



ISSN: 2350-0328

**International Journal of Advanced Research in Science,
Engineering and Technology**

Vol. 11, Issue 8, August 2024

Mineral Salts of Modern Lakes Kamysbulak And Zhalgyzagach In Central Kyzylkums (Deposits of table salt)

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ABSTRACT: The material provides information about the saline lakes of Central Kyzylkum, describes the history of the area and provides an overview map of the territory, as well as a geological map and sections of lakes Kamysbulak and Zhalgyzagach. The results of analyses of the chemical composition of the waters of the Kamysbulak and Zhalgyzagach lakes are presented. The necessity of carrying out additional geological exploration in this area is justified.

KEYWORDS: mineral salts, geological exploration, geological map, geological section, chemical composition, absolute height.

I. INTRODUCTION

Along with the vast majority of scientists who previously studied this territory, we refer to the Central Kyzylkums as the area of development of Paleozoic uplands in the middle part of the relatively flat sandy desert between the rivers Amu Darya and Syr Darya. Here, on an area of about 10 thousand square kilometers, there are low mountains with a relative elevation of up to 500 m, the absolute height of which reaches up to 922 m. These mountains are elongated in the latitudinal – Kuldzhuktau, Auminzatau, in the northeast - Tamdytau, Aitymtau, and in the northwest – Dzhetymtau, Bukantau directions [1].

The largest mountain ranges stretch for more than 50-60 km, with a width of 10-20 km, which are usually composed of strong Paleozoic rocks. This contributed to the formation of the most significant irregularities of the entire region, which are determined precisely by these geomorphological boundaries.

II. SIGNIFICANCE OF THE SYSTEM

The material provides information about the saline lakes of Central Kyzylkum, describes the history of the area and provides an overview map of the territory, as well as a geological map and sections of lakes Kamysbulak and Zhalgyzagach. 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

On the other hand, within the Central Kyzylkums, these irregularities are determined by the presence of large drainless basins, sometimes having rather steep slopes. The largest basin is located southwest of the Bukantau Mountains. The bottom of the basin below the surrounding plains ranges from 80 m to 120 m. At the bottom of the basin is the lowest point of the area, which has an absolute mark of minus 13x.

The Karakatinsk and Ayakagytmin depressions, the Keriz depression, etc. have significantly smaller sizes. The rest of the Central Kyzylkum, between the Paleozoic uplifts and basins, is a relatively calm sandy, sandy-gravelly or clay plain, only in places complicated by shallow ravines and low gentle elevations up to 200 m. The absolute height of this plain reaches 400 m. The relative elevation of the highest mountains, for example, Tamdytau, reaches 500 m, and the difference between the highest and lowest points is 935 m.

At the bottom of hollows, depressions and depressions, there are salt marshes and salt lakes almost everywhere. All salt marshes and salt lakes are located in the peripheral part of the Kuldzhuktau, Auminzatau and Tamdytau mountain groups. Salt accumulations are located from these mountains as follows: to the east and southeast - in the Karakatinsky and

Agytminsky depressions and in the area of Lake Shorkul, Mullaly, Lyavkan; to the northeast – in the Keriz depression; to the north - on the Beleziksor salt marsh; to.

In all depressions, salt accumulation in the relief is mainly caused by the dryness of the climate. Due to the complete absence of permanent water flows – rivers, the entry of salts into drainless depressions occurs either due to their introduction by temporary flows, or by deep reservoir waters.

IV. EXPERIMENTAL RESULTS

Numerous salt marshes, salt patches and salt lakes are located in the most depressed areas of the Central Kyzylkums. We have studied the largest of them in the following sequence: starting from the southeastern part of the Mullaly Lake area (northwest of the Karatau Mountains), to the north is the Lyavkan lake group, and even further north (northeast of the Tamdyn Mountains) are the salt marshes of the Keriz depression. To the west of the latter (south of the Bukantau ridge) are the salt marshes of Belezik-sor (Lake Tuz-Kuduk), the Mynbulak basin and the Kamysbulak and Zhalgyzagach deposits. Small salt marshes and the Sailaukuduk sulfate deposit are located northwest of the Kuldzhuktau mountains. Finally, south-east and north-east of the same mountains there are quite extensive salt marshes in the area of the Ayakagytminskaya and Karakatsinskaya depressions. Weak salinization is observed on Lake Shor-kul, located 25 km west of the city of Kenimeh [1-2].

