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Extraction of Montmorillonite From Bentonites of the Navbakhor Mine

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ABSTRACT: The article presents analyzes of the study of the mineral bentonite of the Navbakhor region and the substance montmorillonite included in its composition. The experiment was carried out in 50 grams of bentonite and 5 liters of distilled water. The results obtained showed that the composition of the synthesized montmorillonite exceeded the percentage of substances such as Al, Ca, Na, K, Mg, Fe, Fe, Ti, P, Cu, Zn found in bentonite.

KEYWORDS: Bentonite, montmorillonite, sorbent, cation, crystal lattice.

I.INTRODUCTION

In recent years, natural bentonite clays have been used throughout the world in animal husbandry, agriculture, water management, food processing, pharmaceuticals and petrochemical industries [1]. In the Republic of Uzbekistan, research work is being carried out to study the physical and chemical properties of mineral resources for use in production. To date, a number of measures have already been implemented aimed at solving this general problem, among which a large place belongs to the production of montmorillonite from bentonite clays of the Navbakhor deposit.

This article examines the production of montmorillonite from bentonite clay of the Navbakhor deposit and the study of the possibility of its use as a sorbent for water purification produced by Navoiyazot JSC.

Based on the results of numerous studies, bentonites have been established to play an important role among non-metallic fossils [1,2]. The most important component of bentonites is montmorillonite. They are characterized by a high cation exchange capacity - from 60-100 mEq/100 g to 80-150 mEq/100 g [1-3]. When interacting with water molecules, the crystal structure of montmorillonite expands, allowing inorganic and rather large organic ions to penetrate there. This process is reversible, like any ion exchange process.

Montmorillonite is the main clay mineral in the group of bentonites or "freshwater gels" and the most common mineral in the group of minerals called smectites. It consists of an octahedral aluminum-oxygen layer sandwiched between tetrahedral silicon-oxygen layers, the vertices of which are turned towards the inner layer. The upper and lower planes of the elementary packets of montmorillonite are covered with oxygen atoms, so the connection between the packets is weak (only van der Waals or intermolecular forces act) [4-5]. In this regard, molecules of water or other polar liquids can freely penetrate between montmorillonite packets (Fig. 1).

II. SIGNIFICANCE OF THE SYSTEM

The article presents analyzes of the study of the mineral bentonite of the Navbakhor region and the substance montmorillonite included in its composition. The study of methodology is explained in section III, section IV covers the experimental results of the study, and section V discusses the future study and conclusion.

III. METHODOLOGY

The crystal lattice of montmorillonite can vary from 0.92 nm, when there are no water molecules between the packets, to 14 nm, and in some cases until the packets are completely separated. The most important feature of the montmorillonite crystal lattice is the replacement of 1/6 of the aluminum atoms in the middle layer with magnesium atoms, which occurred during the formation of clay. Due to the replacement of Al^{3+} with Mg^{2+}, an unsaturated valency arose, i.e. an excess negative charge was created in the lattice. When millions of years ago such particles eventually found their way into bodies of water (montmorillonite is formed during the decomposition or weathering of volcanic ash), to

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compensate for the negative charge, they adsorbed Na^+, K^+, Ca^{2+}, Mg^{2+} cations from the environment, which were located in the interpacket space of montmorillonite.

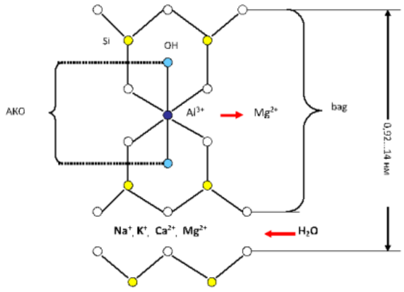

Figure 1. - Diagram of the crystal lattice of montmorillonite

Montmorillonites of the Navbakhor deposit. physical and chemical properties of bentonite clays, physical and chemical methods for studying the properties of mineral and chemical composition, IR spectra, DTA and standard methods of chemical analysis.

Pink bentonite clay from the Navbakhor deposit in the Navoi region was used for production. To isolate the sodium form of enriched montmorillonite, natural clay is first crushed in an impact mill at a grinding rotor speed of 22 thousand rpm for 30 minutes. Next, 500 g of dispersed clay is suspended in 5 liters of distilled water, intensively mixed for 10 minutes and left for sedimentation of microheterogeneous particles of non-clay materials - sand and other components - for 20 hours. Then the top layer of the suspension is separated by decantation and the colloidal-dispersed fraction of montmorillonite is separated from it by centrifugation according to the procedure.

