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TITANIUM DEPOSITS CHARACTERISTICS OF THE VOLYN REGION

Volyn titanium region is located in the northern part of the Ukrainian shield, located within the development of basic and partially acidic rocks of the Korostensky pluton. The sedimentary cover of this territory is represented by deposits of different ages from the Cretaceous to the Quaternary period, in which placers of titanium-bearing rocks have been explored. The composition of the Korostensky pluton is dominated by rapakivi granites, anorthosite, gabbro-anorthosite, and gabbro-norite of the Volodarsk-Volynsky, Chopovytsky, Krovotynsky, and Ushomirsky massifs.

Researching of the paleogeographic characteristics of the formation of placers and placer deposits for this territory were carrid out of Veklich M.F., Komlyev O.O., Remezova O.O., Okholina T.V., Ganzha O.A. etc. [1, 3, 5]. In this article, the authors analyzed and summarized the results of research on the Volyn titanium region.

Magmatogenic deposits of titanium are concentrated within the Volodarsk-Volynsky massif of basic rocks (one of the largest is the Stremyhorod deposit). They have apatite mineralization and are complex apatite-ilminite.

The thickness of weathering crusts within this massif varies from 0.1 to 40.0 m, on average it is 9.0-10.0 m. In the weathering crust profile, a zone of disintegration and initial leaching, partial kaolinization, and complete kaolinization can be distinguished. The amount of ilmenite in the product zones of the weathering crust varies from 30 to 130 kg/m3 and is lower than in the parent rocks. A trend of relative accumulation of titanium minerals from bottom to top along the section of the weathering crust as other components are removed is noted.

Exogenous titanium deposits of the Volyn titanium region are also concentrated within the Volodarsk-Volynsky Massif. These are ancient alluvial and deluvial placers of the Mesozoic and Cenozoic, Quaternary alluvial placers of buried and modern river valleys. The largest Mesozoic (Lower Cretaceous, Irshansk suite) deposits of this type are Lemnenske, Mezhyrichne deposits, Ushytskyi, Ushomyrskyi, Selyshchanskyi, Ivanivskyi placers; Cenozoic - Livoberezhne, Zlobytske [2], Valky-Gatskivke, Pravoberezhne, Poromivske [4] deposits, Quaternary – Irshinske, Vernyo-Irshynske, Katerynivske, Trostyanetske, Stavyshchanskyi and Ocheretyanskyi placers (Fig. 1). Almost all deposits have a paragenetic connection, where the weathered crust and the loose part are ore-bearing.

Lower Cretaceous placers are composed of multi-grained kaolinic sands with a significant amount of gravel material, secondary kaolins and carbonaceous clays. Ore minerals are represented by ilmenite, leucoxenized ilmenite, leucoxene. Their amount in these placers varies significantly: from 20-30 to 300-1100 kg/m^3. These placers are confined to buried valleys and depressions in the topography of the crystalline basement. The length of placers of this age varies from 0.5 to 9.0 km, the width - from several tens of meters to 4.0 km, the thickness reaches 10 - 15 m.

Cenozoic placers also fill the buried valleys produced in the relief of bedrock and their weathering crusts. They are 0.2 to 5.0 km long and 0.05 to 2.0 km wide. The thickness of the product deposits is 0.2–15 m. Ore minerals are the same with Lower Cretaceous placers; their amount is from 50 to 400 kg/m^3.

Quaternary placers are divided into Early Pleistocene, Late Pleistocene and Holocene (modern). Early Pleistocene placers consist of a layer of sands, sandy loams, and loams with patches of secondary kaolins that underlie fluvioglacial sands (Verkhno-Irshinske, Katerynivske, and others). Late Pleistocene placers are confined to the terrace of the Irsha River (Irshynske deposit, in which the amount of ilmenite is 10 - 100 kg/m^3).

