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Prospects of the mafic-ultramafic belt of the Nuratau Mountains for platinoids (Uzbekistan)

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Abstract

Mafic-ultramafic belts, tracing zones of deep faults, and suture zones have been discovered in Uzbekistan. Within their limits, in the mountains of Sultanuvais, Bukantau, Tamdytau, Nurata, and Chakylkalyan, studies have been conducted for the detection of platinum group metals (PGM). The article discusses the prospects of the mafic-ultramafic belt (intrusive massif) of the Nuratau mountains for platinoids. It is located on Yuzhno-Gissarsky and Kuldzhuktau-Zirabulak-Karatyubinsky and includes intrusions of the Kyzylturuk ore poly, etc. The host rocks are represented by metamorphosed Devonian formations (siliceous shales, siltstones, sandstones). The Zarafshan-Turkestan mafic-ultramafic belt (MUB) is a core belt in the Southern Tien Shan, which is traced intermittently for a distance of about 1000 km. From the north, it borders the Turkestan-Alai MUB, in the South Kuldzhuktau-Zirabulak-Karatyubinsky MUB (along the South Auminzatau and Zarafshan deep fault). The belt covers the Malguzar Mountains, the western end of the Turkestan ridge, most of the North Nuratinsky ridge, the South Nuratinsky Ridge, and the Kyzylkum hills: Sangruntau (southern part), Aristantau, Tamdytau (northern half), Auminzatau and Beltau. In the eastern direction, it can be traced to Tajikistan and Kyrgyzstan, in the western direction it stretches up to the Ural-Tien Shan transverse fault. After which it is planned to move to the Mugodzhar and Ural-Tobolsk zones, which form a single Mugodzhar-Alai zone of the Ural-Tien Shan belt.

Introduction

Zarafshan-Turkestan is essentially "gabbroid", it is also characterized by the widespread development of Precambrian and Early Paleozoic formations, enclosing manifestations of the main magma in the form of effusions and hypabyssal intrusions, which are part of the Malguzar gabbro-diorite-diabase complex. It is composed of diabase, gabbro-diabase, micro gabbro, gabbro-diorites, and their corresponding porphyrites, diorite lamprophyres (causalities), diorites, diorite porphyrites (including quartz) and granitoid [1-7].

Gabbro-diorites and diabases are found in Western Sultan-Uwais (Zengebobo, Sheikhjeyli squares), Auminzatau (Zahkuduk, Dzhetymtau exits), Northern Nuratau (Baipurushli, Yukari-Sarai sections, etc.). But they are especially widely developed in the Malguzar Mountains, Karakchatau, Northern Nuratau, on the northern slopes of Southern Nuratau, the elevations of Auminzatau, Gobduntau, Marjanbulak and the northern slopes of the Turkestan ridge, where they form two bands of the sub-latitudinal strike. The North-Malguzar strip, which can be traced for 180 km, stands out most clearly. With a width of 10-12 km in inflation.

The complex is developed on the northern slopes of Northern Nuratau, where serpentinite melange forms at the base of the Majerum tectonic cover in the Ukhum-September and Yatak-Arvatyn synforms, clearly distinguished by a high positive magnetic field. As a rule, the rocks of the complex are tectonically "underlain" by the Asmansai volcano plutonic Association and are overlain by pyrazine shales of the Majerum formation, being rockless formations.

The complex is represented by serpentinites, gabbro, pyroxenites, plagiogranites and related metasomatic formations: rodingites and albitites. Serpentinites of the area are apoperidotite (apogartsburgite) by the nature of the initial rocks, apodunite is less common. By the nature of the minerals, serpentinites are represented by chrysotile-antigorite (± lizardite), antigorite-chrysotile, and chrysotile, and less often lizardite differences. Serpentinites have the following composition: serpentine - up to 92% (antigorite up to 21%, chrysotile up to 48%, bastite up to 22%) magnetite - 1.5%, chrome spinelides - 0.5-1%, carbonates up to 2.2%.

The rocks of the complex are associated with manifestations of chromium, nickel (often with increased platinum contents), and asbestos, but due to their small size and low contents, they are not of practical importance.

Granitoids of the complex are widely distributed in Northern and Southern Nuratau. They composed most of the Temirkabuk intrusive (170 sq.km.), Ustuksky (120 sq.km.), September (25 sq.km.), Akchobsky (23 sq.km.), Koytashsky (47 sq.km.), Aktau (190 sq. km.), Yangaklyk (20 sq.km.), Halbashinsky and Sartakchinsky intrusive arrays and most of the intrusive arrays are not exposed by erosion but fixed by gravitational minima.

