

[https://doi.org/10.59911/mgg.2786-7994.2023.2\(7\).295192](https://doi.org/10.59911/mgg.2786-7994.2023.2(7).295192)

УДК (549.641.23:553.3.068.5):551.763.1]:519.876.5(477)

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LATERAL AND VERTICAL DISTRIBUTION OF TITANIUM-ZIRCONIUM MINERALS WITHIN OF THE ANDRIIVSKYI AND LIKARIVSKYI DEPOSITS (SOUTH-WESTERN PART OF THE NOVOMYRHOROD MASSIF)

General information on the geological structure and ore-bearing capacity of the Likarivske and Andriivske deposits, which are located in the southwestern part of the Korsun-Novomyrhorod pluton within the Novomyrhorod massif (South-Western part), is provided. The productive deposits of the Likarivske and Andriivske deposits are represented by the weathering crust formation and the continental alluvial sand-kaolin formation of the Lower Cretaceous (Aptian-Lower Albian). On the basis of the coordinates, description and results of testing wells, a target database was created. On the basis of this database, cartographic constructions were carried out. The structural (relief of the bottom and of the top surfaces of ore-bearing deposits and their thickness) and material (lithological composition of productive deposits; lateral distribution of the average content of ilmenite, zircon, rutile and apatite in productive deposits) parameters of different ages and different genetic formations of the Likarivske and Andriivske deposits were studied. The direction and strength of correlations between ilmenite, rutile, zircon, and apatite in the weathered crust and continental sediments (sands and redeposited kaolins) of the Lower Cretaceous were studied. It was established that within the limits of the Likarivske and Andriivske deposits, during the geological development of the territory, a zircon-apatite-ilmenite ore-bearing system of different time and different genetics was formed, which is represented by a spatial-paragenetic series: crystalline rocks of the foundation; weathering crusts of crystalline rocks of the foundation; fluvial formations formed due to erosion and redeposition of eluvium; fluvial formations that were formed due to erosion and redeposition of eluvium and Mesozoic-Cenozoic placers of different ages. The results of the research are an information base for supporting mining operations within the studied deposits.

Key words: Korsun-Novomyrhorod pluton, Novomyrhorod massif, gabbro-anorthosite formation, weathering crust of crystalline rocks, continental deposits of the Lower Cretaceous, Likarivske and Andriivske deposits, ilmenite, rutile, zircon, apatite.

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Introduction.

The world's largest deposits of titanium ores are associated with the gabbro-anorthosite formation. The phosphate-titanium formation in the rocks of the main composition was discovered in the Korsun-Novomyrhorod structural-metallogenic zone of the Ukrainian shield, which covers the pluton of the same name, elongated in the meridional direction. Within the boundaries of the Korsun-Novomyrhorod structural-metallogenic zone, the Horodyschensko-Smilyanska and Novomyrhorodska metallogenic zones are distinguished, within which ore fields are located. The Novomyrhorod massif is located in the south of the Korsun-Novomyrhorod pluton within the Novomyrhorodska metallogenic zone. Within the boundaries of the Novomyrhorod massif, manifestations of titanium were found in the rocks of the crystalline foundation: Velykovyskivskiy, Zlatopil'skiy, Kamianuvatskiy, Kostiantynivskiy, Novomyrhorodskiy, Osypivskiy, Pivnicno-Zakhidnyi, Poktovskiy, Shpakivskiy. Along with titanium ores in the crystalline rocks of the foundation, exogenous titanium deposits and ore manifestations in the crust were established weathering of crystalline rocks of the main composition, continental (Aptian-Lower Albian, Middle Eocene, Quaternary) and coastal-marine (Upper Albian, Eocene, Miocene) sediments.

In the production reports and scientific publications of the authors of the article, it was noted that within the boundaries of the Novomyrhorod gabbro-anorthosite massif there is a close spatial and paragenetic relationship between the ore-bearing capacity of the crystalline rocks of the foundation, their weathering crusts and deposits of different ages and genesis, which were formed as a result of erosion and redeposition of eluvium. Such objects include the Likarivske and Andriivske deposits, which combine the ore bearing of the weathered crust and ore bearing of Aptian-Lower Albian continental deposits. Continental deposits are widespread within the Lebedyn-Balagleivska paleovalley and were formed as a result of the erosion of the eluvium. Continental deposits are spread sporadically and have been preserved from erosion until now in the form of sinuous bands resembling the contours of river valleys.

Research materials and methods.

The methodical-methodological basis of the study of the ore bearing of the weathering crust and placers of zirconium-titanium minerals is the work of the authors of the article on geological and genetic modeling of the ore bearing of the sedimentary formation units of the Korsun-Novomyrhorod pluton and the Novomyrhorod massif in particular [1-6]. The basis of studies of the zirconium-titanium ore bearing of the Novomyrhorod massif were production reports: Fedorenko N.S. (1970) «Geological report on the results of the search for ilmenite

placers in the Middle Dnieper region among the sandy deposits of the Lower Cretaceous, carried out by the South Ukrainian Geological Expedition in 1969–1970»; Skorobach V.I., Karmazenko V.G. (1973) «Geological report on the results of searches for ilmenite placers within the southern part of the Lebedyno-Balakliivska depression in Byrzulivska and other areas of the Middle Dnieper region, carried out by the South Ukrainian Geological Expedition in 1971–1973»; Skorobach V.I., Karmazenko V.G. (1976) «Report on the results of preliminary exploration of the Byrzulivskyi alluvial ilmenite deposit and searches for ilmenite placers in the southern part of the Lebedyno-Balakliivska depression in 1974–1976»; Skorobach V.I., Karmazenko V.G., Grechushkina T.A. (1979) «Report on the results of the search for new placer and residual ilmenite deposits within the area of distribution of the main rocks of the Novomirgorod and Voronivsky massifs for 1977-1979»; Skorobach V.I., Tarasenko V.S., Shkurenko I.E. (1983) «Report on the results of detailed searches for titanium ores in promising areas of the southern part of the Korsun-Novomirgorod pluton for 1980–1983»; Flore N. (2005) «Revaluation of prospective and forecast resources of the leading types of minerals discovered on the territory of the enterprise as a result of geological surveying and prospecting works as of 01.01. 2001 on the area M-36-XX, XXV, XXVI, XXVII, XXXII, XXXIII and within the central and northwestern part of the Dnipro lignite basin»; Dushenko I.S. etc. (2006) «Report on the results of detailed exploration of the Byrzuliv placer ilmenite deposit in the Kirovohrad region»; Levchenko N.N. (2006) «Project for detailed exploration of the Byrzuliv ilmenite deposit»; Levchenko M.M. etc. (2012) «Detailed geological and economic assessment of the Byrzuliv placer ilmenite deposit: report of the Public Enterprise «Kirovgeology» on the results of geological exploration carried out in the Kirovohrad region in 2009–2012»; Shafranska N. and others. (2016) «Report on the results of repeated geological and economic assessment of ilmenite reserves in ore sands and weathering crust of Byrzuliv deposit in Kirovohrad region as of January 1, 2016»; Vykhodtsev M.K. (2016) «Preliminary geological and economic assessment of titanium ore reserves of the Likariv placer deposit», as well as scientific publications, the processing and generalization of which material became the basis for creating a complete picture of the titanium bearing potential of promising objects of various ages and genetics within the southwestern part of the Novomyrhorod massif. Cartographic constructions were carried out using the software Golden Software Strater, Golden Software Surfer.

The purpose of the study is to present the results of the ore-bearing research of the Likarivske and Andriivske deposits of apatite-zircon-ilmenite ores.

The Likarivske and Andriivske deposits are located in the southwestern part of the Korsun-Novomyrhorod pluton within the South-Western part of Novomyrhorod massif (Fig. 1).