In general, placer deposits located of the Volodarsk-Volynsky massif are characterized by: placers are limited to relatively wide, vaguely defined valleys with smooth sides; productive deposits consist of sedimentary formations of different genesis and age; the thickness of the ore-bearing deposit and the amount of ilminite does not change significantly both along the length and across the length of the placer; minerals accompanying ilmenite in placers are no industrial importance.

The formation of exogenous deposits of the Volyn titanium region was influenced by many factors. These are primarily tectonic and paleographic conditions. Thus, in the early Cretaceous, in connection with upward epeirogenic movements, a continental regime was established in this territory. The valleys and depressions of river systems were formed in the large depressional structures of the foundation. In the riverbeds were accumulation of ilmenite-bearing coarse-grained sands of the Irshansk suite. From the

second part of the Late Cretaceous to the present time, continental conditions dominated the area. Ilmenite was also accumulated in river valley of Middle Quaternary, Late Quaternary, and modern deposits. And the main thing is the presence of titanium-bearing weathering crusts that were formed on the main rocks of the Volodarsk-Volynsky massif, which do not form deposits of the residual type. These weathering crusts were the source of wear and accumulation of ilmenite in sedimentary deposits of different ages with which placers of this mineral are associated.

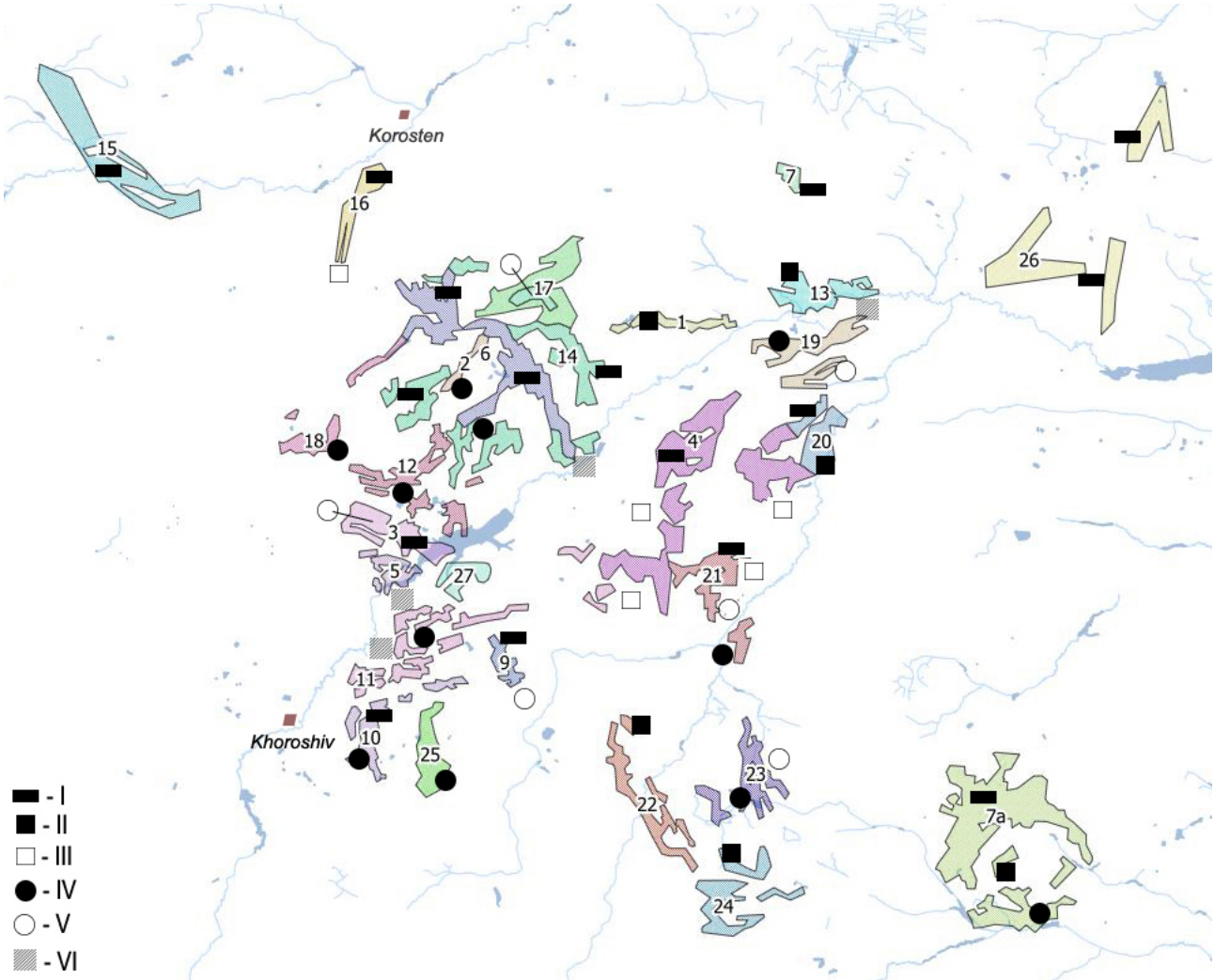

Fig. 1. Overview map of the geological time and paleogeographic conditions of the formation of deposits and placers of the Volyn Placer Region

I – Middle and Late Mesozoic continental deposits and placers in the weathering crust of crystalline rocks; II – Paleogene-Neogene continental deposits and placers; III – marine placers of the Upper Cretaceous; IV – Early and Middle Quaternary alluvial placers (partially undissected); V – Middle Quaternary water-glacial placers; VI – Late Pleistocene and Holocene (modern) placers.

