly arranged fibers with a diameter of 9 to 15 microns and a length of 3 to 1500 mm;
- thickened fibers with a diameter of 15 to 25 microns and a length of 5 to 1500 mm.

Depending on the diameter, the fiber is used for various purposes:

- microfine - for filters of very fine purification of gas-air medium and liquids, as well as for the manufacture of thin paper and special products;
- ultra-thin - for the manufacture of ultra-light heat-insulating and sound-absorbing products, paper, fine filters for gas-air and liquid media;
- super-thin - for the manufacture of pierced heat and sound insulating mats and sound-absorbing (BZM, ATM) products, cardboard (TK-1, TK-4), multilayer non-woven material, heat-insulating knitting and piercing material, long heat-insulating strips and bundles (BTSh-8, BTSh- 20, BTSh30), soft heat-insulating hydrophobized plates, filters, etc. Special heat treatment of super-thin basalt fibers makes it possible to obtain a microcrystalline material with properties that differ from ordinary fibers.

Microcrystalline fibers are 200°C higher than conventional fibers in terms of application temperature, 2.5 times higher in acid resistance, and their hygroscopicity is 2 times lower. The main advantage of this type of basalt fiber is the absence of shrinkage during its operation. High-temperature-resistant heat-insulating materials,

plates, as well as filters for filtering aggressive media at high temperatures are made from microcrystalline fiber.

Due to the unique properties of the materials obtained from basalt raw materials and the development of technology in construction, various modern materials are basalt raw materials.

Basalt rocks are especially in demand for the production of basalt fiber (from Latin fibra - fiber) - short pieces of basalt fiber intended for dispersed reinforcement of binder mixtures, such as concrete. Fiber diameter - from 20 to 500 microns. Fiber length - from 1 to 150 mm. Basalt fiber is produced from the melt of rocks such as basalt at temperatures above 1400. Dispersed reinforcement with basalt fiber increases the following product performance:

- impact strength - up to 500% (this indicator characterizes the brittleness of the material and is estimated by the amount of work that needs to be spent on the destruction of the material);
- abrasion resistance - up to 300%;
- tensile strength in bending - up to 300%, splitting - up to 200%, compression - up to 150%, axial tension - up to 150%;
- crack resistance limit - up to 250% (this indicator characterizes the fiber's ability to prevent the occurrence and propagation of cracks due to three-dimensional reinforcement);
- frost resistance - up to 200;
- corrosion resistance - up to 500% (this indicator is achieved due to the absence of cracks and has an impact on reducing the depth of carbonization);- кавитационную стойкость - до 400 %;
- water resistance - up to 150%.

Basalt fiber increases crack resistance by 3 times, splitting strength by 2 times, impact strength by 5 times, which makes it possible to effectively use it in the construction of earthquake-resistant structures, explosion-proof facilities and military fortifications. The characteristics of basalt fiber make it possible to use it for the construction of radio-transparent structures of complex shape. Basalt fiber allows you to increase the impact load by more than 5 times. All requirements for the quality of industrial floors are met: high resistance to various types of loads (static, shock, dynamic, abrasive), good resistance to temperature extremes, very high resistance to chemical attack. The advantages of floors made on the basis of basalt fiber include low consumption of steel and concrete, short time and low labor intensity of pouring, prevention of cracking already at the stage of hardening of products, obtaining

volumetric reinforcement, a three-dimensional structure, a significant reduction in the thickness of the concrete floor while maintaining strength characteristics.

The main advantages of hydraulic structures made using basalt fiber:

- durability;
- high abrasion resistance;
- high impact resistance;
- high frost resistance;
- high corrosion resistance;
- increased water resistance.

The difference between basalt fiber and metal fiber is that, first of all, basalt fiber does not have a negative cathodic effect in products, and it is also not subject to any corrosion.

Basalt fabric. Woven from a continuous basalt thread, these fabrics are fabrics of various thicknesses, weights, patterns and types of weaving, made in accordance with operational requirements.

Basalt fabric has the following properties:

- good adhesion of the coating;
- non-flammable and fire-retardant;
- excellent tensile strength;
- maintains integrity at temperatures up to 982°C;
- resistance to electromagnetic radiation.

Products from basalt fiber are in demand and are widely used in various fields, ranging from the construction industry to tailoring.

