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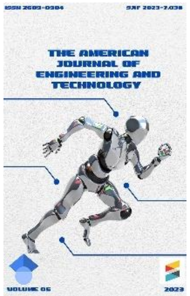

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Research Article

STUDYING THE COMPOSITION OF LOCAL RAW MATERIAL SAPONITE MINERAL RICH IN MAGNESIUM OXIDE AND RECOVERING CHLORIDE-CHLORATE FROM IT

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ABSTRACT

One of the saponite sand deposits in the territory of Uzbekistan is Uchtut, located in the Central Kyzylkum plains of the Navoi region of the Republic of Uzbekistan. It was determined that the main layer of saponite is 1.7-1.9 m apart in some places, 10-15.0 cm thick (40-60% saponite), and in some places it is in the form of two layers. 15.0-20.0 cm (20-40% saponite). The mineralogical composition of saponite obtained from the Uchtut deposit was studied by chemical, X-ray phase, IR spectroscopic, differential thermal analysis, as well as gamma-spectrometric methods. The main mineral in the deposit is saponite, which is a multi-purpose mineral raw material and has been found to contain high levels of magnesium and calcium. The saponite mineral was roasted in a muffle furnace at different temperatures. The cinder was leached in three different percentage solutions of acid, as a result, magnesium chloride was obtained by roasting the saponite mineral at a temperature of 600-800°C, and leached using the hydrocloric acid decomposition method, and in the next step by treating it with ammonium dihydrogen phosphate.

KEYWORDS

Saponite, calcite, montmorillonite, quartz, magnesium, muffle stove, magnetic stirrer.

INTRODUCTION

Kyzilkum, Navoi region of the Republic of Uzbekistan, is rich in mineral resources, which contain a large amount of chemical elements of the periodic system. Among them, Kyzylkum phosphorites, Uchtut

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dolomites, bentonites, marbles, gypsum and many other minerals were gradually exploited on an industrial scale. Currently, exploration works are being continued for the purpose of comprehensive development of new mines. In the Republic of Uzbekistan, there is a certain demand for magnesium-retaining minerals, such as saponites.

Saponites are complex mineral raw materials and are valuable commercial products widely used in various industries. They can be used for granulation of iron ore concentrates in foundry and metallurgy, lubricants for metal rolling, ceramics in construction, expanded clay, drilling and grouting slurries and plasticizers, in the oil and oil refining industry for quality improvement and recovery. Fuel-lubricants, desulfurization oil, for the production of drugs in the chemical industry, medicine and pharmacology for the treatment of waste, as well as for the purification of liquid organic media and drinking water in the food industry, in light and other industries. Production of paper and weights for gasification, production of catalysts and fillers, production of complex mineral additives for feeding and increasing productivity of grains and vegetables in agriculture, decontamination of soil, purification of liquid food products, as an ameliorant in the production of light porous fillers, biomineral fertilizers and in the production of ceramics, the native saponite studied and its complex properties are poorly studied.

One of the saponite sand deposits in the territory of Uzbekistan is Uchtut, located in the Central Kyzylkum plains of the Navoi region of the Republic of Uzbekistan. It was determined that the main layer of saponite is 1.7-1.9 m apart in some places, 10-15.0 cm thick (40-60% saponite), and in some places it is in the form of two layers. 15.0-20.0 cm (20-40% saponite).

The purpose of this work is preliminary mineralogical and technological studies to study the saponite sands of the Uchtut mine and to determine the areas of its practical application. Several saponite samples were taken from the Uchtut mine in the Navoi region for research. These samples were ground on a Retsch RM 200 mobile analyzer. Crushed saponite ores were sieved to a size of 0.02-4.0 mm in an AS 200 laboratory device.

Based on the above, the composition and properties of saponite were determined by chemical and physicochemical methods. In order to determine the chemical composition of saponite using the EDX-7000 device, 10 grams of crushed ore were selected and the results of semi-quantitative analysis were obtained. given in the table.