Not being able to provide full coverage of all the salt marsh zones surveyed by us within the framework of this article, we will focus below on a brief description of them.

Both deposits are located in the southeastern part of the Mynbulak basin. There are two highways not far from the Aitymskoye field, one 10-15 km west of Kamysbulakskoye, the other almost the same distance east of the Zhalgyzagachskoye field. From these main roads, other slightly less well-traveled roads run along the edge of the salt marshes, within which the above-mentioned salt deposits are located. The distance between the latter is about 10 km. The coordinates of the Kamysbulak deposit are as follows: 41° 55' SSH and 63° 25' VD; Zhalgyzagach – 41° 57' SSH and 63° 32' VD.

To date, the deposits of mineral salts of modern lakes Kamysbulak and Zhalgyzagach in Central Kyzylkum have not been studied enough and, accordingly, information on this topic is somewhat outdated in the scientific literature. Thus, in the works of G. Leonov (1896), there is data on Lake Shingeldy, most likely related to the Kamysbulak deposit. The capacity of the new salt is a quarter of an inch (i.e. about 6 mm).

On the second lake – Zhalgyzagach, according to Leonov, there is a brine with a capacity of 3 vershkas (about 13.5 cm) and a new landing - 2 vershkas (about 9 cm). However, currently, according to the results of our study, the salt capacity exceeds 1.5 m [2].

The Kamysbulak deposit is located in a shallow, almost meridionally elongated depression, the absolute mark of which is 52 m. The width of the depression reaches 3-4 km, and the length is about 7-8 km. From all sides, it is approached by arrays of sand dunes towering over the bottom of the depression by more than 40 m. The western side of the depression is steeper than the eastern one. The root outcrops of greenish Eocene clays, which cover the entire bottom of the depression, are visible here. A salt marsh is developed at the bottom of the depression, in the central part of which there is a large salt deposit. A preliminary survey of this deposit showed that its capacity exceeds 3 m, and its area is about 6 km² [3].

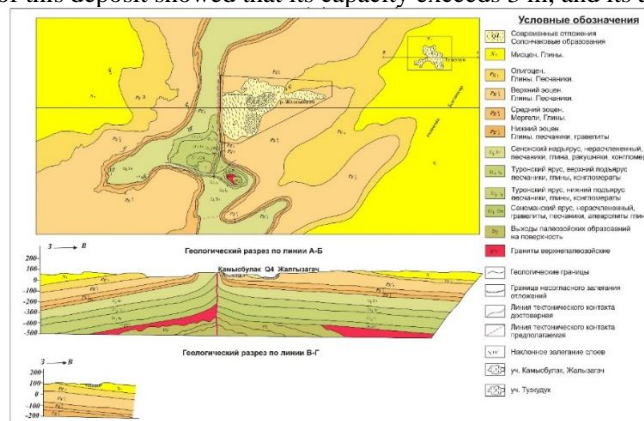


Fig. 2. Geological map of the pre-Pliocene-ancient Quaternary deposits of the part-area of the search for rock salt in the Kamysbulak and Zhalgyzagach sites in the Central Kyzylkums

The chemical composition of the salt deposit contains more than 95% sodium chloride and a little magnesium chloride. The dense brine residue is 253.98 g/l (Table No. 3, sample 1/4). The table salt itself is also quite pure, the insoluble residue in which (see models 1/2 and 1/2/1 in Table No. 1) is about 3%; NaCl – more than 90%; Na₂SO₄ – about 2-3%. Unlike other salt accumulations in the brine of the Kamysbulak and Zhalgyzagach deposits, there is very little bromine (only 8.5 mg/l) and boron (0.8 mg/l), as well as iodine (0.6 mg/l, see).

According to our preliminary estimates, halite reserves at the Kamysbulak deposit reach 20-30 million tons. If a more significant salt capacity is established, they will increase several times more.

The Zhalgyzagach deposit below is located on the northeastern extension of the Kamysbulak salt marsh. This deposit is hypsometrically 17 meters solanchak. Perhaps, during the period of the greatest inflow of water into the Kamysbulak depression, it overflows from the latter through the narrowed zone of salt marshes of the Kamysbulak spring area into the Zhadgyzagach depression.