Fig. 1. The research area on a space image from the Google Earth Pro portal

The Likarivske deposit of titanium ores is located in the central part of the Ingul megablock of the Ukrainian shield, in the southern part of the Korsun-Novomyrhorod pluton between the villages of Byrzulove, Korobchyne, Likareve, south of the village of Likareve, Novoukrainsky district, Kirovohrad region. The geological structure of the deposit includes rocks of acidic and basic composition of the Mesoproterozoic Korosten complex, their weathering crusts and sedimentary formations of the Cretaceous, Paleogene, Neogene and Quaternary systems [6]. Most of the Likarivske deposit is located within the distribution of rocks of the anorthosite formation of the crystalline basement; the northern part of the deposit is located within the distribution of rocks of the Rapakivi granite formation (Fig. 2). Among the rocks of the main composition, labradorite is the most common. The deposit is represented by two sections — Central and Western, the separation of which is caused by Quaternary erosion.

The weathering crust of crystalline rocks is widespread, its thickness is 0.7–32.0 m (average value 7.99 m). The largest thicknesses of the weathering crust are located in the central and northeastern parts of the deposit (Fig. 3, *a*).

In the vertical section of the weathering crust, three zones are distinguished (from bottom to top): disintegration and leaching with a thickness of 0.5–13.0 m; initial hydrolysis (hydromica-kaolinite; montmorillonite-kaolinite) with a thickness of

1.0–13.0 m; final hydrolysis and oxidation of weathering products (kaolinite, gibbsite, and kaolinite-gibbsite) with a thickness of 1.0–14.0 m. The average content of minerals in the weathering crust, kg/m³: ilmenite 4.5–149.2 (average value 37.26); rutile 0.01–0.037 (average 0.016); zircon 0.01–4.77 (average 0.32), apatite 0.01–4.66 (average 0.76). Areas of increased average mineral content in the weathering crust do not coincide spatially (sometimes there is a spatial overlap between areas of increased average ilmenite and rutile content) and do not depend on the thickness of the eluvium (Fig. 4). The correlation and its strength between the average mineral content is as follows: between ilmenite and rutile and ilmenite and zircon — direct weak (+0.23 and +0.27, respectively); between zircon and rutile — absent; between ilmenite and apatite — inverse very weak (–0.13); between zircon and apatite — inverse weak (–0.21); between rutile and apatite is absent.

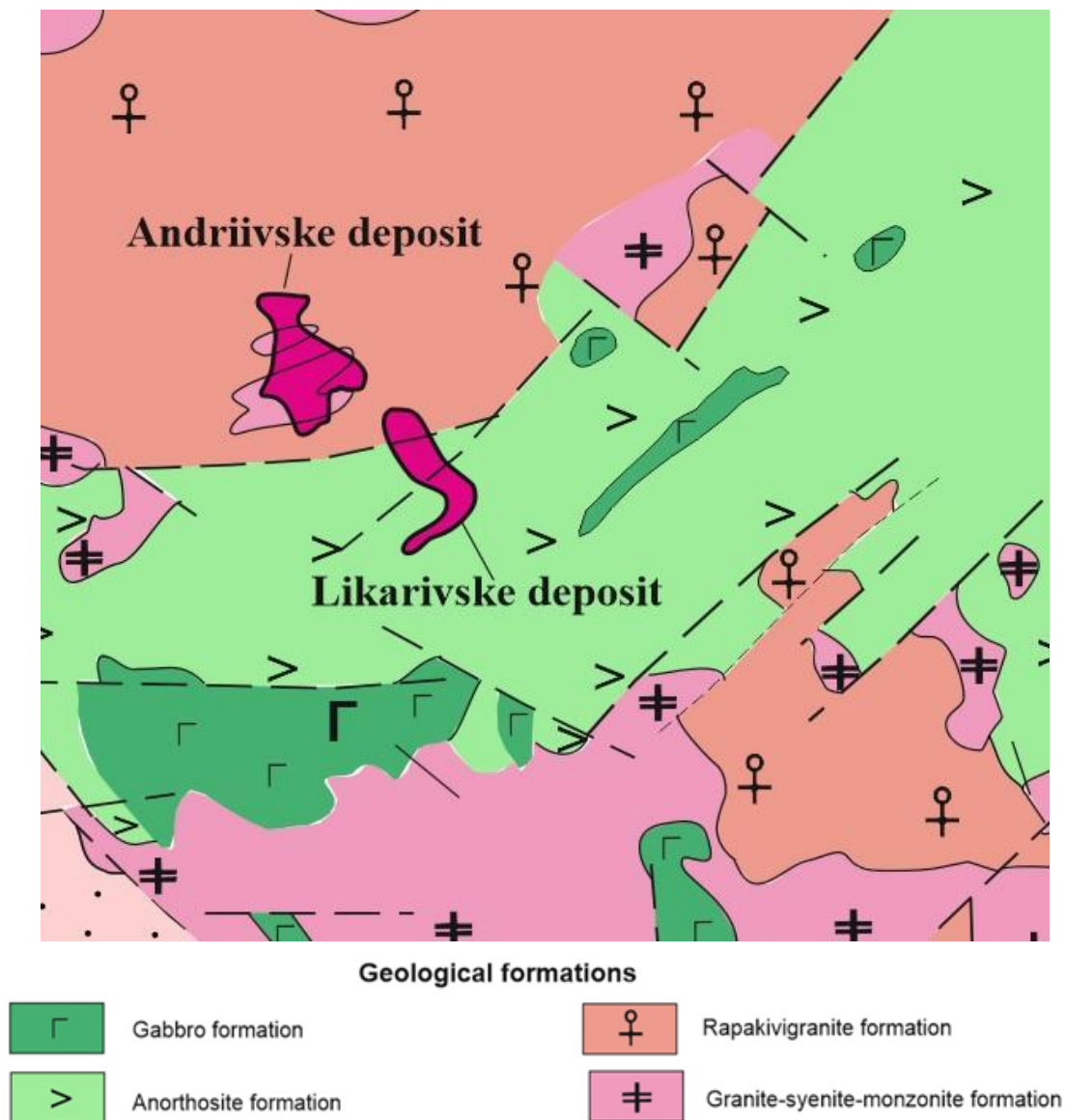


Fig. 2. Geological map of the Precambrian formations of the study area (according to N. Flore, 2005). Scale 1:200000