1. Shershnivske; 2. Lemnenske; 3. Verkhnyo-Irshynske (including Katerynivske); 4. Irshynske; 5. Livoberezhne; 6. Northern part of the Lemnenske deposit; 7a. Torchynske; 9. Krasnorichenske; 10. Poromivske; 11. Pravoberezhne; 12. Valky-Gatskivske; 13. Zlobytske; 14. Lemnenske (residual); 15. Ushytskyi placer; 16. Ushomyrskyi placer; 17. Ivanivskyi placer; 18. Stavyshchanskyi placer; 19. Selyshchanskyi placer; 20. Bukinska ilmenite area (Mezhyrichne deposit); 21. Trostyanetska ilmenite area; 22. Ocheretyanskyi placer; 23. Vydybirskyi placer; 24. Fedorivskyi placer; 25. Poromivske deposit; 26. Shevchenkivska area; 27. Kropyvenske deposit.

References

1. Ganzha, O.A., Kuzmanenko, H.O., Okholina, T.V., Remezova, O.O., Current state of mineral base of titanium deposits of Ukraine, Vol. 99, No. 4, 2022, pp. 60-66. https://doi.org/10.17721/1728-2713.99.08 (in Ukrainian).

2. Ganzha, O., Okholina, T., Kroshko, Yu., Kuzmanenko, H. & Kovalchuk, M. ‘Structural and Lithological Models of Ilmenite Placer Deposits in Ukraine’, Anuário do Instituto de Geociências, 46:55949. 2023, https://doi.org/10.11137/1982-3908_2023_46_55949.
3. Komlyev O.O. Historical and dynamic basin geomorphosystems of geomorphological formations of the Ukrainian Shield: Dissertation of Doctor of Geographical Sciences: 11.00.04. 2011. 523 pp. Kyiv. (in Ukrainian).
4. Kuzmanenko, G.O., Okholina, T.V., Ganzha, O.A., Yaremenko, O.V. Ore yield of the Poromivskoe ilmenite deposit. Mineral Resources of Ukraine, No. 3, 2023, pp. 3-7. https://doi.org/10.31996/mru.2023.3.3-7 (in Ukrainian).
5. Veklich M.F., Dyachenko M.G., Tsymbal S.N. Titanium content of sedimentary deposits on the territory of the USSR (Ukrainian Crystalline Shield). Alluvial titanium deposits of the USSR. M.: Nedra. 1976. 107- 112 pp. (in Russian).