- Fire curtains for fire protection and fire containment;
- filtration material for factory chimneys and dust chambers;
- protection of the roof from destruction by fire;
- fire-resistant clothing;
-reinforcement of composite materials;
- electromagnetic screens.

Reinforcing mesh made of basalt fiber. Basalt mesh is used to reinforce concrete structures. Reinforcing mesh is available in various sizes with epoxy coating for reinforcing concrete and composite materials, as well as with asphalt coating for use in road construction.

Advantages of basalt rebar. The structure is made of composite reinforcement, not subject to corrosion, resistant to alkaline environments of concrete solutions. The fibers are resistant to salt and acid solutions. Specifications are maintained

throughout the entire period of operation. Basalt-plastic material is magnetic-energetic, is not affected by a magnetic field, does not change its inherent properties, and is not electrically conductive.

The product made of basalt plastic retains its original dimensions throughout the entire service life, does not change its properties under the influence of low temperatures. The material has a low thermal conductivity, unlike steel reinforcement.

Basalt insulation. Materials based on basalt fiber have gained great popularity today. And it is not surprising, because this product has high physical and chemical properties compared to mineral wool. That is why it is used as thermal insulation materials for flat, inverted and pitched roof insulation, floor insulation, walls, facades, three-layer sandwich panels, water supply and heating systems, providing high-quality and durable thermal protection. Moreover, this material has become simply indispensable for the insulation of electric and gas stoves, power units and technical pipelines of large diameter.

Research methodology. According to the Ukrainian laboratory, 1990, the industry requirements for basalt raw materials for the production of fibers are as follows:

- raw materials must be fusible, homogeneous in terms of structure and texture;
- stable in material composition;
- practically does not contain silica minerals, iron-containing and magnesian minerals, as well as minerals rich in phosphorus and sulfur.

Analysis of the quality of the tested raw materials showed:

- the best are aphyric weakly crystallized basalts with basic plagioclase (albitization is excluded);
-Hydrothermally altered rocks (quartz, carbonates are not allowed) are not suitable for the conditions as raw materials; the presence of free quartz slows down the melting process, and carbonates, as well as secondary chlorite, epidote, cause strong gas evolution during fiber production;
- the content of MgO should not exceed 7.5%, because its increase worsens the crystallization properties of the melt due to the increase in the upper limit of crystallization;
- high losses on ignition are not allowed, i.e. the rock must be relatively fresh, this affects the rate of its melting

Industry requirements for chemical and granulometric the composition of the raw material.

Name indicators %	RST Ukrainian SSR 5020-80 raw materials from rocks for the production of staple fibers (technical specifications)	TU 21 Ukrainian SSR 410-86 raw materials from rocks for the production of superfine staple fibers	TU 21 GSSR 137-84 raw materials from rocks for the production of continuous fiber	Specifications of SATBIC (China) raw materials from rocks for the production of continuous fiber
SiO_2	43,0-51,0	46,0-52,0	47,5-52,5	52,0-54,5
Al_2O_3	11,0-17,0	13,0-18,0	14,0-18,0	14,0-16,3
FeO	10,0-18,0	8,0-15,0	7,0-13,5	4,5-5,5
Fe_2O_3				3,5-4,5
CaO	8,0-13,0	6,5-11,0	8,0-11,0	8,0-9,0
MgO	4,0-12,0	3,5-10,0	3,5-8,5	6,5-7,5
K_2O	2,0-5,0	2,0-6,0	2,5-6,0	0,7-1,6
Na_2O				3,0-3,5
TiO_2	0,2-1,6	0,5-2,5	0,2-2,0	1,3-1,6
MnO no more	0,40	0,50	0,2	Not regulated
SO_3 no more	1,0	0,50	0,2	
п.п.п. no more	3,0	5,0	4,0	
Granular composition of rocks, mm	3,0-40,0	3,0-40,0	5,0-40,0	

The content of calcium and iron oxides is overestimated compared to the reference deposits, the results of the analyzes do not show the contents of Na20, K20.

It should be noted that one of the main indicators of the suitability of basalt fiber, along with physicochemical, mineralogical, geochemical, petrographic and other properties, is the acidity modulus:

$(SiO_2+ Al_2O_3)/(CaO+ MgO)$

Moreover, the higher the acidity modulus, the more resistant the fiber to the effects of water and moisture and, therefore, the more durable. However, an increase in the acidity modulus due to an increase in SiO2 + Al2O3 leads to an increase in the melting temperature, an increase in the viscosity of the melt, and a decrease in the productivity of the smelting of the final product. It has been experimentally established that the acidity modulus should be at least 1.5-1.8%, and for basalt one-component charges it can rise up to 4.0% and sometimes up to 5.5-7.0%.