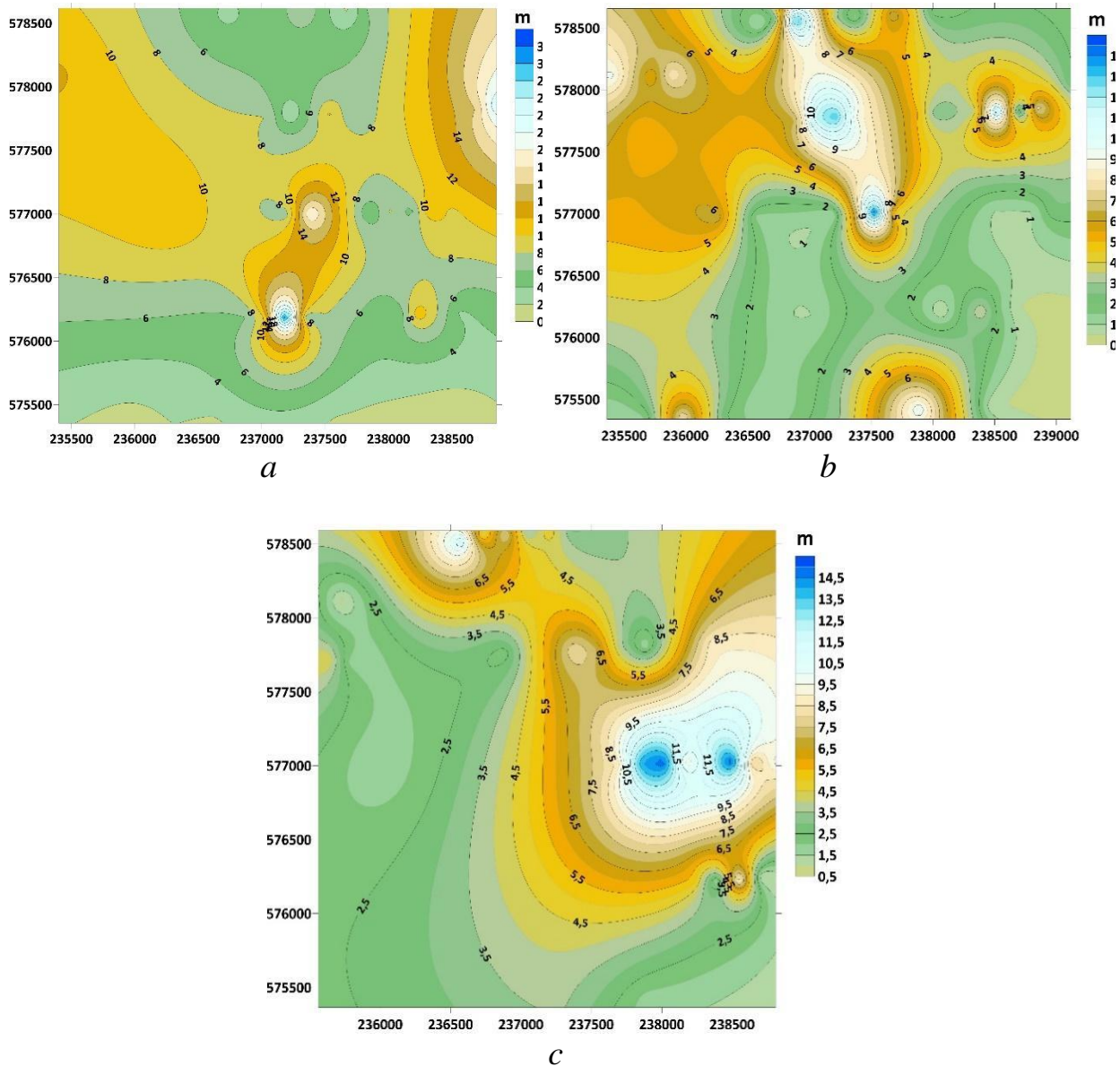


Fig. 3. Likarivske deposit. Isopachites of the thickness of weathering crust (a), Lower Cretaceous sands (b) and Lower Cretaceous redeposited kaolins (c)

With erosion, Lower Cretaceous (Aptian-Lower Albian) continental alluvial, alluvial-deluvial deposits (Smilyan layers) are deposited on the weathering crust, which fill the long-buried erosion-tectonic Lebedyn-Balakeivska paleovalley. The absolute height of the bottom of the paleovalley is 126.0–130.0 m, the relative elevation of the sides of the valley is 20 m [6]. Continental sediments of the Lower Cretaceous are represented by light gray kaolinic sands and redeposited sandy kaolins.

The thickness of the continental sands is 0.5–14.7 m (4.19 m on average). The greatest thicknesses of sand are associated with channel settings and are localized mainly in the northern part of the deposit.

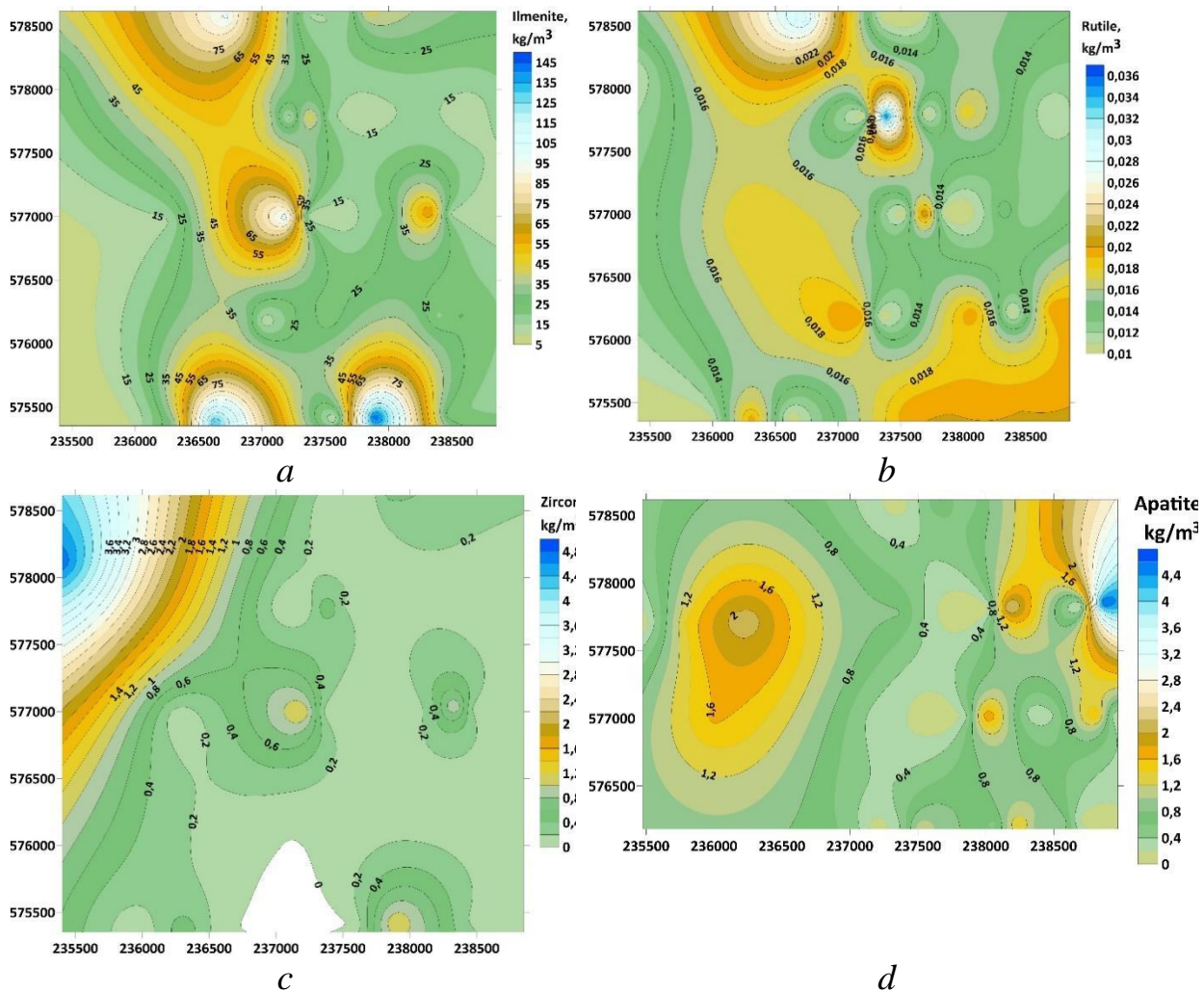


Fig. 4. Likarivske deposit. Lateral distribution of the average content (kg/m^3) of ilmenite (a), rutile (b), zircon (c) and apatite (d) in the weathering crust

Within the sand stratum, several local areas of increase in their thickness have been identified (see Fig. 3, b). The average content of minerals in sands, kg/m^3 : ilmenite 1.5–167.3 (average value 51.55); rutile 0.01–0.25 (average 0.03); zircon 0.01–3.41 (average 0.60), apatite 0,01–2.11 (average 0,55). Areas of increased average mineral content do not coincide spatially (Fig. 5).