№-elements	The amount of elements in the mineral saponite (%)									
	Ca	Si	Fe	Mn	Sr	Cu	Ti	V	K	Organic mix
№1 – top layer	76,0	12,1	8,8	0,14	0,11	0,05	0,7	0,02	1,40	0,68
№2 – bottom layer	75,3	13,2	8,9	0,13	0,11	0,05	0,7	0,02	1,46	0,56

X-ray diffraction analysis was carried out on a DRON-UM1 X-ray diffractometer with two Soller slits with filtered CoKa radiation at a scanning speed of 1°/min. Identification of the phase composition was carried

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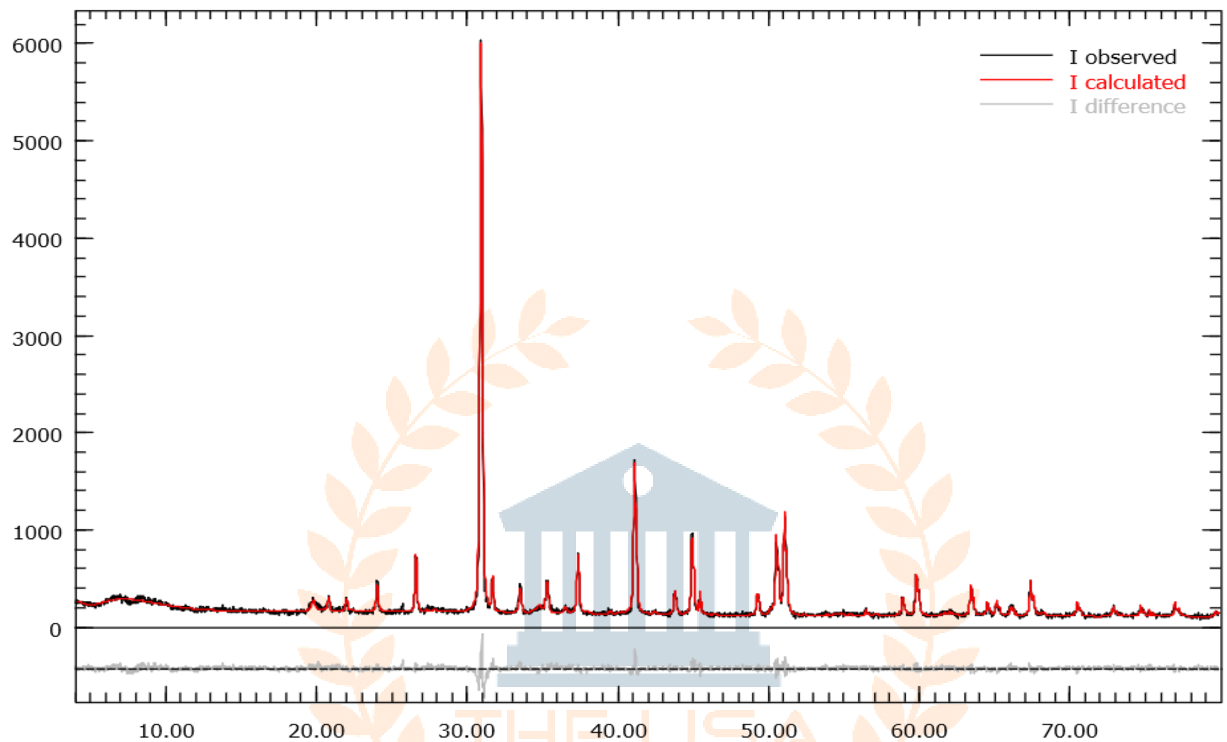
out in accordance with the ASTM card index and works [9-11]. The results showed the presence of the following minerals in the composition of saponite: Saponite + montmorillonite - 75.66%, quartz - 4.93, illite - 7.11%, dolomite - 5.2%, calcite-1.9%, sodium chloride -1.5, hematite - 1.7%, rutile -1.0%, anatase -1.0%



Picture.1 X-ray of mineral saponite

Differential thermal analysis (Fig. 4) was carried out in the temperature range of 20-800 ° C on a Q-1500 derivatograph manufactured by MOM (Hungary). The oven heating speed is 10 °C/min. Synthetic sapphire was used as a reference. The mass loss of the studied saponite sample when heated to 1000 C° is 10.22%. Endoeffects correspond to the beginning of constitutional water removal of minerals in the range of 160-330 C. A further increase in temperature is also accompanied by dehydration of minerals-impurities. A wide, shallow endothermic effect at 330-775 C° is associated with the superposition of the effect of polymorphic transformation of quartz, the beginning of decarbonization of calcium minerals. At 775-935 C°, the rate of weight loss increases significantly in the area of decomposition of carbonate minerals, while the weight loss of 9.11% of the sample is mainly due to the intensive decomposition of calcite.

