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LATERAL AND VERTICAL DISTRIBUTION OF ILMENITE, RUTILE, ZIRCON IN THE LOWER CRETACEOUS SAND SEDIMENTS WITHIN THE ANDRIIVSKYI PLACER (SOUTH-WESTERN PART OF THE NOVOMYRHOROD MASSIF)

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The lateral distribution of the average content of ilmenite, zircon, and rutile in the Lower Cretaceous sedimets (Smilyansk strata) of the Andriyiv placer, which is located in the southwestern part of the Novomyrhorod massif of the Korsun-Novomyrhorod pluton, was studied. The peculiarities of the distribution of the content of ilmenite, zircon and rutile in the vertical section of the wells were clarified. Correlation between minerals was studied.
Key words: Novomyrhorod massif, Lower Cretaceous deposits, sand, lateral and vertical distribution, ilmenite, rutile, zircon.

ЛАТЕРАЛЬНИЙ І ВЕРТИКАЛЬНИЙ РОЗПОДІЛ ІЛЬМЕНІТУ, РУТИЛУ, ЦИРКОНУ В НИЖНЬОКРЕЙДОВИХ ПІЩАНИХ ВІДКЛАДАХ АНДРІЇВСЬКОГО РОЗСИПУ (ПІВДЕННО-ЗАХІДНА ЧАСТИНА НОВОМИРГОРОДСЬКОГО МАСИВУ)

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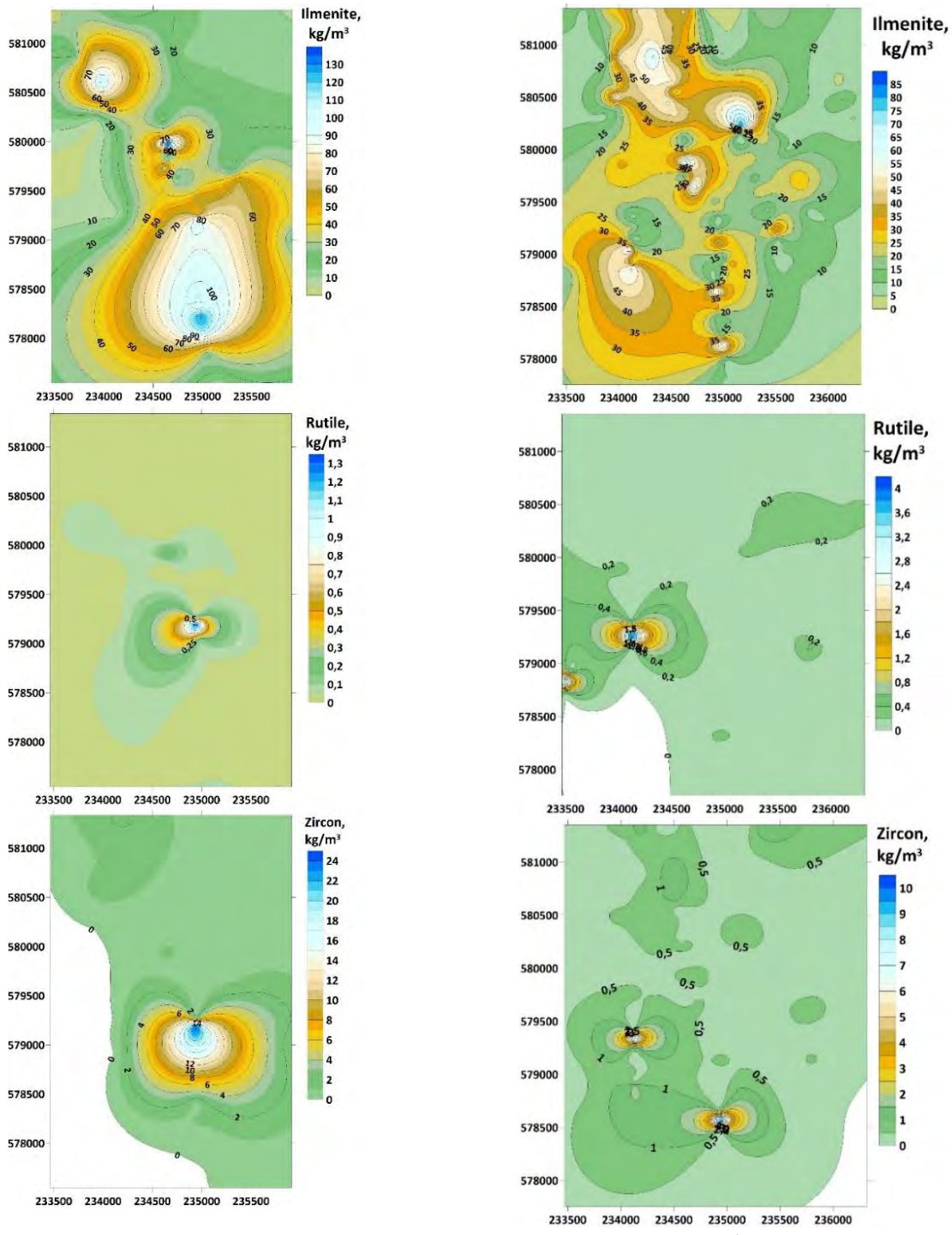
Досліджено латеральний розподіл середнього вмісту ільменіту, циркону, рутилу в нижньокрейдових відкладах (смілянські верстви) Андріївського розсипу, який розташований в південно-західній частині Новомиргородського масиву Корсунь-Новомиргородського плутону. З'ясовано особливості розподілу вмісту ільменіту, циркону і рутилу у вертикальному перетині свердловин. Досліджено кореляційні зв'язки між мінералами.
Ключові слова: Новомиргородський масив, нижньокрейдові відклади, пісок, латеральний і вертикальний розподіл, ільменіт, рутилу, циркон.

