International Journal of Geology, Earth & Environmental Sciences ISSN: 2277-2081
An Open Access, Online International Journal Available at http://www.cibtech.org/jgee.htm
2023 Vol. 13, pp. 204-207/Aziz

MINERAL COMPOSITION OF ORES OF THE BALPANTAU DEPOSIT

***Aziz Xasanovich Jurayev**
Institute of Geology and Geophysics named after Kh. M. Abdullaev
64, Olimlar street, 100041, Mirzo Ulugbek district, Tashkent, Uzbekistan
**Author for Correspondence: juraevaziz88@gmail.com*

ABSTRACT
Balpantau mine is one of the unusual gold mines of Central Kyzylkum. Its mineralization, unlike the genesis of other deposits of Central Kyzylkum, gold mineralization is connected to volcanogenic-sedimentary associations. It should be noted that the variety of minerals of the mine is very wide. Now we will talk about them below.

Keywords: *Balpantau mine, gold, Tamdytau, mineral, Central Kyzylkum*

INTRODUCTION
When considering any mine, it would be a big mistake not to dwell on the wide variety of minerals. The Balpantau mine has a gold mine associated with the only volcanogenic-sedimentary formations of Central Kyzylkum. This causes the diversity of minerals to increase.
The Balpantau gold deposit is located on the northern slopes of the Tamdytau mountains in the Central Kyzylkum region. The ore-bearing rocks are the lower silurian kushkumbai (according to other authors, the middle silurian kosbulak) formation (Stratigraphic dictionary of Uzbekistan, 2001).
Gold mineralization of the Balpantau deposit is characterized by a number of features that are somewhat different from those in known gold deposits localized in the black shale strata of the Central Kyzylkum.
Pre-ore transformations of rocks belong to the propylite-berezite formation (Stratigraphic dictionary of Uzbekistan, 2001). These processes are caused by the action of the same carbon dioxide solutions, the differences between them are due to the composition of the host rocks (Korjinski, 1956; Shabynin, 1953).
Below we present the features of the mineral composition of ores and the distribution of main and associated components at the Balpantau deposit.
The mineral composition of the deposit's ores is very simple. It includes 32 minerals. Minerals producing noticeable accumulations are pyrite and arsenopyrite. Some minerals occur constantly, but do not form significant concentrations. These are chalcopyrite, pyrrhotite, and marcasite. They are observed both in the form of independent macro-segregations and in the form of micro-inclusions in other minerals. The remaining minerals occur sporadically in the form of microinclusions or rare veinlets.

MATERIALS AND METHODS
Below is a description of the most important minerals that determine the ore content of the area or have an indicator value.
Native gold is the main mineral of the deposit. In the endogenous ores of Balpantau, we have established micro and macroscopic allocations of native gold in quartz, iron hydroxides, limonitized carbonate, pyrite and arsenopyrite.
According to rational analysis, native gold and silver are found in the following varieties: 1) free and in the form of intergrowths with ore components; 2) finely disseminated in quartz; 3) in Fe oxides and hydroxides, carbonates; 4) finely disseminated in sulfides of the pyrite-arsenopyrite association.
Native gold of the first type determines, in the most cases, the gold content of the region. It is associated with the mineralization of quartz - gold mineral association and is noted in the form of microsegregations in quartz, quartz-carbonate-limonite veinlets. Macrovisible native gold is rare and forms intergrowths with dolomite, pyrite, and arsenopyrite. It is concentrated in the vein mass very unevenly, forming microclusters and cuts along cracks. Microvisible native gold, finely dispersed and dusty, is more widely developed. The

shape of goldstones is xenomorphic, amoeboid, oval, teardrop-shaped, and veined. They are located in cracks and contacts of early sulfide grains. Often gold, together with chalcopyrite and vein mass, cements crushed, brecciated grains of arsenopyrite (an analogy to this was noted at Tamdybulak).

