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X-RAY AND ELECTRON MICROSCOPIC (SEM) STUDIES OF NATURAL MINERAL SORBENTS

Murodov Malikzhon Negmurodovich[1], Hojiyeva Ruxsora Baxtiyorovna[2]

[1]Bukhara Engineering Technological Institute, Department of Oil Refining Technology, Candidate of Technical Sciences, Senior Lecturer

[2]Bukhara Engineering Technological Institute, Department of Oil Refining Technology, Assistant

ANNOTATION

The increasing importance of petroleum oils for the reliable operation of machines, mechanisms and various equipment, increasing requirements for them and their further tightening makes it necessary to develop and introduce new technologies that allow obtaining high-quality petroleum oils, prolong their service life by regeneration, and introduce cleaning methods into technological processes (additional treatment), in particular with the use of local natural mineral sorbents of new deposits such as the Navbakhor deposit of bentonite clays.

For the industrial development of a new deposit, the reserves of which are large, it is necessary to comprehensively study it using a complex of physicochemical research methods.

KEY WORDS: ***adsorbent, natural mineral sorbents, bentonite, petroleum oils, X-ray X-ray, structural analysis.***

Аннотация

Возрастающее значение нефтяных масел для надежной эксплуатации машин, механизмов и разнообразного оборудования, повышение требований к ним и дальнейшее их ужесточение вызывает необходимость разработки и внедрения новых технологий, позволяющих получать высококачественные нефтяные масла, продлевать сроки их службы путем регенерации, вводить в технологические процессы методы очистки (доочистки), в частности с использованием местных природных минеральных сорбентов новых месторождений как Навбахорского месторождения бентонитовых глин.

Для промышленного освоения нового месторождения, запасы которого велики необходимо его всестороннее изучение с использованием комплекса физико-химических методов исследования.

Ключевые слова: адсорбент, природные минеральные сорбенты, бентонит, нефтяные масла, рентгенрентген, структурный анализ.

INTRODUCTION

Natural mineral sorbents, widespread in Uzbekistan [1-3], are mostly associates of clay and other minerals. These include montmorillonite (bentonite), palygorskite, attapulgite, sepiolite, zeolite, bauxite, tripoli, diatomites, opokas and similar varieties of sedimentary, volcanic and other rocks. Montmorillonite is predominant in PMS.

The structure of the atomic lattices of the PMS (Fig. 1) is based on a combination of two structural elements, the first of which consists of two layers of closely packed oxygen atoms or hydroxyl groups with

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aluminum, iron and magnesium atoms between them in octahedral coordination, and the second - of two silicon-oxygen tetrahedra. In the first (I), the structural elements of the metal atoms are at an equal distance from six oxygen or hydroxyl atoms, and in the second (II), silicon atoms are equidistant from four oxygen or hydroxyl atoms, depending on the requirements for the balance of the structure formed by tetrahedra with silicon atoms in their centers ...

I)

II)

