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Research Article

ABOUT THE ROLE OF MAIN DIKES IN THE FORMATION OF SULFIDE-RARE MINERALIZATION OF THE KOYTASH-UGAT BELT OF NORTHERN NURATAU, UZBEKISTAN

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ABSTRACT
In the given article research about formation of sulphide-rare metal deposits in the Koytash ore field and their stages has been made. The intrusion of subalkaline basaltoids dikes was the main reason for the formation of sulphide-rare metal deposits due to the enclosing calcareous skarns of the Koytash ore field, which is proved by the temperature influence of dikes on host rocks, where potassium activity increases when leaching iron from non-ferrous minerals.

***Keywords**: Genesis, Sulphide-Rare Metal Deposits, Ore Field, Dikes, Subalkaline Basaltoids, Calcareous Skarns, Mineralization, Rocks*

INTRODUCTION

In the ore fields of Late Paleozoic gold ore and rare metal deposits of Western Uzbekistan, dike complexes are widely developed, which form extended dike belts, swarms and bunches. The general systematics of the dikes, their composition, the sequence of formation, genesis, ore content, and other problems have not been sufficiently studied.

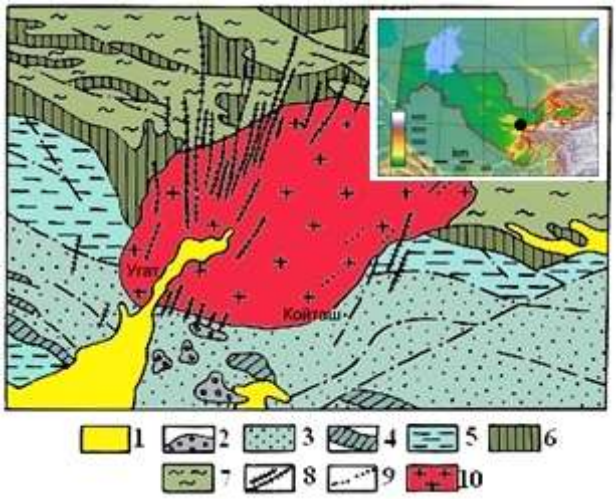

Figure 1: Scheme of the geological structure of the Koytash ore field (According to E.V.Chukarev, 1968) M1: 50000 with some changes.

While deciding the question of the formational affiliation of mineralization, it is important to correctly determine its genesis. The genesis of the sulphide-rare metal mineralization of the Koytash-Ugat belt (Koytash ore field, Western Uzbekistan) has not yet been properly answered. Some believe that the mineralization was due to carbonate rocks under the influence of granitoids of the Koytash intrusion (Babadzhanov and Khamrabaev, 2005), others - due to hornfels (Khamrabaev, 1994). In the southern, eastern and southwestern contact zones of the Koytash intrusion, there are three types of mineralization:

skarn formations with tungsten-molybdenum mineralization, sulphide-rare metal (W, Mo, Au, Cu) and quartz-polymetallic, which were formed in the above sequence. This leads researchers to various considerations about their origin.

The Koytash ore field, where the various dikes of the main subalkaline composition are diverse in composition, shape, and size, formation of which is associated with the intraplate geodynamic stage of the development of the region. Koytash granitoid intrusion is a benchmark of intrusions of Western Uzbekistan. Its rocks transect Cambrian-Ordovician deposits - in the north, medium-carbon and Silurian - in the south. The intrusion, with an area of 47 km^2, is oval in shape and is composed of biotite-amphibole and biotite granodiorites, adamellites, granites and alaskites (Fig.1). Vein series is represented by granite-porphyry, leucocratic granites, aplites and pegmatites, the latter forming dike swarms (stock work) in the eastern near-contact part of the intrusion. The massif is dissected by numerous dikes of lamprophyres (spessartites), diorite-porphyrites, diabases, malhites, granite, and granodiorite-porphyries, and other submeridional directions, the number of which, according to Z.A.Yudalevich, reaches 32 (Klipenshtein *et al.*, 1979).

1-Quaternary sediments; 2-conglomerates, upper carbonate sandstones; 3-siltstones, sandstones, calcareous siltstones of the Middle Carboniferous; 4-limestones of the Middle Carboniferous; 5-limestones, sandstones, siliceous schist of the Lower Silurian; 6-metamorphosed quartz-chlorite-sericite, calcareous schist's of the Upper Cambrian-Ordovician; 7-quartz-micaceous schist's, siltstones and Cambrian sandstones; 8-dykes of lamprophyres and diorite of porphyrites (T_1); 9-dyke aplite (P_{1-2}); 10-biotite-hornblende granodiorites (P_1).