An exception is the northern part of the deposit, which has significant average contents of ilmenite and zircon. The correlation and its strength between the average content of minerals is as follows: between ilmenite and rutile — inverse weak (-0.22); between ilmenite and zircon — direct strong ($+0.80$); between zircon and rutile — inverse very weak (-0.16); between ilmenite and apatite — inverse weak (-0.20); between zircon and apatite — inverse weak (-0.24); between rutile and apatite — direct strong ($+0.74$).

About 85% of sand belongs to the class with a grain size of less than 0.2 mm. Almost all ilmenite is concentrated in the size class — 1.5+0.045 mm. The extraction of ilmenite is 87%.

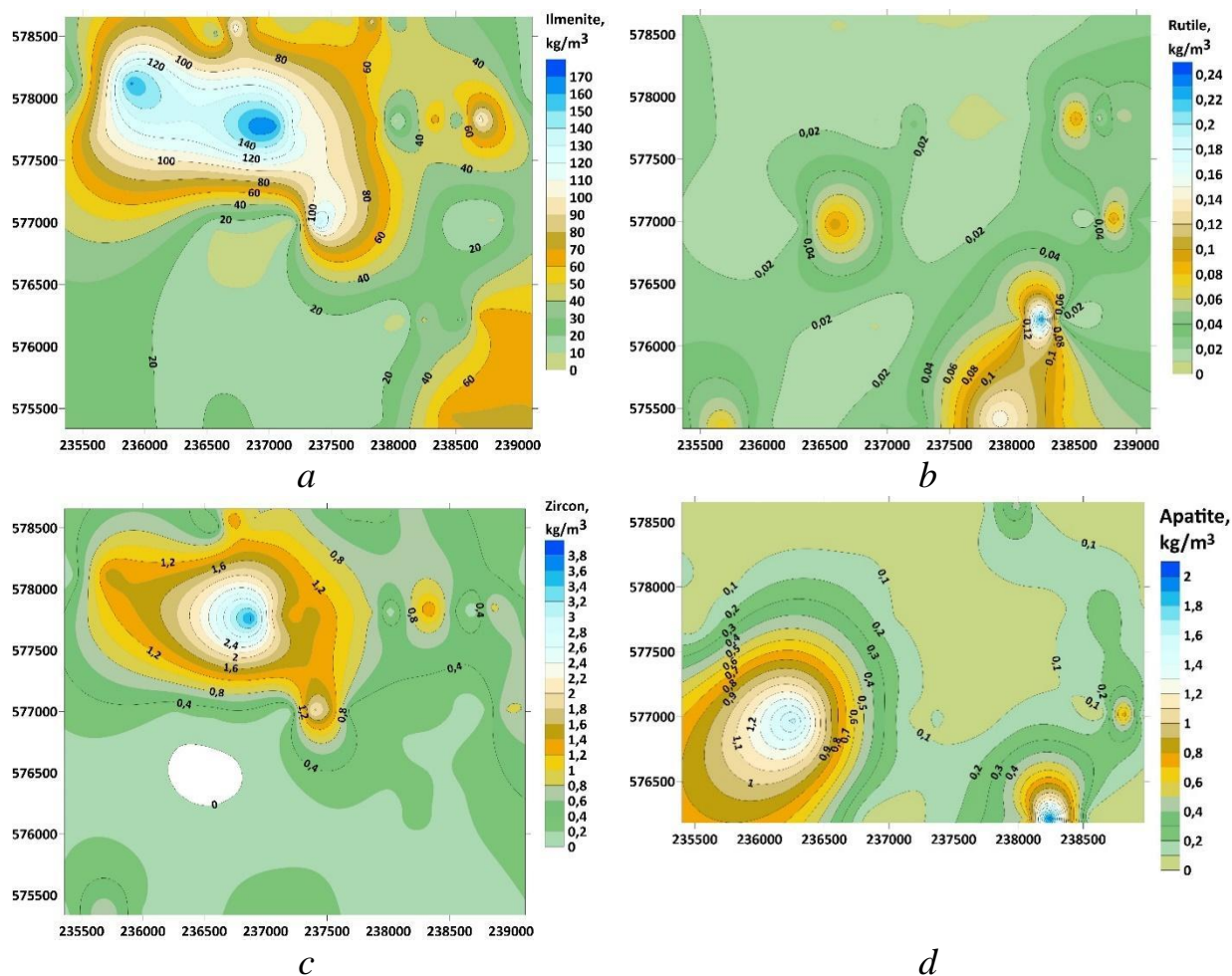


Fig. 5. Likarivske deposit. Lateral distribution of the average content (kg/m^3) of ilmenite (a), rutile (b), zircon (c) and apatite (d) in Aptian-Lower Albian sands

Redeposited kaolins were formed in floodplain and deluvial-alluvial environments. The thickness of redeposited kaolins is 0.8–15.1 m (average value 5.92 m). Areas with the maximum thickness of redeposited kaolins are present in the northwestern and centraleastern parts of the deposit. (see Fig. 3, c). Average mineral content in redeposited kaolins, kg/m^3 : ilmenite 4.4–223.0 (average value 90.66); rutile 0.01–0.06 (average 0.018); zircon 0.02–3.02 (average 0.81), apatite 0.01–2.20 (average 0.18). Areas of increased average mineral content do not coincide spatially. (Fig. 6). An exception is the central part of the deposit, which has significant average contents of ilmenite and zircon.

The correlation and its strength between the average content of minerals is as follows: between ilmenite and rutile — absent; between ilmenite and zircon — direct moderate (+0.39); between zircon and rutile — inverse very weak (–0.17); between

ilmenite and apatite — inverse moderate (-0.3); between apatite and zircon — inverse weak (-0.24); between apatite and rutile is absent.

The productive layer is represented by sands and redeposited kaolins. In general, the ore body has a layer-like shape, lies subhorizontally, with variable thickness and uneven roach, characterized by uneven distribution of useful components both horizontally and vertically. Within the Central area, the weighted average content of ilmenite is 147.22 kg/m^3 , zircon — 1.83 kg/m^3 , and within the Western area, the weighted average content of ilmenite is 104.35 kg/m^3 .