The Zhalgyzagach depression is surrounded from the north and east by steep cliffs (up to 30 m high) of Eocene clays and other rocks. In the southwest, it receives high steep dunes of loose sand. In the northwest and southwest, through narrow passages, the depression merges with the saline depressions of Kamysbulak and Dzhengeldy-Zhalgyzagach [4-5].

Table 1.
Results of spectral analysis of salts of Central Kyzylkums

№ sample	Brief description of the sample	Detected elements																					
		Si	Al	Mg	Ca	Fe	Mn	Ni	Co	Ti	V	Zr	Cu	Ga	Be	Na	Sr	Ba	K	Li	Rb	Cs	
1	1/2	Halite	0,3	0,06	0,6	0,3	0,006	0,001	-	-	0,001	0,001	-	-	-	More 1	-	-	-	-	-	-	-
2	1/2/1	Halite	0,3	0,06	0,6	0,6	0,1	0,001	-	-	0,006	0,001	-	Less than 0,001	-	More 1	-	-	-	-	-	-	-
3	1/3	Halite	0,06	0,03	0,6	0,6	0,03	0,003	-	-	0,001	0,001	-	-	-	More 1	-	-	-	-	-	-	-

Application: Concentrations of elements are given as a percentage

Table 2.
Chemical composition of water-soluble salts of Central Kyzylkums

№	№№ sample.	Place of capture	Sample definition	Insoluble residue	H ₂ O	Cl		So ₄		Na		K		Ca		Mg		Сумма %
						r/%	г/зкг	r/%	г/зкг	r/%	г/зкг	r/%	г/зкг	r/%	г/зкг	r/%	г/зкг	
1	1/2	Kamysbulak deposit	Halite	3,06	0,33	56,52	1624,95	1,48	30,81	37,81	1644,76	traces		0,16	7,99	0,04	3,00	100,59
2	1/2/1	- « - » -	Halite	2,54	0,54	57,72	1599,95	2,14	44,50	37,16	1616,47	traces		0,46	22,99	0,06	4,99	100,74
3	1/3	Zhalgyzagach deposit	Halite	1,46	0,45	55,84	1574,95	4,60	95,86	37,72	1640,82	traces		0,40	19,99	0,12	9,99	100,72

Table 3.
Chemical composition of brine and mineralized waters of lakes and salt marshes of Central Kyzylkum

№	№№ sample.	Place of capture	Dense residue	Components														
				Cl		SO ₄		HCO ₃		Na+K		Ca		Mg		K		
		г/л		г/зкг		г/л		г/зкг		г/л		г/зкг		г/л		г/зкг		г/л
1	1/4	Kamysbulak deposit	253,98	153,1872	4319,8790	0,2352	4,8921	0,2440	4,0016	94,5486	4112,8644	0,3206	15,9979	2,4320	199,9104			
2	1/4/1	Kamysbulak deposit	2,568	1,1344	31,9900	0,0214	0,4451	0,732	12,0048	0,7567	32,9175	0,1280	6,3872	0,0624	5,1292			
3	1/5	Zhalgyzagach deposit	309,82	189,3564	5339,8504	0,3713	7,7230	0,4880	8,0032	109,2562	4752,6469	0,0641	3,1985	7,2960	599,7312			
4	1/5/1	Zhalgyzagach deposit	2,1040	0,8508	23,9925	0,0171	0,3556	0,732	12,0048	0,7537	32,7880	0,024	1,1976	0,0288	2,3673			

V. CONCLUSION AND FUTURE WORK

We have carried out a chemical analysis of the brine composition of the Kamysbulak deposit (see model 1/2 in Table No. 2). The results of the analysis showed that the composition of the purest variety of salt taken in the upper part of the deposit contains 3-4% more sodium sulfate compared with Kamysbulak halite (Table No. 2, model 1/2).

We did not have the opportunity to explore other parts of the Zhalgyzagach deposit, however, an analysis of the general geological situation suggests that in the north-eastern direction the halite capacity is increasing and the quality is improving. It is possible that halite reserves in this field exceed 5-7 million tons.

Thus, based on the above, we have learned the following conclusions:

According to preliminary estimates, halite reserves at the Kamysbulak deposit reach 20-30 million tons. If a more significant salt capacity is established, they will increase several times more.



ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 11, Issue 8, August 2024

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