RESULTS OF THE ANALYSIS AND THEIR DISCUSSION.

On the territory of the Republic of Uzbekistan, basalts are distributed in the following parts of it.

The Republic of Karakalpakstan - on the territory of the Sultanuvais mountains, 3 objects of basalt raw materials suitable for industrial development are known. The occurrence of amphibolites Sultanuizdag, studied by Popov in 1961, is located in the Beruni region, 110 km southeast of the city of Nukus, 35 km east of the Karatau pier and 8 km north of the Nukus-Turtkul highway, 8.5 km north of the village Saksonbir.

Gabbro and amphibolites of this manifestation are developed over an area of more than 20 km2 and stretch in a strip 1-1.5 km wide along the axial part of the ridge; occur among shales and marbled limestones of the Karakuduk, Beshmazar and Dzhamansay formations of the Devonian. Amphibolites and gabbro are connected by mutual transitions, their contacts are indistinguishable to the naked eye..

According to genetic features, amphibolites of Sultanuizdag are divided into:

1. Paraamphibolites are melanocratic and plagioclase amphibolites formed as a result of metamorphism of basic effusive rocks.

2. Orthoamphibolites are massive leucocratic rocks formed from metamorphosed basic intrusive rocks with a composition similar to gabbro.

The rocks are quite homogeneous in terms of chemical composition. The content (in %) of the main components in paraamphibolites varies within the range of p.p.p. are 1.26-2.14.

When comparing the data required by SATBIC (China) for the chemical composition of the main components of rocks of the basalt group with those rocks located in the Sultanuvais (Berkutau) mountains, in general, good convergence is noted for basic oxides.

Comparing the above data with the requirements of SATBIC (China) (table), it can be concluded that the content of silica and alumina for stone casting is within

acceptable limits for the Berkutau site. The content of the sum of iron oxides and carbonates slightly exceeds the limits, however, their values during technological tests do not adversely affect the quality of the final product obtained from basalts. Conclusion - the most suitable in terms of their values to the requirements of SATBIC (China) of the chemical composition of the rocks are basalts, andesite-basalts of the Berkutau site.

Jizzakh region - The Madaniyat area is located at the eastern end of the Koitash mountains, 9 km northwest of the city of Jizzakh and 3 km southeast of the village of Sasyk.

Basaltoid rocks, represented by diabase porphyrites, form dike-like bodies in the schist sequence of the Lower Silurian. Inferred resources are estimated from dike No. 1. Diabase porphyrites are cryptocrystalline, massive, composed mainly of labrodor. The cracks show iron oxides: goethite and ocher.

Samarkand Region - The Aktash area of development of basaltoid rocks is located on the northern slope of the Zirabulak mountains in the Narpay district of the Samarkand region, 35 km northwest of the city of Nurobod. The rocks are represented by basaltic porphyrites forming sill-like bodies among the shales of the Katarmai Formation. The predicted resources are estimated from a large body traced along the strike for 3 km, the dip is relatively steep ~ 65°, with a thickness of 10 to 35 m.

Acidity module of basalt raw materials in Uzbekistan

Object, Sample No.	$(SiO_2+ Al_2O_3) / (CaO+ MgO)$
Berkutau basalts (Sultanuvais)	6,4
Madaniyat (Jizzakh)	3,85
Aktash (Samarkand)	3,67

Chemical composition of basalt raw materials in Uzbekistan

Object, Sample No.	Chemical composition (in%)								
	SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	TiO_2	Na_2O	K_2O
Berkutau basalts (Sultanuvais)	53,1	14,6	8,5		6,7	3,9	0,7	3,9	1,7
Madaniyat (Jizzakh)	46,0	11,21	15,35		8,93	5,92	2,95	0,86	0,4

Aktash (Samarkand)	55,6	16,4	11,2		12,1	7,5			

In search of basalt raw materials, geological work is being carried out in many parts of the country, including in Berkuttau. Here we also consider data from Madaniyat and Aktash. It should be noted that the results of analyzes and technological studies at the Berkuttau site show that here the basalt raw material meets all the requirements for this raw material.

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