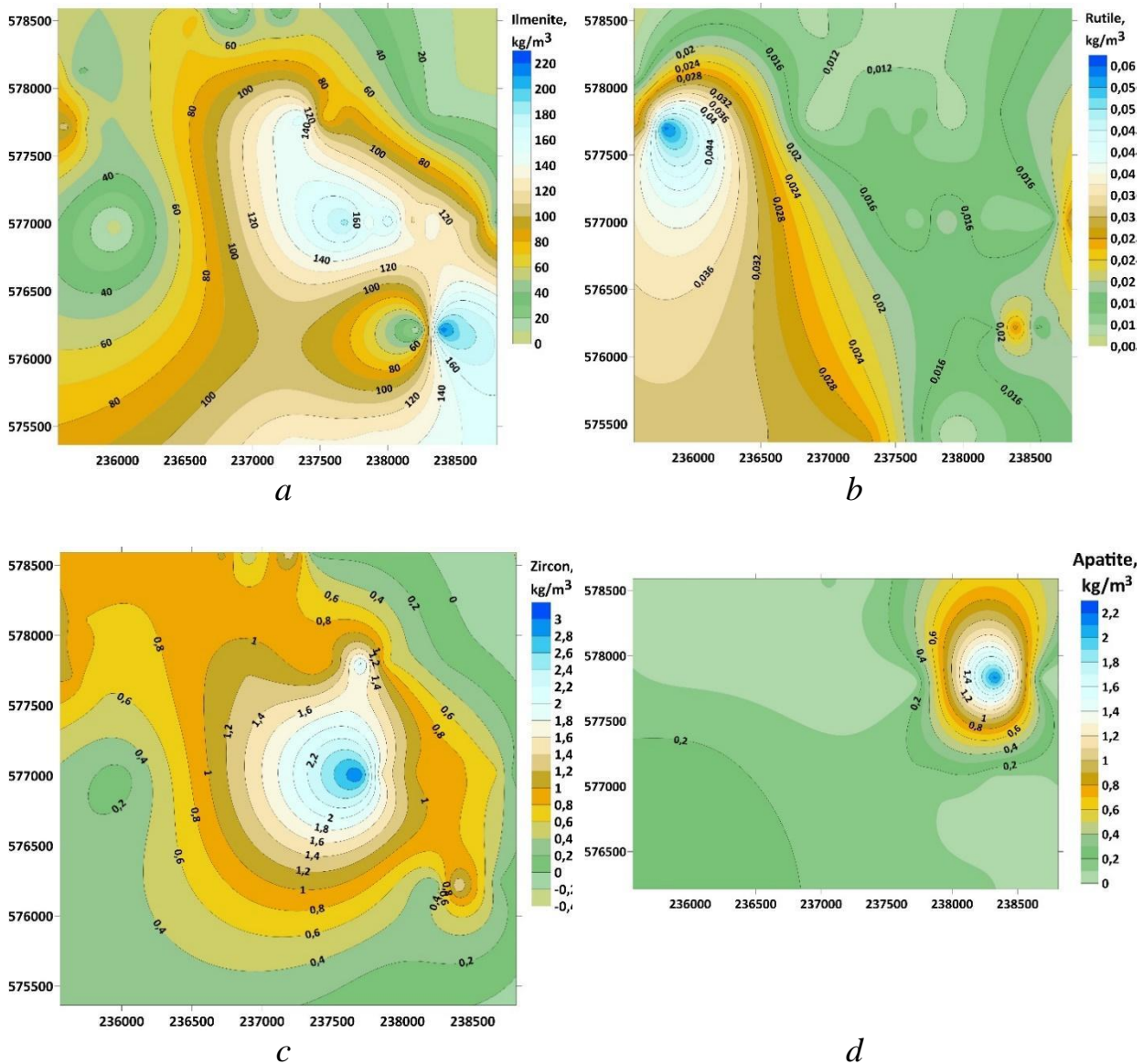


Fig. 6. Likarivske deposit. Lateral distribution of the average content (kg/m^3) of ilmenite (a), rutile (b), zircon (c) and apatite (d) in Aptian-Lower Albian redeposited kaolins

According to the results of the chemical analysis of the ilmenite monomineral fraction, performed during the preliminary geological and economic assessment of

the deposit reserves, the TiO_2 content in ilmenite is 61.02%, and the $\text{FeO}/\text{Fe}_2\text{O}_3$ ratio is 0.78. The ZrO_2 content in zircon is 63.54%.

There is no correlation between the content of apatite in the weathering crust and redeposited Lower Cretaceous kaolins; it is also absent in Aptian-Lower Albian redeposited kaolins and sands; in weathering crust and Lower Cretaceous sands — direct weak (+0.23).

A layer of sands and redeposited kaolins with flint inclusions lies in the roof of the Lower Cretaceous continental deposits. The thickness of the sands is 0.5–2.0 m, and the layer of chert is 0.1–1.0 m [6]. The continental deposits are overlain by coastal-marine formations of the Burimska suite, which are timed to depressions in the topography of the crystalline rocks of the foundation and their weathering crust. These are glauconite-quartz sands, multi-grained, weakly kaolin, poorly sorted. The thickness of deposits is up to 3.0 m, sometimes more. The content of ilmenite is 10–30 kg/m^3 , and only in the eastern part of the site in some samples it reaches 150.0 kg/m^3 [6]. Above the section are undissociated lower-middle Eocene sediments, represented by multi-grained, light-gray, gray, yellowish-gray sands up to 3.0 m thick. The ilmenite content in the sands reaches 50.0 kg/m^3 [6]. Upper Paleogene glauconite-quartz fine-, very fine-grained, greenish-gray sands overlap the Eocene deposits. The thickness of deposits is up to 20.0 m; the content of ilmenite is up to 50.0 kg/m^3 [6]. On the sediments of the Kharkiv suite lie the sands of the Lower Neogene (Novopetrivska suite) fine- and very fine-grained, light gray, yellowish-gray, 2.0–12.0 m thick. The section is completed by variegated clays of the Neogene system (Miocene) and sands, loams eolian-deluvial and alluvial-deluvial of the Quaternary system.

Reserves and resources of ilmenite are classified as C_2 and P_1 . The deposit belongs to the significant deposits.

The Andriivske deposit is located on the northern flank of the Likarivske deposit within the Velyka Vys river valley and its slopes in the territory of the Novomyrhorod district of the Kirovohrad region (between the settlements of Ivanivka, Troyaniv, Andriivka, and Likariv). The geological structure of the deposit includes: rapakivi granites and their weathering crust, ilmenite-rich continental deposits of the Lower Cretaceous (Aptian-Lower Albian), coastal marine deposits of the Lower Cretaceous (Upper Albian) and Quaternary alluvial deposits of the Velyka Vys river valley [6]. The deposit is located within the distribution of rocks of the granite-rapakivi formation and granite-syenite-monzonite formation (see Fig. 2).

Due to the lack of data, the presented material regarding the weathering crust concerns only the eastern part of the deposit. The thickness of the weathering crust is 0.2–16.5 m (average value 5.86 m). The thickness of the weathering crust increases in the direction from north to south (Fig. 7, a). The average content of minerals in the

weathered crust, kg/m³: ilmenite 15.95–61.5 (average value 25.32); zircon 0.03–3.11 (average 0.52); rutile 0.01–0.1 (average 0.03), apatite 0.1–2.43 (average 0.97). Halos of increased mineral content do not coincide spatially (Fig. 8).