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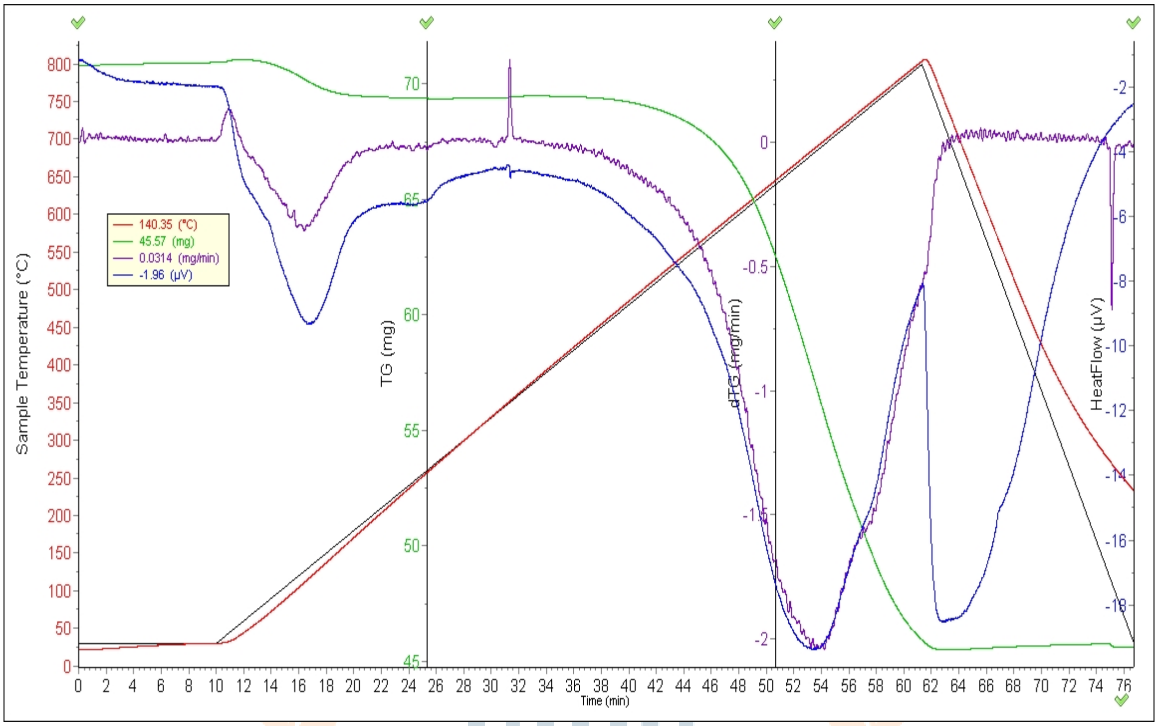

Picture.2

The researches we obtained during the experiments show that when the saponite mineral was burnt in a muffle furnace step by step at different temperatures, the appearance of the mineral turned white and its mass decreased.

	Mineral size (mkm)	Burn time (min)	Initial weight (g)	Mass loss %				
				600°C	650°C	700°C	800°C	900°C
1.	2-4	120	100	12.42	20.93	26.63	37.89	42,11
2.	4-8	120	100	13.13	20.18	27.5	38.54	57.62
3.	8-16	120	100	11.8	20.01	27.61	39.45	42.23

As can be seen from the table, it can be seen that the mass loss of 2-4 µm saponite at 6000C is 12.42%, and at 8000C it is 37.89%, which indicates the formation of calcium and magnesium oxides at high temperature. The composition and properties of the produced saponite mineral show that it is a raw material for use in many areas of the national economy. It was studied to form chloride salts by dissolving burnt saponite mineral in concentrated and diluted hydrochloric acid. When we dissolve saponite in it with hydrochloric acid, the following reactions occur.

$MgO + 2HCl = MgCl_2 + H_2O$

$Al_2O_3 + 6HCl = 2AlCl_3 + 3H_2O$

$Na_2SiO_3 + 2HCl = 2NaCl + H_2SiO_3$

These reactions were carried out in a fume hood because chlorine gas could be released during this reaction. A yellow solution is formed in this process. The efficiency of the process of obtaining a solution of calcium and magnesium chlorides by decomposition of saponite with hydrochloric acid largely depends on the rheological properties of solutions and slurry solutions formed at different stages of the process. These properties are necessary to analyze the processes of decomposition of raw materials, to determine the optimal conditions for carrying out the processes.