Previous reports indicate that the main dykes contain a large number of xenoliths, such as meta-ultramafites, pyroxenites, gabbroids, hornblendites, bipyroxene and garnet-pyroxene gneisses, plagiogneisses, granulites, charnockites, xenocrysts of amphibole, garnet, etc., as deep dikes. and captured at the level of formation of dykes - altered granitoids, quartzites, sandstones, siltstones, crystalline schists, marbles, etc., whose presence indicates the subcrustal origin of the andesibasalt dykes and porphyry diorites (Musaev and Khamrabaev, 1984; Musaev, 1985; Khamrabaev and Iskandarov *et al.*, 1990; and Ishbaev, 2005).

The presence of xenocrystals of garnet and amphibole indicate the formation of igneous melts of malchite dikes of the Koytash ore field under granulite facies conditions, which is confirmed by the complementarity of garnet dykes and garnet compounds from xenoliths of garnet-pyroxene gneisses. Large megacrysts of amphiboles of lamprophyres dikes are rich in the kersutite of minerals, which indicates the existence of the body of kersutite-augite gabbro at the basement of the crust of Northern Nuratau, and their xenoliths occurs in lamprophyres (Musaev and Khamrabaev, 1984; and Musaev, 1985).

Analysis of published data and collected field research data convinced us that the dike formations of the Koytash ore field are directly related to the genesis of sulphide-rare metal mineralization. This assumption is based on the fact that in sulphide-rare-metal ores, the presence of association characteristic of the basic rocks: troilite, pyrrhotite, arsenopyrite, pyrite, chalcopyrite, and pentlandite in dykes indicate their complementarities.

The Koitas-Ugat belt of the southwestern and southern exocontact parts is confined to the northern wing of the Koytash basin. It is opened from the mine "Razvedochnaya ", "Glavnaya" in the west to Shurkunda (Dunetepa) - in the east, with a total length of 3700 m and a width of 900 m. Sulphide-rare-metal ore of the Koytash-Ugat belt form independent contact bodies with a thickness of 5 to 30 m , sometimes up to 90 m, a length of more than 1.5 km. Ore bodies formed on the contact of the metamorphosed carbonate-terrigenous medium carboniferous mass with the Koytash granitoid intrusion, their shape is different: lens-and- sheetlike deposits, intersecting, reticulated veins and veined (Khamrabaev, 1994).

Dikes of significant thickness and lengths of medium-basic and acidic compositions that are confined to the deep-seated meridional fault zone are widely distributed within this belt (Muradov, 1973). They fill

clearly defined parallel cracks in the granitoids. In the western part of the area, they have a meridional strike, and in the eastern part - a submeridional one, which implies the release of dikes from one magmatic chamber. It is established that they intersected in the central part of the river valley Saganaksai. There Nurata geophysical party (1971-1973) revealed an intense magnetic anomaly. With this zone of magnetic anomaly, there is also an area from which, according to Buzkova *et al.* (1988), like a fan, the dyke bodies depart.

The introduction and development of granitoids in Permian contributed to the establishment of shear fractures, on the southwestern plumage of the deep hidden Saganaksai fault. The presence of shear cracks contributed to the creation of favorable conditions for the circulation of ore-forming melts, the introduction of dike formations of medium and basic composition, this is indicated by the connection with them of mineralization and the proximity of their geological age according to radiological dating (247 ± 2 million years).

Dikes of the basic composition transect the sulphide-rare-metal bodies of the Koitas-Ugat belt (Fig. 2), which in return are transected by quartz-polymetallic ore-bearing veins with typomorphic elements - lead, zinc, copper, iron, sulfur, and also satellites - gold, silver, cadmium, bismuth and indium (Khamrabaev, 1992). This indicates that these dikes are inter-ore and have a direct connection with the formation of sulphide-rare metal deposits.