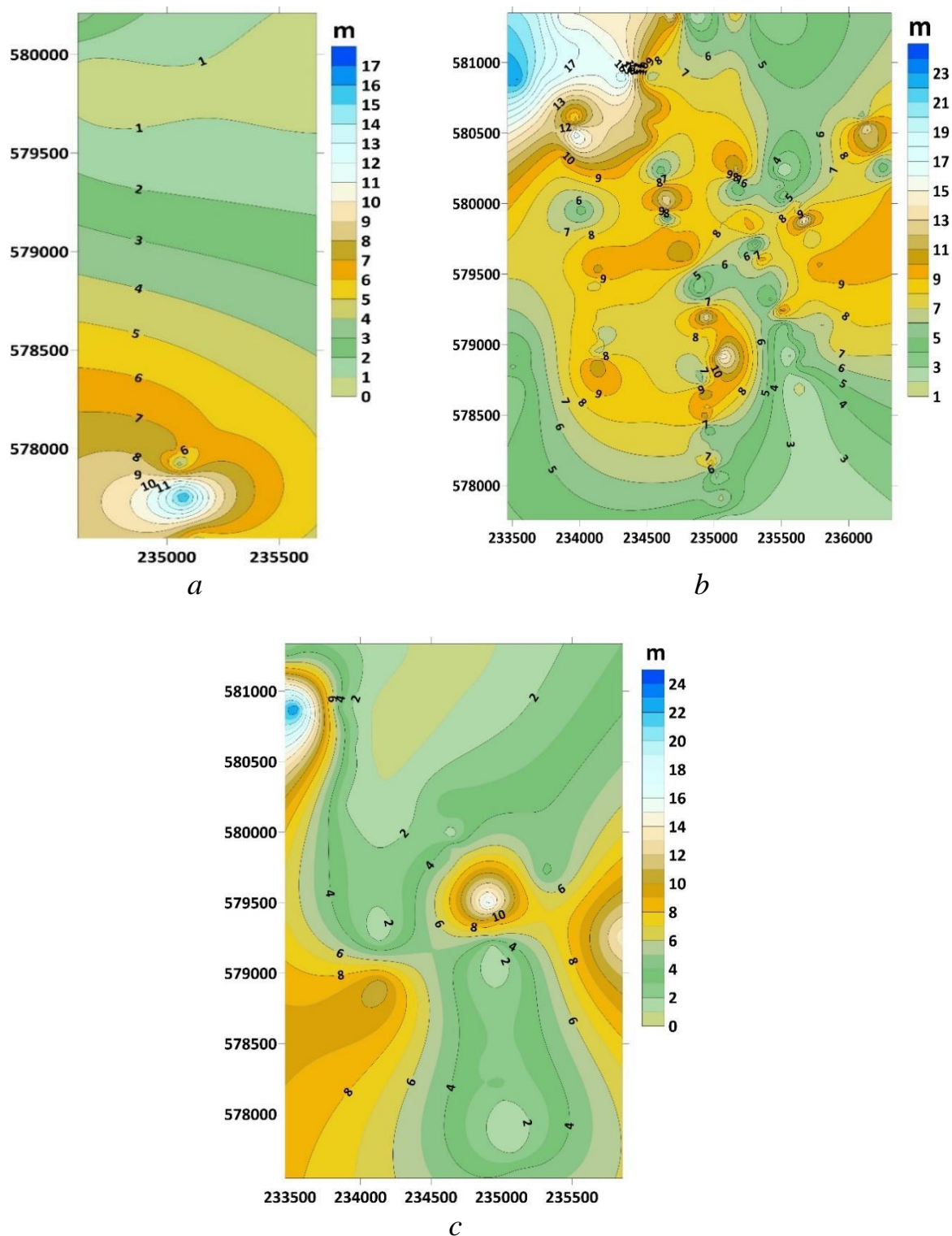


Fig. 7. Andriivske deposit. Isopachites of the thickness of weathering crust (a), Lower Cretaceous sands (b) and Lower Cretaceous redeposited kaolins (c)

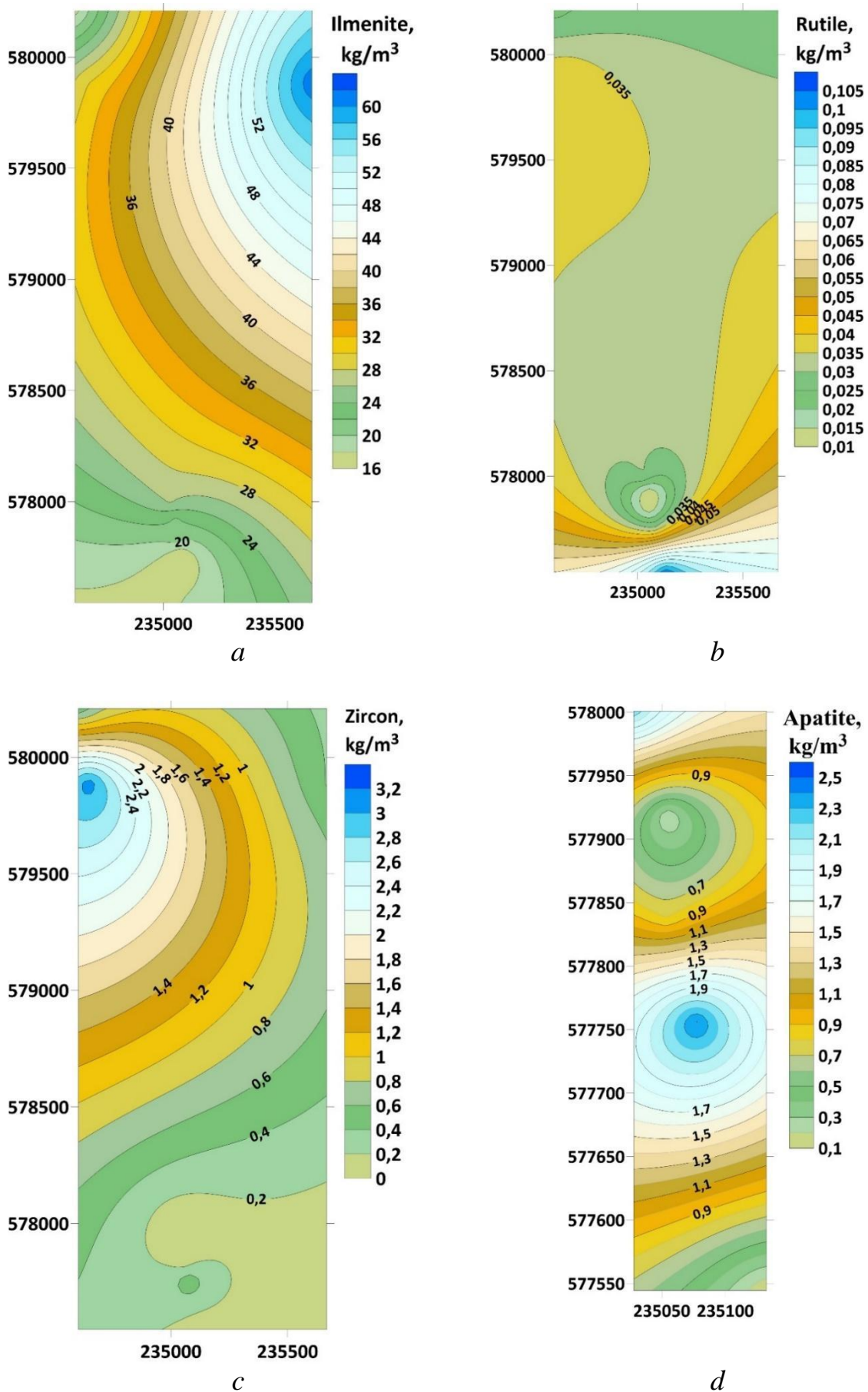


Fig. 8. Andriivske deposit. Lateral distribution of the average content (kg/m^3) of ilmenite (a), rutile (b), zircon (c) and apatite (d) in the weathering crust

The correlation relationship and its strength between the average content of minerals is as follows: between ilmenite and zircon, the direct line is very weak (+0.11); between rutile and apatite — the reverse is moderate (–0.31); between apatite and zircon — straight average (+0.65); there are no correlations between ilmenite and rutile, between rutile and zircon, and between ilmenite and apatite.

Continental deposits of the Lower Cretaceous fill the erosion-tectonic Lebedyn-Balakleivska paleodepression and are widespread at the intersection of the Velyka Vys river valley and the Lebedyn-Balakleivska paleodepression. In some areas, Lower Cretaceous deposits are eroded by the modern valley of the Velyka Vys River. The Lower Cretaceous continental deposits are represented by Aptian-Lower Albian Smilyan strata. These are alluvial and alluvial-deluvial sands of quartz, light gray, kaolin and redeposited sandy kaolin.

The thickness of Aptian-Lower Albian sands is 1.2–23.8 m (average value 8.41 m). In general, the thickness of the sands increases from the southeast to the northwest (see Fig. 7, *b*) Within the axial part of the paleovalley, the continental sediments are partially eroded by the modern valley of the Velyka Vys River. Average content in wells, kg/m³: ilmenite 2.85–83.58 (average value 22.57 m), zircon 0.03–11.96 (average 0.47), rutile 0.01–4.8 (average 0.14), apatite 0,02–1,7 (average 0,43). The maximum content of ilmenite is 182.7 kg/m³. Halos of increased mineral content do not coincide spatially (Fig. 9). The correlation and its strength between the average content of minerals are as follows: between ilmenite and zircon — direct is very weak (+0.12); between zircon and rutile — direct very weak (+0.1); between ilmenite and rutile — absent; between ilmenite and apatite — inverse very weak (–0.13); between rutile and apatite — absent; between zircon and apatite — direct very weak (+0.11).