In the southeast, the Ukhum-September synform is cut off by the Majerum surge and completely wedged at the kish. Balaban. Along this fault, the rocks of the upper plate of the Majerum formation are brought into contact with the sand-shale Kansai formation of the upper Riphean.

In the northern wing, the plate deposits connect with the main field of sand-shale deposits developed in the foothills of the North Nuratinsky ridge and lie in the cores of antiform folds.

Shales serve as cement for the "pellets" of sandstones of rounded, sometimes fusiform shape, ranging in size from 5-10 to 30-40cm (commensurate with the thickness of the layers), lenticular bodies (sometimes clear blocks) of limestones, dolomites, siliceous rocks, albitophyres ranging in size from the first tens of cm to 3-5m. Sometimes these rocks compose rather long (up to 600m) formation-like bodies with a capacity of up to 60m.

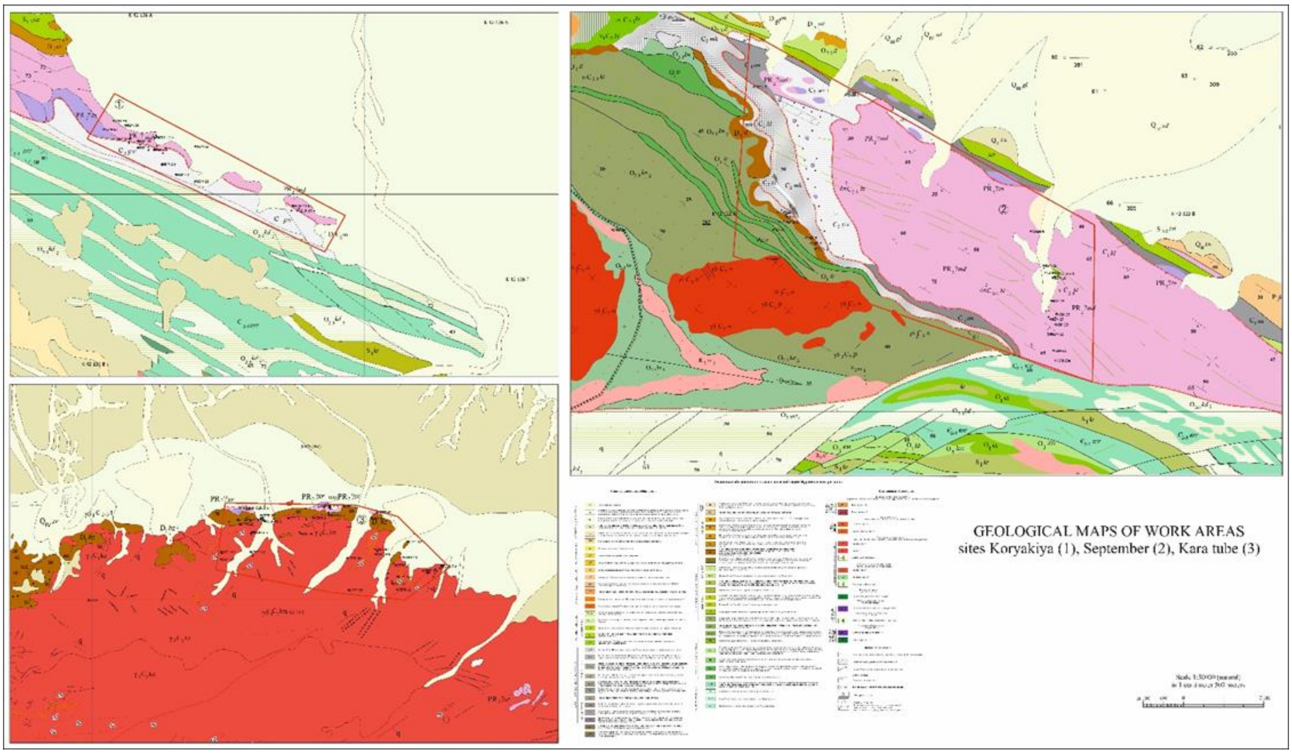

Figure 1. Geological map of the study area

Material and Method

The research methodology is based on the results of collection, examination and analysis of previously performed correction work.

After the analysis to clarify promising positions, field-verification work was carried out.

