



Determination of the Physical-Chemical and Mineralogical Composition of the Vermiculite Sample of Tebinbulok Mine

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Annotation: In this article, 100 g of vermiculite sample was extracted and ground into powder in a vibratory mill. Then the sample was fired in a crucible casting furnace at a temperature of 400°C for 20 minutes. The fired sample was removed from the oven and placed in three separate special molds without cooling. Samples in the form of cooled tablets are installed in the working chamber of the THERMOFISHER - ARL Perform'X X-ray fluorescence spectrometer and chemical analysis is performed using a special program.

Keywords: Vermiculite sample, cooling, into powder, ground, chemical analysis, casting furnace.

Introduction: Vermiculite is a naturally occurring mineral of the hydromica group with a layered structure that is silvery, yellowish, or golden-yellow, and rarely brown. The reason why this mineral is called "vermiculite" (Latin "vermiculite" - "worm") is that at high temperature, it expands sharply, like a grain of corn, increases its volume by 10-15 times, and due to the decrease in density, it becomes light like a pea or worm-shaped pod.

Vermiculite mineral has the characteristic of increasing the temperature up to 15 times from its initial volume when subjected to thermal effects in the temperature range of 400-1000 °C. Vermiculite is not primarily mined as a raw material, but is widely used in industrial, agricultural and construction industries. Expanded vermiculite is also called "zonolite".

In the Republic of Uzbekistan, vermiculite ore was found only in the Karaozak district of Karakalpakstan (70 km from Nukus), and other deposits of vermiculite ore have not yet been identified by geologists. This makes it an important task for researchers to develop and implement the most rational, technological and economically optimal technologies for using vermiculite raw materials from the Tebinbulok mine, which is currently considered the only one in the republic.

The rest of the vermiculite ore grains of the Tebinbulok mine include hydrobiotite varieties of vermiculite with a size of 30-40 mm. In appearance, vermiculite ore has silver and gold hues. The average density of vermiculite ore with an average moisture content of no more than 2% is 2200-2300 kg/m³. At the moment, several enterprises are engaged in the mining and processing of vermiculite raw materials in the Tebinbulok mine under a special license. The founder of "Triumph Vermiculite" LLC, engaged in mining and processing activities in the Tebinbulok vermiculite mine, is "Triumf Gorniyak" LLC, registered in Navoi region. "Triumf Gorniyak" LLC has two separate production sites in the industrial zone of Navoi region for the deep processing of its vermiculite,



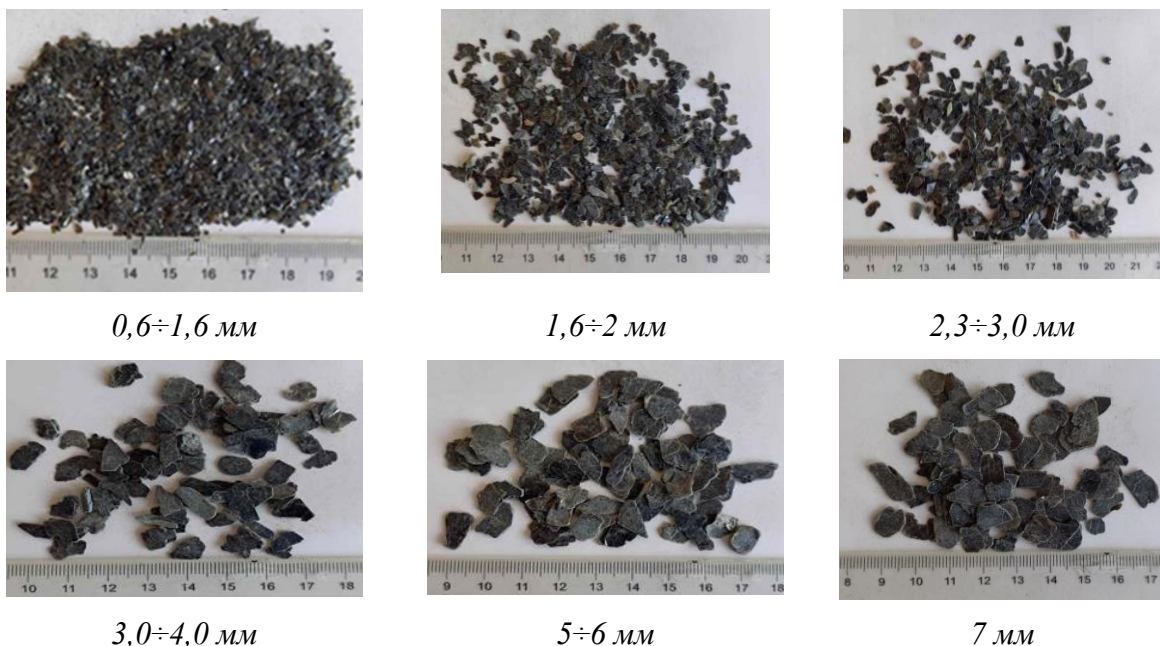
including the production of vermiculite plates and biodegradable pots with vermiculite for growing seedlings in greenhouse conditions.

"Triumpf Vermiculite" LLC is engaged in mining and preliminary processing of vermiculite raw materials in the Tebinbulok mine, and the mined vermiculite ore is enriched in several stages on a special technological line, and vermiculite concentrate in several fractions as a finished product is delivered to its founder, "Triumpf Gornyak" LLC (Navoi region) and vermiculite concentrate is multiplied there, and other finished products are made on the basis of multiplied vermiculite, including vermiculite light heat protection plates.