About 75% of the sand consists of classes with a size greater than 0.315 mm. Extraction of ilmenite 84.5%.

The thickness of redeposited kaolins is 0.6–23.6 m (on average 4.85 m), the largest is concentrated in the western (with a maximum in the northwestern) and central-eastern parts of the deposit (see Fig. 7, *c*). Average content, kg/m³: ilmenite 4.0–165.4 (average 46.65), zircon 0.05–2.5 (average 1.47), rutile 0.01–1.5 (average 0, 07), apatite 0,01–4,1 (average 0,36). The correlation and its strength between the average mineral content is as follows: between ilmenite and zircon — direct moderate (+0.30); between zircon and rutile — direct moderate (+0.48); between ilmenite and rutile — direct weak (+0.24); between ilmenite and apatite, — inverse very weak (–0.17); between zircon and apatite — inverse moderate (–0.32); between rutile and apatite — absent.

Upper Albian coastal sands lie on the eroded surface of the Smilyan strata. The thickness of the sands reaches 20 m, the content of ilmenite — from the first kilograms to 20 kg/m³, occasionally up to 60 kg/m³ [6].

Within the deposit, there are modern Quaternary ilmenite placers, which are confined to the Velyka Vys river valley, in the place where the river erodes Upper Cretaceous (Upper Albian) coastal marine and Lower Cretaceous (Aptian–Lower Albian) continental deposits.

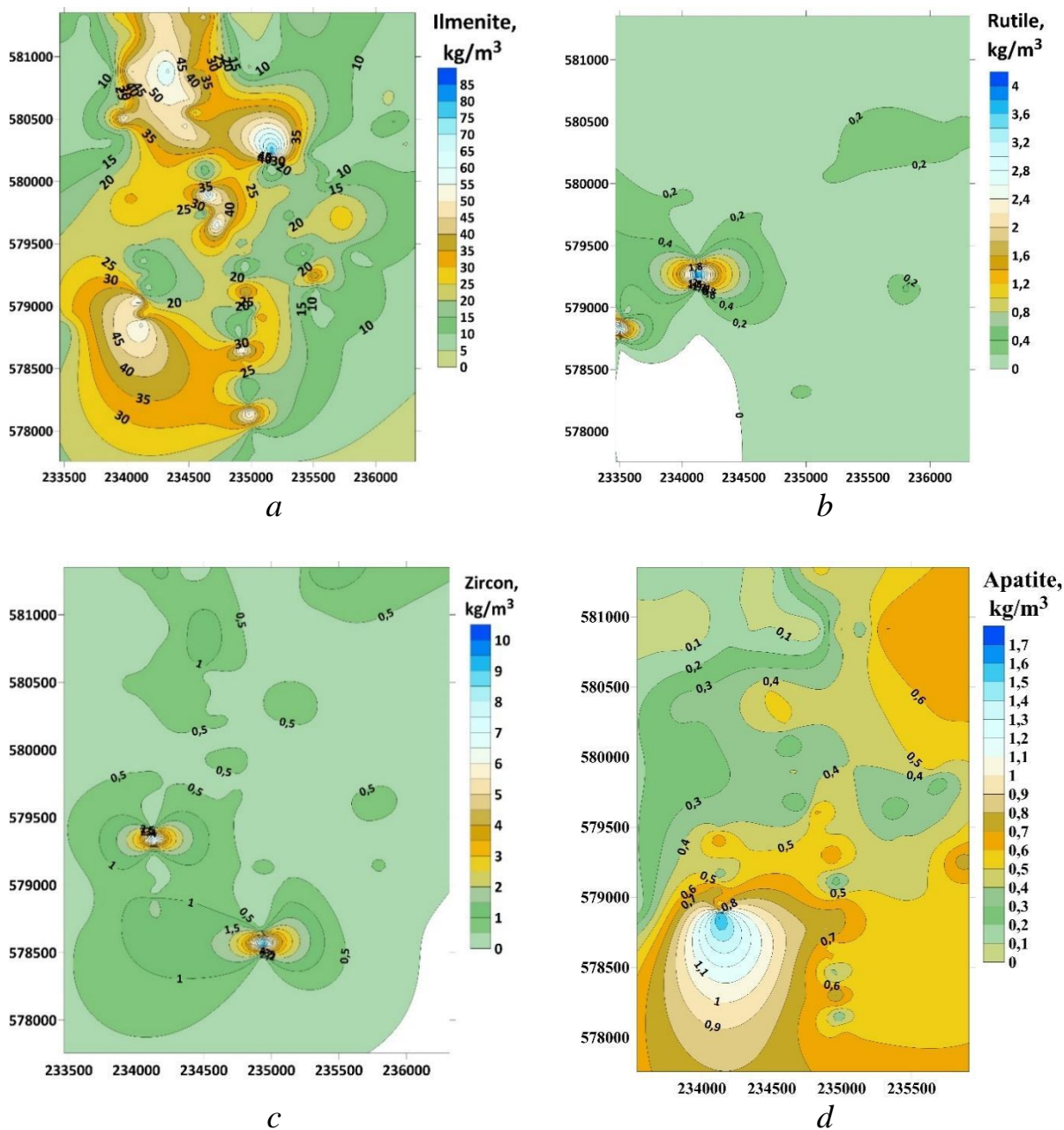


Fig. 9. Andriivske deposit. Lateral distribution of the average content (kg/m³) of ilmenite (a), rutile (b), zircon (c) and apatite (d) in Aptian-Lower Albian sands

Minor tributaries of the river erode the weathering crust of the crystalline rocks of the foundation. The Quaternary placer is composed of medium-coarse-grained, gray alluvial sands. The width of the placer is 0.3–0.6 km, the length is up to 4.0 km. The thickness of the productive layer is 2.7 m. The content of ilmenite is 30–61 kg/m³ (average value is 47 kg/m³).

Reserves and resources of ilmenite are classified as C₂ and P₁.

