



CRM of Ukraine Database Supplements

Mineral target:	Ternivske deposit
Commodity:	Nickel and cobalt ores

Version: 17 April 2024

Project	101075609 — GSEU — HORIZON-CL5-2021-D3-02
Supplement Data	
Supplement number:	MO.400038
Dissemination level:	Public
Supplement type:	Description
Work package:	WP2: Critical Raw Materials, the International Centre of Excellence and United Nations Framework Classification (CRM-ICE-UNFC)
Lead WP/ Supplement beneficiary:	[EGS]

Supplement status	
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Location: Dnipropetrovsk region, Kryvorizkiy district, 5 km southwest of the Terny village, 1 km south of Kamiane Pole railway station.

Research: In 1950, the Pervomayska Gophysical Party discovered a number of magnetic anomalies in the Ternivska site, nickel ores were discovered by wells. In 1952 the Kryvorizka Party, together with the search for bauxite, discovered the Ternivske deposit of nickel and iron ores. The deposit's ore reserves were calculated according to the C1+C2 category. In 1954, the Ukrainian Geological Administration conducted searches and exploration of nickel ores in the Ternivske and Nove deposits. The exploration of the Ternivske deposit was carried out with wells of mechanical column drilling on a grid of 50x50m and partially 25x25m. According to the results of the exploration work, the reserves of nickel ores were approved by the decision of the GKZ (protocol dated 07.08.1954 No. 9164).

Geological characteristics: the Precambrian crystalline rocks, their weathered crust and sedimentary layers of the Tertiary and Quaternary systems take part in the geological structure of the Ternivske deposit. In the composition of the Precambrian, ultramafic rocks form a massif about 5 km long and 300-400 m wide. They are represented mainly by serpentinites and serpentinitized peridotites. The host rocks are plagiogranites and biotite gneisses. Plagiogranites are developed both to the north and to the south of the strip, gneisses are less common. The Precambrian weathering crust on the deposit area is developed everywhere and has a thickness of 20-40 m. Outside mineralization contour, in some areas, there is no weathering crust at all. On serpentinites, the weathering crust is represented by three types of rocks, replacing each other in the vertical direction: disturbed, partially carbonized serpentinites (3-4 m); nontronite-chlorite rocks (10-12 m); ocher (10-15 m, sometimes up to 20 m).

The Tertiary system includes sediments of the Paleogene (Buchatski, Kyivski, Kharkivski, and Poltavski layers) and Neogene (Sarmatian layer). All the listed sediments are represented by intercalation of clays, sands and marls. In addition, brown coal is present in the composition of the Buchatskiy layer.

The column of the sedimentary pile ends with red-brown clays and loams of the Quaternary system. The total thickness of rocks covering the weathering crust is 50-100 m.

The deposit's ore reserves are calculated according to C1 and B categories.

Three types of ores are distinguished within the Ternivske deposit:

1. nickel ores with an average nickel content in the ore of 1.11%;
2. iron ores doped with nickel with an average content of iron of 38.22% and nickel of 0.54%;
3. iron ores lightly alloyed with nickel, with an average iron content of 35.93% and nickel 0.2%;
4. iron-nickel ores containing more than 30% iron.

Nickel ores do form a single body. The total length of the body is 1.0 km. The maximum width of the body is 250 m, the minimum is 20 m. The ore thickness varies from 1.0 to 17.6 m, with an average of 4.9 m across the deposit.

The depth of the ores varies from 39.8 to 82.6 m. The ores lie almost horizontally. Their surface and bottom are slightly wavy. Nickel ores are more often confined to the zone of nontronite-chlorite rocks, sometimes to the upper part of the weathering zone.

Within the ore layer, the nickel content is fairly uniform. The maximum nickel content in individual samples reaches 2.5%, but in general it does not exceed 1.5%, on average it varies from 0.9 to 1.27%. The cobalt content is small and on average is 0.048%.

Chemical composition of nickel ores of the Ternivske deposit:

Components	Ni	Co	Fe	Cr	SiO ₂	Al ₂ O ₃	TiO ₂	CaO	MgO	P ₂ O ₅
min. content, %	0.7	0.01	4.71	0.43	12.56	5.40	0.33	0.03	1.16	0.03
max. content, %	1.69	0.221	45.98	2.02	42.12	18.05	1.29	5.05	25.16	0.104
avg. content, %	1.11	0.048	28.73	1.2	23.0	8.95	0.64	0.56	11.19	0.064

The hydrogeological conditions for the development of the deposit are favorable. The main aquifers are: aquifer of Sarmatian sands, aquifer of sands of Buchatskiy layer and aquifer of weathering crust. The inflow of water into the future quarry will be no more than 30-50 m³/hour and will not significantly affect the development of the mineral commodity.

The mining and technical conditions of the western part of the deposit are more favorable due to the absence of water-bearing Buchatski sediments, as well as the depth of occurrence is less than in the eastern part of the deposit. In the western part of the deposit, the thickness of overburden to nickel ores is on average 50-55 m, to iron ores alloyed with nickel 45-50 m. In the eastern part of the deposit, the thickness of overburden to nickel ores is on average 60-70 m, to iron ores doped with nickel 50-60 m. To the south of the deposit of nickel ores is the Pichuginske lignite deposit with confirmed reserves in TKZ. In connection with this, it is possible that nickel ores and lignite mining will be carried out together. Advantages are given to the open-cast method of development.

Assessment of resources/reserves: as of 01.01.2023, reserves of cobalt-nickel-silicate ores amount to 1,565,000 tons in categories B+C1, including nickel - 12.4 thousand tons; C2 – 1,565.0 thousand tons, including cobalt - 542.0 tons.