Introduction. The largest titanium ore deposits in the world are associated with the gabbro-anorthosite formation. The gabbro-anorthosite formation of the Korsun-Novomyrhorod pluton is no exception [1]. Native, eluvial and placer deposits of titanium ores have been established here [1, 2]. The ore content of the sedimentary cover is mainly related to the crust of weathering of the crystalline rocks of the foundation and the products of its erosion and redeposition – the continental sediments of the Lower Cretaceous. To date, the most productive are the continental deposits (Smilyan layers), which are confined to the Lebedyn-Balakleivska paleovalley. One of the promising placers is Andriivskyi [2].

Research materials and methods. The methodical-methodological basis of the study of 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 ore bearing of sedimentary formation units of Ukraine and placers of zircon and ilmenite in particular. The basis for the research was the production reports and the work of the authors of the publication. Cartographic constructions were carried out using the software Golden Software Strater, Golden Software Surfer.

Presenting main material. The Andriivska area is located 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 Likarivka). The geological structure of the site includes (from bottom to top): rapakivi granites and their weathered crust, ilmenite-bearing continental deposits of the Lower Cretaceous (Aptian-Lower Albian) and Quaternary alluvial deposits of the Velyka Vys river valley. Continental sediments of the Lower Cretaceous lie with erosion on the weathering crust of the crystalline rocks of the basement within the Lebedyn-Balakleivska paleodepression. Deposits are represented by light gray quartz sands and redeposited kaolins.

The thickness of redeposited kaolins is 0.6–23.6 m (4.85 m on average). The largest thicknesses of redeposited kaolins are concentrated in the western (with a maximum in the northwestern) and central-eastern parts of the section (Fig. 1 *a*). Average content (kg/m^3) of ilmenite – 4.0–165.4 (average value – 46.65), zircon – 0.05–2.5 (average value – 1.47), rutile – 0.01–1.5 (average value – 0.07). The distribution band of increased ilmenite content extends from the southeast to the northwest with a maximum in the southern part; the lateral distribution of the average rutile and zircon content is uniform with a local increase in the almost central and southeastern sections, respectively (see Fig. 1 *a*). A direct moderate correlation exists between the average content of ilmenite and zircon (+ 0.30) and the average content of zircon and rutile (+ 0.48); direct weak - between the average content of ilmenite and rutile (+ 0.24).



a *b*

Fig. 1. The isogypsums of the average content of ilmenite, rutile, and zircon in the redeposited kaolins (*a*) and in the sands (*b*) of the Andriivska area

The thickness of Aptian-Lower Albian sands is 1.2–23.8 m (average value – 8.41 m) and increases from southeast to northwest. The average content of ilmenite in wells is 2.85–83.58 kg/m^3 (average value – 22.57), zircon – 0.03–11.96 kg/m^3 (average value – 0.47), rutile – 0.01–4.8 kg/m^3 (average value – 0.14). The maximum content of ilmenite is 182.7 kg/m^3. Halos of increased mineral content do not coincide spatially (see Fig. 1 *b*). Very weak direct correlations exist between the content of ilmenite and

zircon (+ 0.12) and the content of zircon and rutile (+ 0.1); there is no correlation between the content of ilmenite and rutile.