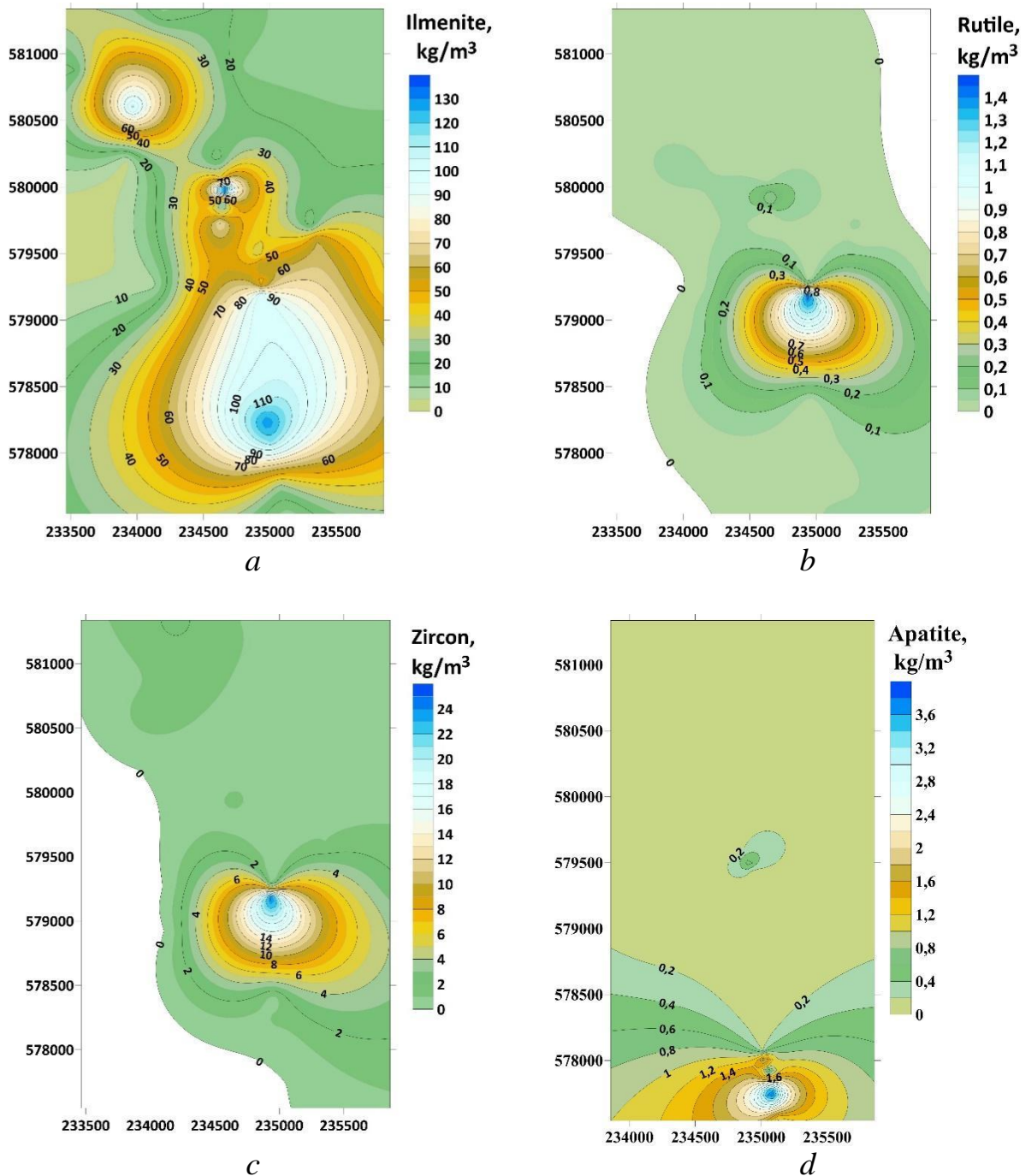


Fig. 10. Andriivske deposit. Lateral distribution of the average content (kg/m³) of ilmenite (a), rutile (b), zircon (c) and apatite (d) in Aptian-Lower Albian redeposited kaolins

Conclusion.

1. Within the southwestern part of the Novomyrhorod massif of the Korsun-Novomyrhorod pluton within the limits of the Likarivske and Andriivske deposits, during the long geological history of the area's development, a different time and different genesis, spatially paragenetic rutile-apatite-zircon-ilmenite ore-bearing system was formed. The ore-bearing system is represented by ore-bearing crystalline rocks of the basement, their weathering crusts and continental deposits of the Lower Cretaceous (Aptian-Lower Albian).

2. The main useful component of the deposits is ilmenite. Associated components are zircon, apatite, rutile.

3. The industrial content of ilmenite has been established in the following deposits: Likarivske deposit — weathering crust of crystalline basement rocks, continental Aptian-Lower Albian, marine Upper Albian, continental Lower-Middle Eocene, and marine Middle Eocene; Andriivske deposit — weathering crust of crystalline basement rocks, continental Aptian-Lower Albian sediments, continental Quaternary sediments.

4. The main ore-bearing potential of the deposits is contained in the weathering crust and continental deposits of the Lower Cretaceous. Lower Cretaceous deposits fill the Lebedyn-Balakleivska paleovalley, which developed its channel in the weathering crust of the crystalline rocks of the foundation.

5. Maps were created that characterize the lateral change in the thickness of the weathering crust, Lower Cretaceous continental sands, and redeposited kaolins, as well as the lateral distribution of the average content of ilmenite, rutile, zircon, and apatite in these deposits.

6. The lateral distribution of the thickness of the weathering crust is due to the relief of the surface of the crystalline rocks of the foundation and the partial erosion of the eluvium during the geological development of the territory. The uneven distribution of the thickness of the Aptian-Lower Albian continental deposits is caused by the configuration of the tectonic-erosive paleovalley, the relief of the surface of the weathering crust, the amount of terrigenous material entering the sedimentation basin, facies conditions, erosion.

7. The lateral distribution of the average content of ilmenite, rutile, zircon, and apatite in the ore-bearing deposits is mostly unsustained, with local areas of increased content. The average content of minerals in the weathering crust is determined by their average content in the parent rocks of the crystalline foundation; in continental formations of the Lower Cretaceous — by the content of minerals in the weathering crust, partly by the relief of the rock and the facies conditions of formation.

8. Halos of significant content of mineral, as a rule, do not coincide spatially.

9. Correlations between average content of mineral are direct and inverse. Correlations are mostly very weak, weak or absent; sometimes correlations are moderate and rarely — strong.

10. The significance of the obtained results lies in the establishment of the inherited character of ore bearing in a wide formation and stratigraphic range. This determines the paragenetic and spatial relationship and significant resource potential of the studied deposits.

11. The obtained results prompt a revision of the ore-bearing potential of the territories within the various geoblocks of the Ukrainian shield, where deposits of different ages and different genesis and ore occurrences of titanium-zirconium minerals are spatially and paragenetically related.

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ЛАТЕРАЛЬНИЙ І ВЕРТИКАЛЬНИЙ РОЗПОДІЛ ТИТАНО-ЦИРКОНІЄВИХ МІНЕРАЛІВ В МЕЖАХ АНДРІЇВСЬКОГО І ЛІКАРІВСЬКОГО РОДОВИЩ (ПІВДЕННО-ЗАХІДНА ЧАСТИНА НОВОМИРГОРОДСЬКОГО МАСИВУ)

Подано загальні відомості про геологічну будову та рудоносність Лікарівського та Андріївського родовищ, які розташовані у південно-західній частині Корсунь-Новомиргородського плутону в межах Новомиргородського масиву (південно-західна частина). Продуктивні відклади Лікарівського і Андріївського родовищ представлені формацією кори вивітрювання і континентальною алювіальною піщано-каоліновою формацією нижньої крейди (апт-нижній альб). На підставі координат, опису і результатів опробування свердловин створено цільову базу даних, на основі якої здійснено картографічні побудови. Досліджено структурні (рельєф підосви, поверхні рудовмісних відкладів та їх товщина) і речовинні (літологічний склад рудоносних відкладів; розподіл середнього вмісту ільменіту, циркону, рутилу і апатиту за латераллю в продуктивних відкладах) параметри різновікових і різногенетичних утворень Лікарівського і Андріївського родовищ. Досліджено напрям і силу кореляційних зв'язків між ільменітом, рутилом, цирконом і апатитом у корі вивітрювання та в континентальних відкладах (піски і перевідкладені каоліни) нижньої крейди. Встановлено, що в межах Лікарівського і Андріївського родовищ протягом геологічного розвитку території утворилася різночасова і різногенетична циркон-apatит-ільменітова рудоносна система, яка представлена просторово-парагенетичним рядом: кристалічні породи фундаменту; кори вивітрювання кристалічних порід фундаменту; флювіальні формації, які утворилися за рахунок ерозії і перевідкладення елювію та різновікових мезозой-кайнозойських розсипів. Результати досліджень є інформаційною базою для супроводу видобувних робіт у межах досліджених родовищ.

Ключові слова: Корсунь-Новомиргородський плутон, Новомиргородський масив, габро-анортозитова формація, кора вивітрювання кристалічних порід, континентальні відклади нижньої крейди, Лікарівське і Андріївське родовища, ільменіт, рутил, циркон, апатит.

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Стаття надійшла: 21.08.2023.