



CRM of Ukraine Database Supplements

Mineral target:	Mazurivske deposit
Commodity:	Niobium

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Endorsed (WP leader):	Guillaume Bertrand, BRGM
Supervised	Boris Malyuk, BRGM/GIU
Approved (Metadata Coordinator):	Oleksiy Likhosherstov, GIU
Author(s):	Affiliation:
Nataliya Kovalenko	GIU
Stella Shekhunova	IGS
Vitaliy Sukach	IGMOF
Maria Kurylo	UAG

Minerals: feldspar raw materials in the form of man-made waste - tailings from the enrichment of weathered rare metal ores, which according to their granulometric composition belong to "sands", "sand-silt deposits" and "loams" are classified as minerals; to accompanying minerals - zirconium, niobium in the composition of the products of the "sand" production of the Eastern part of the storage of waste from the enrichment of weathered ores of the Mazurivske rare metal deposit.

Location: Volnovakhsky District, Donetsk Oblast, the waste storage facility for beneficiation of weathered ores of the Mazurivske rare metal deposit is directly located within the land allocation of the beneficiation chemical and metallurgical factory of the Open Joint-Stock Company "Mariupolskiy Ilyich Metallurgical Combine at a distance of 600 m to the southwest from the outskirts of the Donskoe village and 12 km south of the district center and Volnovakha railway station.

Research: beneficiation wastes represent the lying tailings of the processing of weathered ores of the Mazurivske rare metal deposit, which was mined by the open-cast method in the 1930s-1960s of the last century. The ores were processed at the beneficiation factory of the Donskoy Chemical and Metallurgical Plant to obtain zirconium concentrate. The beneficiation waste, which made up 99% of the original volume of processed ore, was stored. In total, almost 2 million tons of ore were processed. In 1992-93, the "Ukrgeolbudm" State Complex Geological Expedition carried out an assessment of beneficiation waste as a raw material for glass and ceramic production. In 1993-94, the Ukrainian State Institute of Mineral Resources conducted laboratory, and in 1995-96, expanded laboratory technological studies with the development of waste enrichment schemes and production of feldspar and zircon concentrates and pyrochlore product. In 2003-2004, exploratory work was carried out for the geological and industrial assessment of man-made waste from the enrichment of the Mazurivske rare metal deposit, according to the results of which the following were tested:

- balance pre-estimated reserves of "sands" that meet the requirements of GOST 13451-77 "Feldspar and quartz-feldspar materials for the glass industry" up to PSS grades - 0.2-16; PShS-0.25-20, PShS - 0.3-20, PShS-0.5-20, KPSHS-N-11.5 and the requirements of JSC "Ilyich MMC" to technological grades A, B, B by categories in quantity (thousand tons) B – 828.6;
- reserves with uncertain industrial value of "sand-silt deposits" and "loams" by category C2 in quantity (thousand tons) 199.1 and 105.8, respectively.

In 2017, a preliminary geological and economic assessment of the reserves of the Eastern section of the deposit of weathered ore beneficiation was carried out at the deposit, according to the results of which, according to the protocol dated November 30, 2017 No. 4176, the balance reserves of feldspar raw materials were tested by categories in the amount: B+C1 (UNFC 121) – 825.7 thousand tons and off-balance reserves (UNFC 221) of associated useful components (ZrO_2 and Nb_2O_5) as part of the products of "sand" production (information about mineral resources and reserves for these components is confidential).

Geological characteristics. Structurally, the deposit belongs to the outer ultramafic-mafic ring of the Oktyabrskiy alkaline massif.

From a structural point of view, the area of the Mazurivske deposit is a horst, which is complicated by discontinuous faults. In the north and northeast, the contact of basic and ultrabasic rocks with granitoids is tectonic, which is confirmed by geological exploration. In the south and southwest, the boundary of the Mazurivske deposit runs along the contact of basic and ultrabasic rocks with alkaline syenites. The contact has a steep dipping ($80-85^\circ$). The Mazurivske deposit is a vein deposit, within which 16 shallow productive bodies are located. They are a set of contiguous ore bodies stretched out in the latitudinal direction according to the extension of the block of basic and ultra-basic rocks. 44 ore bodies were discovered at the deposit. Their length is mostly more than 300 m, and the thickness ranges from 45 to 80 m. Contacts of ore bodies with host rocks are clear and can be clearly traced in well cores.

Productive sections consist of ore bodies formed by diverse ores varieties: mariupolites (49.9-61%), microcline-nepheline pegmatites (16.8-24.7%), syenite pegmatites (0.5-18.7%), feldspar and feldspar-mica metasomatites (13-14%).

The content of rare metals in ore bodies is: niobium pentoxide - 0.12%, tantalum - 0.0058%, zircon - 0.444%. The distribution of niobium, tantalum and zirconium oxides in industrial bodies is uneven and extremely uneven. The main carrier of niobium and tantalum is pyrochlore, and zirconium is the main carrier of zirconium. According to the content of conventional tantalum pentoxide in the deposit, low-grade (16-33%), ordinary (28-58%), and high-grade (15-55%) ores are distinguished.