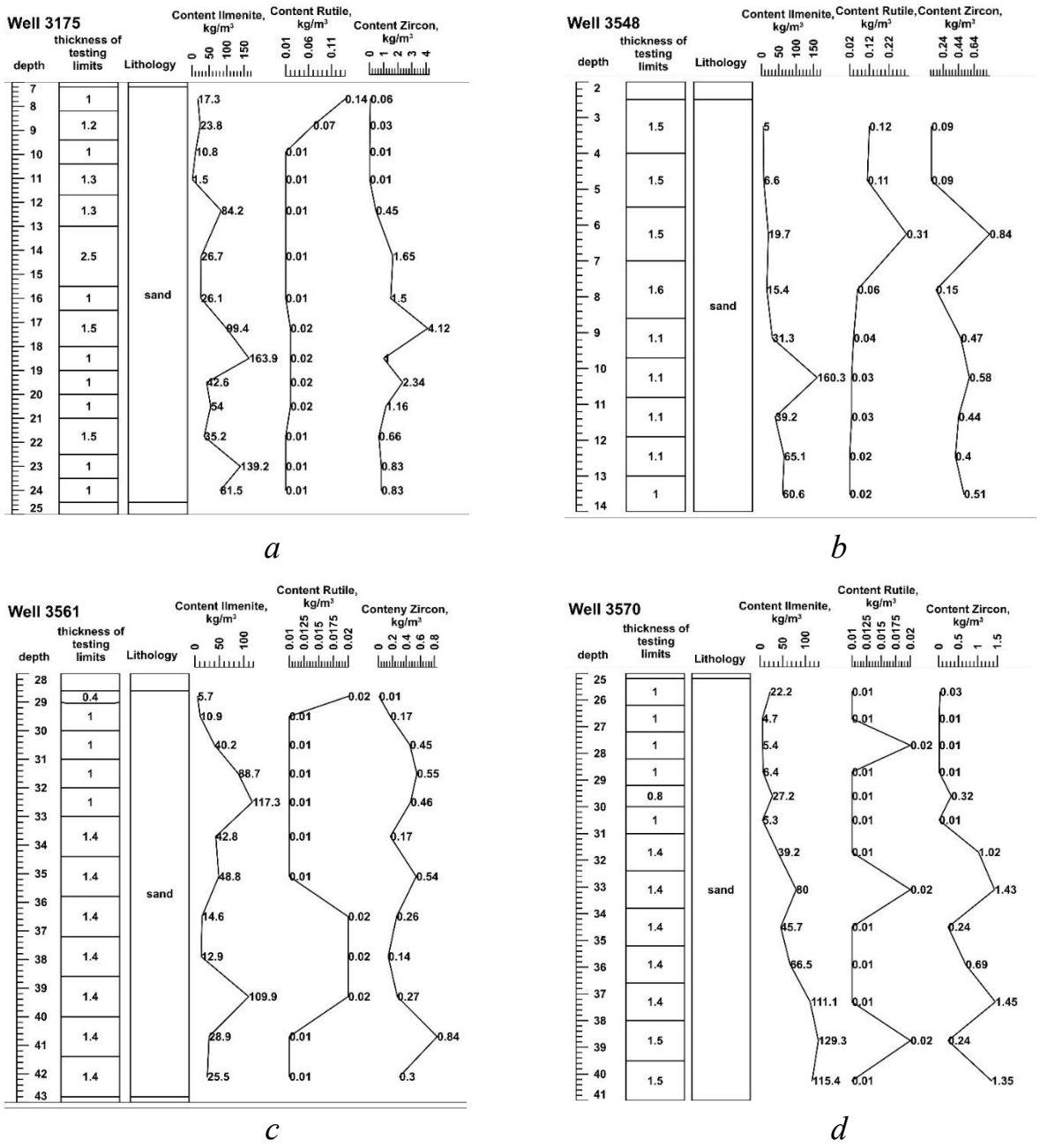


Fig. 2. Distribution of the content of ilmenite, rutile, and zircon in the vertical cross section of the wells of the Andriivskyi placer

Correlation analysis investigated the directionality and strength of correlations between the content of ilmenite, zircon, and rutile in the vertical section of wells. It was found that correlations between mineral content in different wells can have different directionality and strength (fig. 2). In particular, between the content of ilmenite and rutile, the correlations have the following direction and strength: inverse

very weak (– 0.18), inverse weak (– 0.25), inverse moderate (– 0.41), direct weak (+ 0.26). Correlations between the content of ilmenite and zircon have the following direction and strength: direct moderate (from + 0.30 to +0.43), direct average (+ 0.69). Correlations between zircon and rutile content have the following direction and strength: inverse weak (– 0.27), inverse medium (– 0.56), direct moderate (+ 0.34), sometimes the correlation may be absent.

Conclusions.

The halos of distribution of the highest average content of ilmenite in redeposited kaolins and sands spatially mostly coincide with and follow the direction of extension of the paleovalley. Halos of increased average rutile and zircon content in redeposited kaolins and sands do not coincide spatially. In general, the Andriivskyi placer is promising and, together with the Byrzulivske and Likarivske deposits, forms one ore field, which is characterized by spatial proximity and a similar geological structure.

The obtained results are the factual basis for the scientific support of mining operations.

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