Based on the technology available at the enterprise, vermiculite ore is divided into the following fractions according to the silver or gold color when crushed: silver color concentrate: $0.6\div 1.6$ mm; $1.6\div 2$ mm, $2.3\div 3.0$ mm; $3.0\div 4.0$ mm; 5mm; 6 mm; 7 mm. The golden vermiculite concentrate is divided into fractions of $0.8\div 1.6$ mm and $1.6\div 2.2$ mm. Vermiculite concentrate obtained from the Tebinbulok mine meets the requirements of grades 100, 150, 200, 300 according to GOST 12865-87 "Multiplied vermiculite" with high temperature expansion.

In research work as well. The enterprise also used several vermiculite concentrates with small, medium and large grain sizes obtained by grinding and enriching vermiculite raw materials (Fig. 1):

Silver vermiculite concentrates



Golden vermiculite concentrates



Figure 1. Grinding from Tebinbulok vermiculite mine ore and to different grain sizes obtained by beneficiation silver and gold vermiculite concentrates



In the research work, the chemical composition of vermiculite concentrate was determined on a modern THERMOFISHER-ARL Perform' X type X-ray fluorescence spectrometer in the laboratory of the "Jizzakh Cement Plant" enterprise (Fig. 2a).

For this purpose, 100 g of vermiculite sample was taken out and ground into powder in a vibratory mill. Then the sample was fired in a crucible casting furnace at a temperature of 400C for 20 minutes. The fired sample was removed from the oven and placed in three separate special molds without cooling. Samples in the form of cooled tablets are installed in the working chamber of the THERMOFISHER - ARL Perform'X X-ray fluorescence spectrometer and chemical analysis is performed using a special program (Fig. 2b).

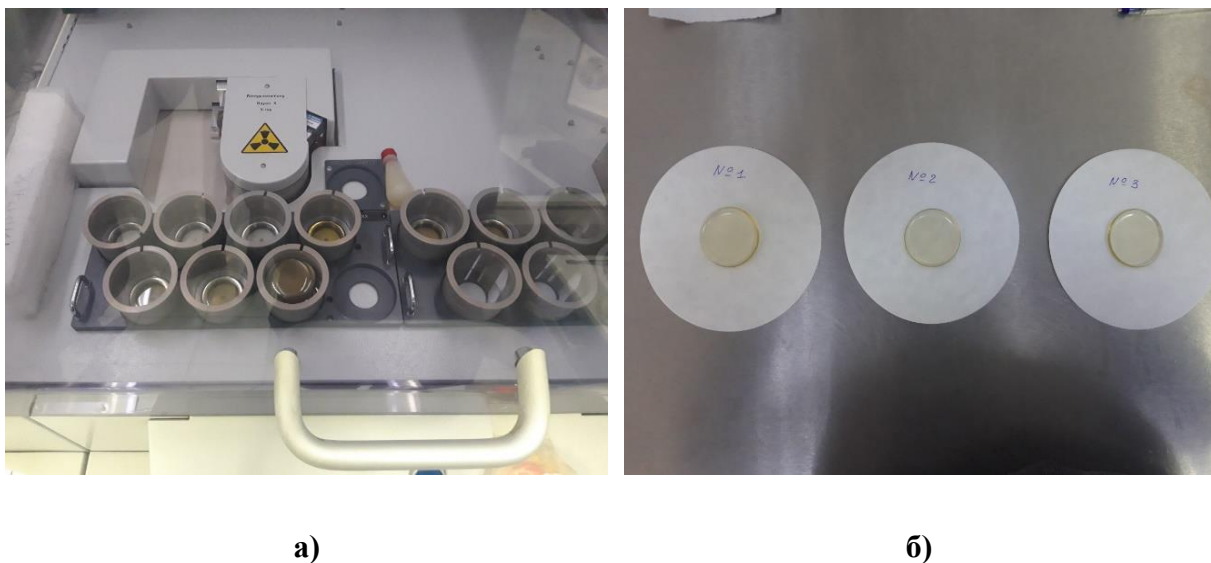


Figure 2. Determination of the chemical composition of vermiculite concentrate preparation of samples for

The chemical composition of Tebinbulok vermiculite concentrate used as raw material in the research is presented in Table 1.

Table 1. Enriched Tebinbulok vermiculite concentrate chemical composition

№	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	SO ₃	Na ₂ O	K ₂ O	TiO ₂	Mn ₂ O ₃	К.м.й (IIIII)
1.	35,7	14,5	12,41	3,7	14,82	0,12	0,00	5,51	1,34	0,141	4,77
2	36,2	14,38	12,81	3,5	14,55	0,10	0,00	5,96	1,35	0,139	4,75
3	36,4	14,41	13,09	3,87	15,33	0,11	0,00	5,6	1,36	0,139	4,74
Ўпр.	36,08	14,43	12,77	3,69	14,90	0,11	0,00	5,69	1,35	0,1404	4,75

Summary:

From the data presented in Table 1 above, it can be seen that the studied vermiculite sample contains SiO₂ - 35.7-36.2; Al₂O₃ – 14.5; Fe₂O₃ – 12.77-13.1; CaO - 3.5-3.7; MgO – 14.55-15.33 and K₂O – 5.5-6.0 % are available. Due to the presence of moisture in the sample and the presence of various organic and volatile substances, the amount of losses during casting is on average 4.7%.

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