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CRITICAL MINERALS IN THE ALLUVIAL DEPOSITS OF THE TROSTYANYTSYA PLACER DEPOSIT OF ILMENITE

Mineral raw materials that have a specific application in industry (including high-tech and strategic industries) and for which there is no substitute at the current level of technological development, and whose supply is dominated by one or more producers, belong to the critical category. These minerals are economically important, and the stability of their supply is characterized by a high degree of risk [4].

The list of critical mineral raw materials differs not only for regions and countries of the world, but also changes over time for the same region due to the importance of mineral raw materials and the ways of their supply [1].

The State Geology and Subsoil Service of Ukraine analyzed minerals perspective of significance for national economic security and consumption trends in the world and selected 20 critical minerals, the confirmed reserves of which allow increasing their production in Ukraine [6]. These raw materials are divided into two groups: "Raw materials for import substitution" and "raw materials for innovative industries". The first group includes: natural gas and oil, uranium, coking coal, lead, zinc, gold, flux limestone, fluorite, potassium salts. The second group includes: titanium, zirconium, lithium, nickel, cobalt, beryllium, rare earths, tantalum, niobium, graphite.

According to the calculations of Ukrainian scientists, about 20% of reserves and resources of titanium minerals are concentrated within the Ukrainian placer subprovince, which includes 13 titanium-bearing regions [3].

The Volyn titanium-bearing region is one of the first places in terms of reserves. Ilmenite deposits are located not far from each other and represent a single group spatially connected with a series of main rocks of the Korosten intrusive complex. All deposits are essentially ilmenitic, with appreciable amounts of apatite (eluviall) and zircon (Irshynskyi placer) [5]. In some deposits, scandium and vanadium are present in ilmenite, and hafnium in zirconium. One of these deposits is Trostyanytsya, which was discovered during geological surveying in 1964-1970.

From a geological and structural point of view, the Trostyanytsya deposit is confined to the northern part of the Volodarsk-Volynskyi massif of the main rocks of the Korosten pluton [2], in the northwest it borders the Middle area of the Mezhyrichny placer ilmenite deposit, in the northeast it borders the Bukinsky deposit.

The main rocks of the Lower Proterozoic and the products of their physical and chemical weathering, as well as loose sedimentary formations of the Mesozoic-Cenozoic age, take part in the geological structure of the Trostyanytsya deposit.

The alluvial deposit fills a valley-like depression of a complex configuration, stretched in the northeast direction for a distance of up to 5 km, with a width of 2.5 km. The thickness of the productive deposits varies widely, on the sides of the subsidence it is 2-4 m, in the center it reaches 20 m. The bed of alluvial placer is the weathered kaolin crust, which is the source of the accumulation of ilmenite, which after the destruction of the crust is eroded into the placer.

Alluvial deposits make up 50% of the ore-bearing layer of the deposit and are represented by Middle Jurassic-Lower Cretaceous sands – 3%, secondary kaolins – 25%, Paleogene-Neogene sands – 4%, secondary kaolins – 5%, Lower Quaternary sands – 13%.

The main ore mineral of sedimentary deposits is ilmenite, the content of which ranges from 5-10 to 400 kg/m^3, sometimes up to 523 kg/m^3. High concentrations of ilmenite are characteristic of secondary kaolins. without the main ore component in the deposit, the following are present (kg/m^3): zircon – 0,44; rutile – 0,09; apatite – 0,2; magnetite – up to 0,03; in significant quantities - monazite, disten, titanomagnetite, as well as some components strategically important for the economy of our country.

Ilmenite from the alluvial deposits of the Trostyanytsya deposit in the form of isomorphic impurities contains elevated concentrations of vanadium and scandium (V_2O_5 – 0.265%, and Sc_2O_5 – 95.5 g/t). Vanadium can be extracted at existing titanium-magnesium enterprises during the metallurgical process.

Comprehensive development of this deposit will simultaneously solve several important issues for the sustainable development of the state, namely: it will continue the activity of Mezhyrichny GZK, it will bring a significant profit to the economy of the district, and it will partly provide critical raw materials for the necessary branches of industry. The deposit is promising, but requires detailed research using modern methods.

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