IV. EXPERIMENTAL RESULTS

Therefore, it is of interest to study the chemical composition of bentonite clay and the production of montmorillonite from bentonite clays of the Navbakhor deposit, determined by the chemical composition that corresponds to the works of previous authors [2-3] (Table 1).

Table 1.
Chemical composition of the initial bentonite clays of the Navbakhor deposit

№	Indicator name	Montmorillonite deposit	
		Alkaline bentonite clay	Alkaline earth bentonite clay
1.	SiO_2	57,37	56,23
2.	Al_2O_3	13,69	13,56
3.	CaO	0,48	0,69
4.	Na_2O	1,53	0,98
5.	K_2O	1,75	2,20
6.	MgO	1,84	3,76
7.	Fe_2O_3	5,10	6,50
8.	TiO_2	0,35	0,61
9.	CO_2	1,68	0,20
10.	SO_3	0,75	0,21
11.	P_2O_5	0,75	0,49
12.	H_2O	5,05	7,31
13.	Water Rast. Salts	1,83	2,76
14.	P	16,71	14,06

As can be seen from Table 1, practically bentonite clay contains oxides of iron, calcium, sodium, magnesium, titanium and water-soluble salts. Therefore, it shows that it is possible to obtain or separate montmorillonite from bentonite clays.

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Obtaining mass determination by chemical analysis in the Spektrofotometer “UV-2600 Shimadzu” device, which is presented in table. 2 and fig.2

Table 2.
Chemical analysis of original bentonite clay and synthesized montmorillonite.

№	Indicator name	Bentonite clay	Synthesized montmorillonite
1.	Si	62,0	62,5
2.	Al	13,6	12,9
3.	Ca	2,67	2,98
4.	Na	1,53	1,98
5.	K	4,44	5,53
6.	Mg	1,84	3,76
7.	Fe	11,9	12,3
8.	Ti	1,75	1,83
9.	P	1,35	1,21
10.	Cu	0,0132	0,0157
11.	Zn	0,0264	0,0304

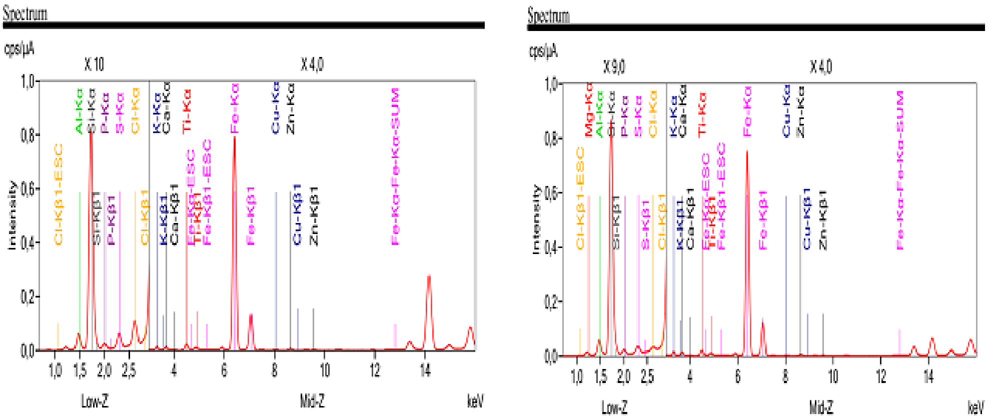

Figure 2. Chemical analysis of the original bentonite clay and synthesized montmorillonite.

From the results of chemical analysis in Table 2 and Figure 2, the colloidal dispersed phase of montmorillonite was isolated from the supernatant by dissolution of finely ground Navbakhor bentonite in water, sedimentation of microheterogeneous particles of sand and rocks from it, followed by centrifugation from the supernatant.

V. CONCLUSION AND FUTURE WORK

The results of the study are the structure and areas of use of montmorillonite and the method of obtaining montmorillonite from bentonite clay of the Navbakhor deposit. Obtaining the initial bentonite clay and synthesized montmorillonite determination by chemical analysis in a Spektrofotometer “UV-2600 Shimadzu” device.

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