The actual fieldwork consisted of the following:

- cosmophotogeological works (field interpretation);
- geological linking routes;
- examination of ore occurrences and anomalies;
- points of detailed geological observations;
- structural and lithological sections;
- mineralogical sections;
- thematic specialized works

- construction of geological sections, analysis of ore-controlling factors with an assessment of their information weights (additional study of geological factors, assessment of information weights of factors, signs), comparative analysis with reference units, allocation of forecast positions (assessment of the prospects of favorable geochemical and geological-structural positions, allocation of forecast-promising cosmo structural, geochemical and geological-structural positions).

Results

A promising section of the Nuratau mountains, statistical calculations by spectral analysis-(spillage). Reduced average content for many elements, including traditional satellites of gold - As, Ag (18 and 0.6 cu/e, respectively). And also, the low maximum value–As-200 cu/e (0.02%), raises the question of the possibility of its use as an indicator of gold mineralization. Accordingly, concentrations of most chemical elements were obtained for the Nuratau mountains (concentrations Sb-81.3; Au-42.2; Ta-22.2; W-22; Sn-10; Ag-8.8; As-7.2; Cr-6.8; Pb-4.4; Ni-4.1; Bi-3.8; Cd–3.1; Zn-2; Co-1,9; V-1,9; Mn-1,4; Mo–1,3; Ga-1,2; Ge-1,1). Normalized according to A.P. Vinogradov.

To compare the concentrations on the site of the Nuratau mountains, the concentrations for the regional background were taken with the concentrate according to A.P. Vinogradov (granite-metamorphic shell), y/E. Accordingly, concentrations of most chemical elements were obtained according to the regional background, (concentrations of Ag-79,1; W – 24,6; Nb-17,6; Ge -14,1; As–10,2; Mn – 9,2; Mo-8,4; Cu -5,8; Co– 5,2; V–3,4; Ti-3,3; Li-3,1; Pb-3.

To compare the concentrations for the Nuratau mountains section, the concentrations for the regional background with the concentrate according to A.P. Vinogradov (granite-metamorphic shell), y/e were taken. Accordingly, concentrations of most chemical elements were obtained by regional background, (concentrations of Ru-62,3; Pt-33; Pd-23,3; Os-5,7; W-3,2; Te-1,9; Ir-1,9; Sb-1,9; As-1,7; Rh-1,4; Se-1,3; Cr-1,3; Ag-1,2; Au-1,2; Re-1,1; Y-1,1; Zn-1,1; Mg-1,1; Mo-1,1; Na-1,1; P-1; Ti-1; V-1; B-1; Sc-1; In-1; Co-1; Mn-1; Ca-0,9; Fe-0,9; Ni-0,7; Cu-0,6).

The most significant correlations - 43 samples with a critical value of the correlation coefficient for 5% of the significance level of Pk-0.303) are noted with Ti, Sc, Mo, Cr, P, Y, Ca, Fe, V, Co, Mn, In, Mg, Zn, Te, Na, Sb, Pd, Re, As, Ru, Os, Pd, Rh, Ag, W, Cu, Pt, Au, Ni.

Conclusion

40 samples were taken from the named sites analyzed by mass spectrometric analysis (GP "CL"). First of all, we note the geological position of the testing site – this is the eastern, rather steep slope of the ridge, representing the wing of the North Nurata anticline, which compose metamorphosed outcrops of terrigenous-carbonate deposits of the ancient Zhenvachisai formation (EO_1zv), and the wings compose metamorphosed -carbonate–shale formations of the Majerum formation (Omd), and further north, metavolcanic and subvolcanic of the Shavaz formation. A winding and intermittent, but sustained power strip (300-400m) can be traced along the slope of the rocks from the main to the ultrabasic composition: gabbro, peridotites, pyroxenites, dunites. This band with a length of >10 km is a structural position favorable for the localization of platinoids. But in this case, nickel was more significantly manifested: out of 40 analyzed samples, it showed contents from 0.12 to 0.33% in 25 (63%), and the rest were elevated.

Of the platinoids, palladium showed up better: in 17 samples out of 40 (43.5%) it has a content of 0.1 c/u up to 0.46 c/u, platinum is much weaker – 8 times (20%) and with a content from 0.1 to 0.19 c/u.

The positions of the North Nuratinsky Mountains on platinoids are significantly weaker than the previous ones described, and therefore we did not evaluate their potential. But it should be noted that they can attract the attention of the industry for joint mining with nickel, which undoubtedly needs to be further explored.

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