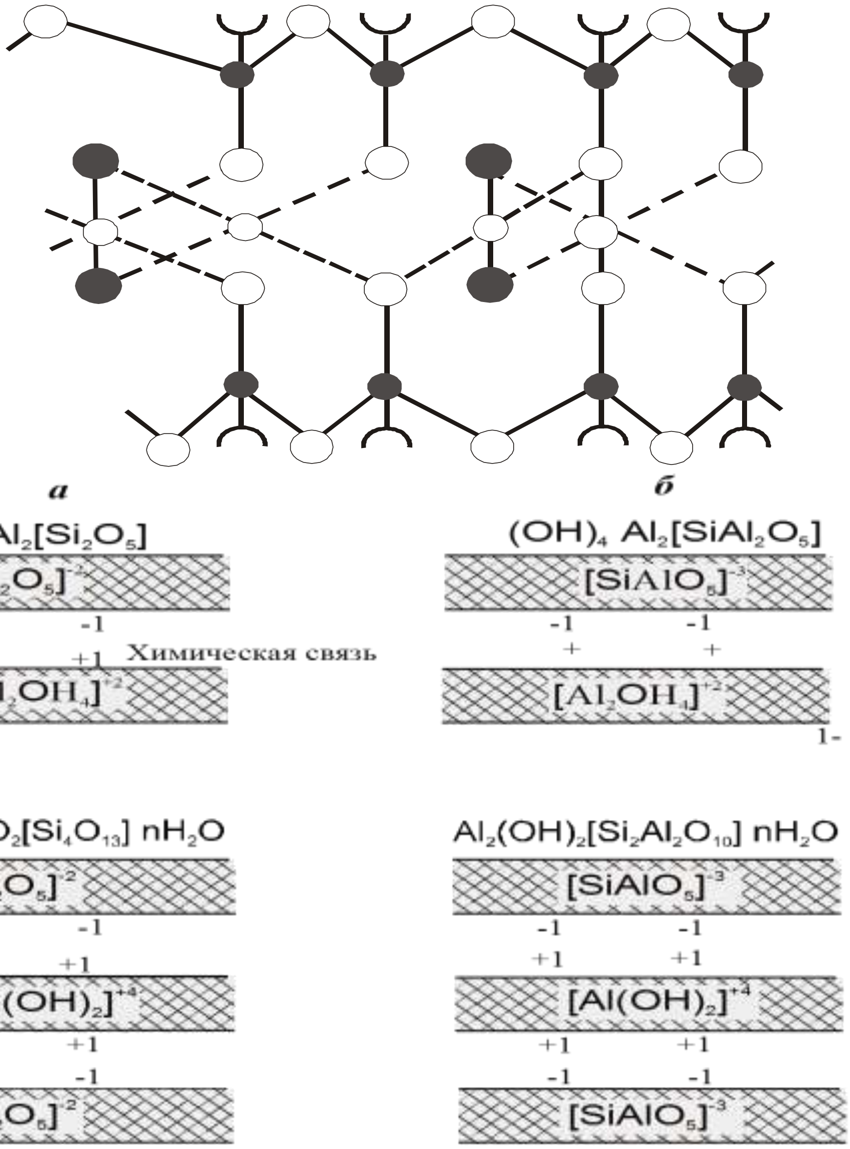

Fig 1. The structure of the atomic lattices of the PMS

I. Structure of atomic lattices of natural mineral sorbents
II. Crystal chemical structure of two - (a) and three-layer (b) types
crystal lattice of clay minerals without

(I) and taking into account
(II) (II) isomophoric substitution.

A different set of these layers, composed of structural elements, forms a crystal lattice of minerals. Adsorbents, in particular PMS, are widely used in various sectors of the national economy as dryers, for separation of mixtures of substances, gas regeneration, purification, etc. A lot of literature is devoted to these phenomena.

Characteristics of local natural mineral sorbents in Uzbekistan. The Navbahor bentonite clay deposit was discovered in 1998 [4]. Exploration work on it has been completed, the reserves are approved by the State Reserves Committee of the Republic of Uzbekistan and it is prepared for industrial development.

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The material composition of bentonite clays was studied by the authors [4] by complex laboratory methods (chemical, thermal, electron microscopic and X-ray structural analyzes), the total exchange capacity of absorbed bases, the ratio of exchangeable cations were determined, and the physicochemical properties were studied. Based on the results of laboratory studies, in the section of the productive stratum of the field, alkaline and alkaline-earth varieties of clays have been identified, which differ greatly in their physicochemical properties from each other. The bentonite number (swelling capacity) of alkaline bentonites in the samples ranged from 42 to 86, an average of 79 ml. Colloidality varied from 45 to 90.6, an average of 80.5%. These indicators in alkaline earth bentonites are much lower than in alkaline ones and are on average 41 ml and 51%, respectively.

The objects of our research were alkaline bentonites.

The chemical composition of the sample determined by us gave the following results (given below).

Chemical composition (mass,%)

SiO_2	Al_2O_3	Fe_2O_3	Na_2O	K_2O	MgO	CaO	P_2O_5	TiO_2	FeO	Ппп
54,20	11,78	9,29	3,36	2,53	1,77	1,34	0,15	1,37	-	14,21

As can be seen from the above data, the main oxide in the mineral is silicon oxide (54.20 wt%), the content of coloring oxides is also significant: Fe2O3 - 9.29 and TiO2 - 1.37; aluminum oxide - 11.78% of the mass. Based on the studies carried out, it can be said that the sample under study is composed of montmorillonite.

X-ray examination. The study was carried out using a DRON-3M X-ray diffractometer with monochromatic CuKa radiation at a voltage of 25 kV and a current strength of 14 mA. The survey was carried out on reflection in the range 20 = 10-500. Scanning electron microscopic studies [5] were carried out on an REM-200 device. Silver was preliminarily deposited on the samples in a VUP-4K vacuum station with simultaneous rotation.

In the studied sample of bentonite (Fig. 1.), as shown by X-ray data, a large number of maxima are observed, which reflects the complex crystalline layered structure of clay [6-10]. SiO2 with characteristic reflections 2 = 210, 270, 36.60 and 39.50 prevails. (most intense reflexes). For AI2O3, the most characteristic reflections are at 2 = 29.60, in the range 42-440 and 47-500.

Fig. 2. Electron microscopic data of samples of initial bentonite

(X-ray and microscopic studies were carried out at the Institute of Chemistry and Physics of Polymers of the Academy of Sciences of the Republic of Uzbekistan, for which the author is grateful to M.S. Ruzimuradov O.)

Conclusion: SEM studies show that the particles of the initial bentonite themselves have a granular structure and at high magnifications have a geometric shape, which corresponds to the crystalline nature of bentonite.

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