The deposit belongs to the geological and industrial type of rare metal albitites associated with nepheline syenites. The main industrial type of ores is fine-grained, complex tantalum-niobium-zirconium.

The upper part of the deposit is a weathering crust. According to the degree of weathering, clayey and transitional weathering crusts are distinguished. The content of rare metals in weathering zones does not change.

At the beneficiation factory, zircon was extracted from the ore using a gravity-magnetic beneficiation scheme, and the waste of the factory in the form of pulp - "tails" was sent to the tailings repository. Since 1967, the tailings storage facility has not been operated.

Mineral composition of natural varieties of ore rocks of the deposit:

Natural varieties of ore rocks	Minerals, mass fraction, %								
	albite	microcline	nepheline	kaolin	aegirine	amphibole	magnetite	zircon	pyrochlore
Mariupolite	56.0	10.9	19.2	1.5	5.65	5.0	0.25	0.75	0.20
Feldspar metasomatite	50.3	38.7	0.01	4.1	0.01	0.01	0.15	1,2	0.245
Albite-biotite metasomatite	46.4	10.5	1.4	7,8	0.01	0.2	0.2	0.61	0.37
Nepheline-Microcline pegmatite	24.0	42.7	21.1	2,3	3,4	0.1	0.1	0.45	0.10
syenite (ore)	63.5	21.45	0.01	1.6	0.01	0.41	0.41	0.63	0.27
Composite	43.3	18.5	16.05	8.3	4.27	0.12	0.12	0.76	0.25

Chemical composition of natural varieties of ore rocks of the deposit:

Natural varieties ore rocks	Mass fraction, %											
	Nb ₂ O ₅	Ta ₂ O ₅	ZrO ₂	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	CaO	Na ₂ O	K ₂ O	Na ₂ O / K ₂ O
Mariupolite	0.114	0.008	0.44	57.37	21.00	2.17	1.70	0.42	1.57	8.98	2.80	0.31
Feldspar metasomatite	0.14	0.0073	0.773	61,641	18.00	1.78	1.29	0.41	0.88	6.25	5.13	0.90
Ab-Bi metasomatite	0.212	0.010	0.368	50.14	15.92	4.72	7.56	1.96	2.60	5.50	4.11	0.75
Nepheline-microcline pegmatite	0.060	0.0028	0.270	57.35	20.66	1.87	1.28	0.24	1.35	6.16	6.36	1.03
Syenite	0.151	0.0127	0.380	59.29	17.58	2.08	2.90	0.99	2.17	7.24	3.22	0.44
Mariupolite	0.146	0.0076	0.457	59.27	20.80	2.24	2.12	0.67	1.78	8,18	3.66	0.45

A new technological scheme of beneficiation was developed and worked out, which ensures obtaining a tantalum-niobium product (mass fraction of Nb_2O_5 – 7.48%, yield – 0.49%, extraction – 36.64%), zircon concentrate (mass fraction of ZrO_2 – 62.65%, yield 0.72%, extraction – 73.54%), nepheline-feldspar concentrate of PSS brand with a yield of 69.84%. The tantalum-niobium product can be processed by the hydrometallurgical method to obtain commercial products in the form of technical niobium oxide with a mass fraction of Nb_2O_5 – 98%, technical tantalum oxide Ta_2O_5 – 95%, rare earth concentrate with a mass fraction of rare earths – 70%.

In terms of hydrogeology, the conditions for developing the deposit are simple. The main aquifer, which determines the amount of water inflows, is the aquifer complex of crystalline rocks of the Lower Proterozoic. It is characterized by low filtration properties of crystalline rocks and low flow rates (from 0.008 to 0.8 l/s) of wells. The chemical composition of the water is mostly sulfate, hard, with a high (up to 5.3 g/l) salt content.

According to the classification of deposits, the deposit belongs to simple engineering and geological conditions of development. Deposits are combined into two engineering-geological complexes: loose soils of the Quaternary age and rocks of the Lower Proterozoic. The thickness of loam ranges from 0 to 16 m, on average it is 7.2 m, the rock is mainly of medium density.

The rocks are represented by gabbros and pyroxenites, which have high strength properties: the strength limit in the dry state is more than 900 kg/cm²; in water-saturated - more than 650 kg/cm²; the slope angles in the rocks are 65-70°C.

The radiation situation in the work area is within normal limits. The measurements of the exposure dose of gamma radiation of overburden rocks are 12-14 mCi3/hour, which is within the limits of what is permissible according to existing sanitary standards.

The deposit belongs to the group of deposits of complex geological structure (group 2) in accordance with the Classification of Mineral Reserves and Resources of the State Mineral Resources Fund.

The mineral reserves: as of 01.01.2023, they are divided by category in the amount:

- reserves of feldspar raw materials B+C1 (121) – 825.7 thousand tons; with uncertain industrial value (332) – 305.0 thousand tons.

Information about other mineral resources and reserves is confidential.