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Abstract

Full Text

CHEMISTRY

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ON THE POTASSIUM-BEARING CHARACTER OF THE SALT DEPOSITS OF TUVA

(Presented by Academician I. I. Chernyaev, September 14, 1957)

On the territory of the Tuvan Autonomous Oblast there are salt lakes and springs, and the Tuz-Tag salt deposit (Salt Mountain), located in the foothills of the southern slope of the Western Tannu-Ola Range, 160 km southwest of the city of Kyzyl, has long been known (Fig. 1).

Fig. 1. Schematic map of the Tuvan Autonomous Oblast. **a** –salt deposit; **b** –salt and weakly mineralized lakes: **1** –Khak, **2** –Chadyr, **3** –Khadyn, **4** –Svatikovo, **5** –Kach-Khol' , **6** –Dus-Khol' I, **7** –Dus-Khol' II, **8** –Kak-Khol' II, **9** –Shara Nur, **10** –Amangeldy-Khol' ; **v** –outlets of salt springs on the northern slope of the Tannu-Ola Range: **11** –on the Khuregecha River, **12** –on the Tustukhem River.

The literature contains data on some lakes of Tuva and on the Tuz-Tag salt deposit ([1]–[4]). We carried out the first survey of the salt lakes and salt deposits of Tuva in 1953. The physicochemical characterization of the salt and weakly mineralized lakes of Tuva was given by us in a previous work ([5]). In the present article we characterize the salt deposits of Tuz-Tag, paying special attention to potassium and other salts of the marine type.

The salt deposits of Tuz-Tag are associated with the existence of marine basins on the territory of Tuva during the Upper Silurian and Lower Devonian geological periods (Fig. 2). The total thickness of the salt-bearing deposits of Tuz-Tag is more than 300 m ([6]). The salt beds of Tuz-Tag, occurring at an angle of 40–45°,

come out at the surface. At the deposit, rock salt has long been mined, and there are a number of quarries (workings) up to 3–5 m deep. We examined the salt beds exposed at the surface and collected samples for study. In four beds the salt was gray, and only in one middle bed, along with gray salt, there were interlayers of pink, lemon-yellow, and flesh-red color (thickness of the interlayers 3–10 cm). Such coloration of salt is characteristic of natural potassium salts.

During chemical examination of salt samples taken from these interlayers, we found a significant amount of potassium chloride (up to 65%).

Fig. 2. Map of the distribution of marine basins in the territory of Tuva and adjacent regions. **1** –Upper Silurian marine basin, **2** –Lower Devonian sea

Table 1 gives chemical analyses of several samples of potassium salts taken in the middle quarry. As is evident from the analyses, the salt samples are represented by sylvinite with a high content of potassium chloride. In connection with the discovery of a high content of potassium chloride in several salt samples taken from the salt beds of the Tuz-Tag deposit, we examined salt cores extracted in 1951 by the Mining-Geological Expedition from boreholes drilled at the Tuz-Tag deposit. One hundred salt samples were taken from 8 boreholes at various depths.

Table 1

Sample No.	KCl	$MgCl_2$	NaCl	$CaSO_4$	$CaCl_2$	Residue insoluble in water	Sum of salts	Color of salts
			in weight percent					
74	65.63	2.58	21.90	3.39	–	4.09	97.59	Lemon-yellow
71	43.91	0.86	52.43	0.64	0.11	1.39	99.34	Flesh-red
70	10.09	–	72.72	0.48	0.61	15.08	98.98	Pink

A general examination of the preserved cores showed that, along with gray rock salt, there are cores with inclusions of yellow, pink, and red salts. Many cores, especially those with pink, dark-red, and yellow coloration, are strongly washed out, probably as a result of washing the boreholes during the drilling process. Potassium and magnesium salts may have been washed out to a considerable extent from the salt cores.

As the chemical analyses showed, the most potash-bearing cores are the salt cores from boreholes Nos. 7 and 8, from depths of 15 to 105 m. The potassium chloride content in individual samples taken from the core reaches 16–39%.

Below are chemical analyses of potash-bearing inclusions in salt cores from boreholes Nos. 5, 7, and 8 (Table 2).

The potassium salts in these samples are represented in the form of sylvinite, just as in the samples we took from the salt beds exposed at the surface.

It should be noted that the Mining-Geological Expedition did not find a significant content of potassium salts in the cores, probably because the analysis of the average sample was carried out without detailed study of individual specimens and potassium-bearing inclusions.

Table 2

Sample No.	Borehole No.	Depth in m	KCl	NaCl	$CaSO_4$	$CaCl_2$	$MgCl_2$	Insoluble residue in water	Sum of salts
187	8	16.5 – 18.3	39.56	56.58	0.90	0.18	–	1.47	98.79
189	8	23.30 – 24.30	1.98	95.72	0.50	0.03	–	0.45	98.68
180	7	59.1 – 68.8	16.21	77.27	1.06	0.32	–	4.26	99.12
183	7	90.7 – 100.1	3.77	69.42	0.46	1.69	1.26	17.55	94.15
185	7	100.1 – 106.5	2.55	44.00	5.85	0.10	–	46.21	98.71
171	5	38.2 – 40.2	1.83	96.23	0.38	0.08	–	0.73	99.25

in weight percent

The data obtained deserve attention, in our opinion, and make it possible to raise the question of a more detailed study of the salt deposits of the Tuz-Tat deposit from the standpoint of identifying deposits of potassium, magnesium, and other salts of the marine type.

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Note: Figure translations are in progress. See original paper for figures.