Ammonium dihydrogen phosphate (NH4)H2PO4 solution was added to the solution obtained from this process. The resulting solution was shaken at 80°C for 20 minutes. In this case, the yellow solution became creamy, the resulting solution was cooled under natural conditions, and it was found that a white precipitate was formed. The white precipitate formed was determined to be magnesium ammonium phosphate.

$MgCl_2 + (NH_4)H_2PO_4 = MgNH_4PO_{4(sink)} + 2HCl$

At the next stage of our scientific work, the process of obtaining magnesium chlorate by treating magnesium chloride and sodium hypochlorite obtained on the basis of local raw material saponite mineral and sodium hypochlorite was studied. It was found that the following chemical reaction took place and the yield of the product was 75%

$MgCl_2 + 2NaClO = Mg(ClO_3)_2 + 2NaCl$

The composition of magnesium chlorate obtained was analyzed using chemical, physico-chemical methods. The presence of ClO3- ions in the composition was analyzed using the permanganometric method, Mg2+ atomic absorption photometry and complexometric methods, and the following results were obtained.

Theoretical composition of magnesium chlorate wt.%: Mg2+ -11.14; ClO3- -55.79; Na+-19.60; The presence of Sl- -10.47 and N2O-3.0%; magnesium chlorate content mass.% obtained practically:

Mg2+ -11.11; ClO3- -55.76; Na+-19.50; The presence of Si- -10.37 and N2O-3.2 was determined. The composition of the synthesized magnesium chlorate was studied by modern physicochemical analysis methods.

It was possible to obtain magnesium ammonium phosphate by precipitation of saponite mineral with ammonium dihydrophosphate (NH4)H2PO4 and to obtain pure magnesium chloride as a result of its processing. This indicates that magnesium chloride can be used for further purposes.

Take 10 grams of saponite mineral and mix 5% HCl solution at 50-70 T for 1 hour using a whisk.

1. 10 g of 8-16 mm Saponite mineral was taken and mixed in 100 g of 5% HCl solution at T°=70° for 1 hour using an Intellel Sterrer 300-I magnetic stirrer (300 min/rev). (As a result of the reaction, the solution boiled).
2. 10 g of 8-16 mm Saponite mineral was taken and mixed in 100 g of 10% HCl solution at T°=70° for 1 hour using an Intellel Sterrer 300-I magnetic stirrer

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(300 rpm). (As a result of the reaction, the solution evaporated and decreased, leaving a solid phase).

A. Saponite mineral was taken from 10 grams and mixed with 5% HCl solution at 40°C using a mixer (400 rpm) for 1 hour. The remaining solution was passed through the filtrate, the liquid phase was 46 ml, pH=5.5, P=1.1 g/ml.

B. Add 10g of Saponite mineral to 100g of 10% HCl solution at a temperature of 40C at 400 rpm. It was dissolved in a magnetic stirrer for 1 hour. We passed the remaining solution through the filtrate, the remaining solution in the liquid phase is 87 ml/l, pH=2, P=1.1 gr/ml.

C. Add 10g of Saponite mineral to 100g of 15% HCl solution at a temperature of 40C at 400 rpm. It was dissolved in a magnetic stirrer for 1 hour. The resulting solution was passed through a filter and the liquid phase was checked. The remaining solution is 85 ml/l, the pH of the solution is strongly acidic pH=1.8, P=1.13 gr/ml.

Mineral size	**Mineral mass**	**HCl solution**	**T°**	**Flame velocity min/rotation**	**Time hour**	**The solution left over from the reaction, the liquid phase that passes through the filter**	**Density of solution p**	**pH environment of solution**	**solubility υ**	**The sediment remaining in the remaining filter after the reaction**
4-8 mm	10gr	5 % 100 g solution	40 °	400 min/**rotation**	1 hour	46 mll	1.1 g/ml	5.5	3.14	1.35 g
4-8 mm	10 gr	10 % 100 g solution	40 °	400 min/rotation	1 hour	87 mll	1.1 g/ml	2	3.26	1.62 g
4-8 mm	10 gr	15 % 100 g solution	40 °	400 min/rotation	1 hour	85 mll	1.13 g/ml	1.8	3.46	3.77 g

CONCLUSION

These studies showed the possibility of obtaining environmentally friendly magnesium compounds on the basis of chemical, x-ray, IR-spectroscopic, differential-thermal analysis, and also gamma-spectrometric methods. As a result, magnesium chloride was obtained by calcining the saponite mineral at a temperature of 600-8000C, using the solyano-acidic decomposition method, and in the next step by treating it with ammonium dihydrogen phosphate.

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