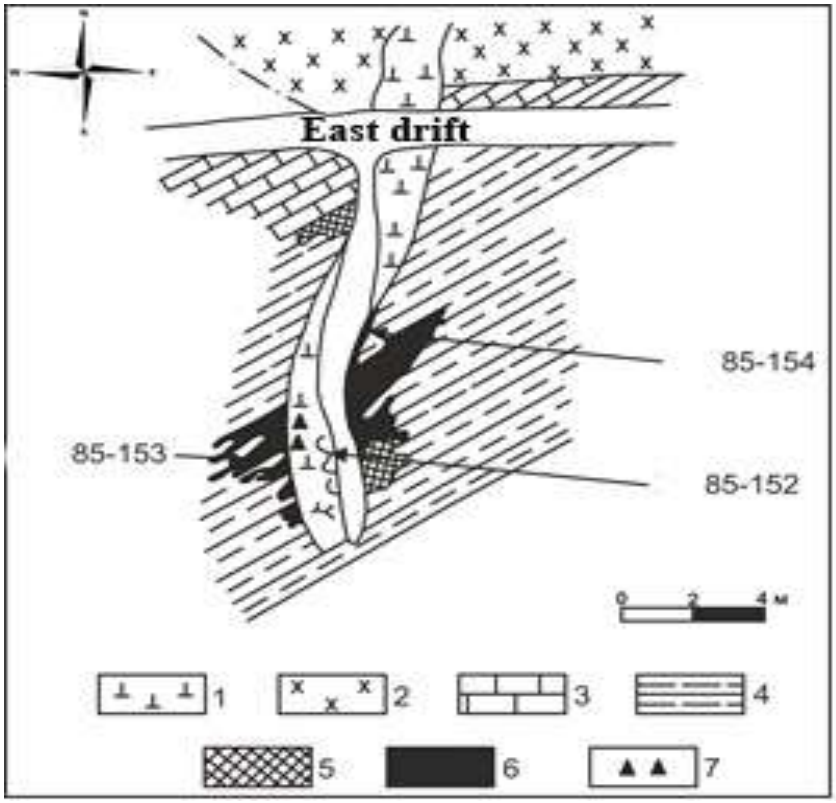

Figure 2: Diagram of the relationship between granodiorites, major dikes and sulfide-rare meta ores of the Koytash-Ugat belt, horizon 700 m (Khamrabaev *et al.*, 1993).

1-diorite porphyrite (T_1), 2-granodiorite (P_1), 3-marbled limestone (C_2), 4-hornfels (C_2), 5-skarns and skarned rocks, ubogosulfide, 6-skarn-sulphide (pyrrhotite-chalcopyrite-pyrite) deposits, 7-xenoliths of ores in diorite porphyrites

Figure 3: Contact of the granodiorite of the Koytash intrusion with the dike of the andesibasalt (sample UP-8) with pronounced kalifeldsparization with impregnation of pyrite ***(****the arrow indicates the zone of kalifeldsparization and sulphidization, the symbols denote the name of the minerals)*

The contact between the rocks of the dikes of the basic composition with granodiorites is clear and soldered (Fig. 3). The temperature effect of dikes on granodiorites is expressed in the process of kalifeldsparization. Consequently, there is reason to believe that the formation of sulphide-rare metal deposits at a depth of 450-500 m of the Ugat-Koytash belt is the result of the temperature influence of dikes on skarned limestones of the Koytash basin. This occurred under conditions of an increase in potassium activity due to the acid-base interaction of the main magma of dikes with granodiorite. At the same time, biotite and especially predominant hornblende became unstable and iron was extracted from them. The leached iron is combined with sulfur, usually in excess in the main magma, resulting in the formation of a sulphide deposit in the interformational tectonic space between the granodiorites of the endocontact of the southwestern part of the Koytash intrusion and the hornfels and limestones of the Middle Carboniferous. The fact that silver-polymetallic mineralization is the final process of the ore-magmatic system of the described region and it is superimposed on skarns and sulphide-rare mineralization on skarns as was noted before (Ishbaev, 2005).

Conclusion

Thus, we assume that the formation of sulphide-rare metal deposits of ores took place in many stages. At first, the introduction of acid magma and its contamination with limestones in the eastern and southwestern parts of the Koytash intrusion led to the formation of rocks of increased basicity - granodiorites. Later, in the magmatic stage, calcareous-terrigenous deposits of C_2 under the influence of granodiorites, the invaded intrusion were subjected to contact-metamorphic processes. This caused the appearance of hornfelses on terrigenous deposits and magnesia skarns over the dolomites. Later, at the beginning of the high-temperature hydrothermal stage in the Koytash-Ugat belt, calcareous skarns appeared along with magnesian ones, developed according to hornfels and apogranities. In parallel, the formation of quartz-feldspar metasomatism with albitization, greisenization of apogranits on the apical parts of the intrusion occurred, where granodiorites adjoin pure limestones, powerful zones of pyroxene calcareous skarns and wollastonites were formed in the eastern section of the Koytash deposit. The introduction of subalkaline basaltoid dikes into the noted host rocks caused the formation of sulfide-rare metal deposits.

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