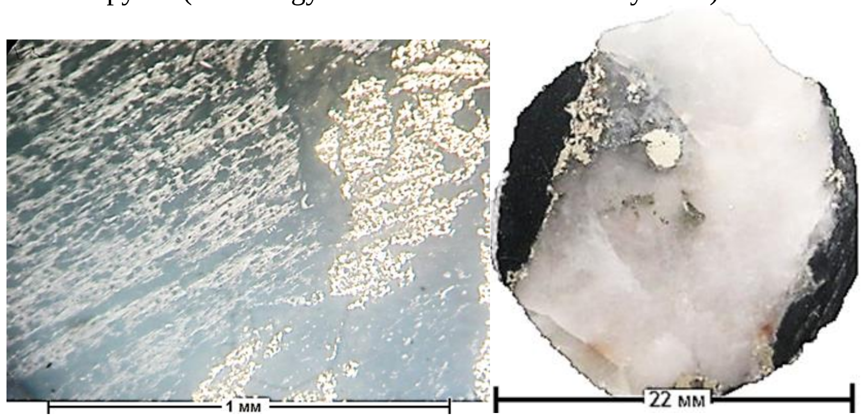

Figure 1: Types of ores of the Balpantau deposit. Carbonaceous-chlorite shale with an albitite vein, relics of albite-quartz nests with pyrite.

Native gold of the second type is concentrated in the feldspar-quartz aggregate near the sulfides. Frequent intergrowths of gold with chalcopyrite are noted.

Together with gold, the veins contain pyrite, chalcopyrite, and single grains of rutile. The total number of gold marks is small compared to the number of polished sections examined.

The size of gold particles ranges from 0.1 mm to 0.001 mm and less. The predominant gold grades are 0.001-0.009mm and <0.001mm. The color of gold is pale yellow. The gold is a low grade. Among the impurity elements in gold, the following are identified: iron, nickel, copper, chromium, arsenic, antimony.

Gold is associated with the quartz-carbonate-limonite (formerly sulfide-bearing) association and determines the presence of gold in sulfides. Occurs in the form of single characters. In the testing, it corresponds to kustelite. Kyustelite is noted at the contact of pyrite with arsenopyrite included in it, which explains the local increase in silver in sulfides. Kustelite plays a minor role in the overall gold balance due to the low abundance of the polysulfide association.

Subdisperse gold in sulfides of the first type forms pinpoint gold deposits less than a micron in size. The gold content in sulfides is very small. The relationship between the gold content and the amount of sulfides in the gold-pyrite-arsenopyrite association, as well as the gold content in these sulfides, suggests the existence of subdisperse gold.

Pyrite is the most widespread mineral, deposited and redeposited during a long process of ore formation. The mineral is present in varying quantities in all types of rocks and is confined to zones of metasomatic alteration, forming veined-disseminated forms of segregations (Pic.1).

Several generations of pyrite are distinguished, respectively attributed to certain paragenetic mineral associations. Pyrite is widely developed in the zone of altered rocks. It forms uniform impregnation, less often concordant or cross-cutting schistosity veinlets, and lens-shaped aggregates. Its amount varies from 3-5 to 20%.

Pyrite is the main gold-bearing mineral of the gold-pyrite-arsenopyrite association and makes up from 40 to 60% of its volume. Pyrite constantly grows together with arsenopyrite, forms uneven dissemination, often condensation along cracks, lacy, aggregative intergrowths. The mineral contains inclusions of carbonate, carbonaceous matter, slate, single inclusions of pyrrhotite, chalcopyrite, and native gold. Aggregates are often brecciated and fractured. The cracks were healed with later minerals.

Pyrite of the quartz-feldspar-gold association occurs in small quantities (no more than 10% of the association volume). The crystal habit is pentagondodecahedral; xenomorphic, aggregative clusters are more common. Size no more than 0.5-0.9 mm. Pyrite contains inclusions of native gold. Related elements (in%): copper - 0.001; silver - 0.1; gold - 0.01 (Pic.1).

Pyrite is also part of the chalcopyrite-carbonate-silver association and is found in veinlets in the form of well-formed pentagondodecahedrons, often collected in chain-like aggregates along the veinlets. The crystals are fractured, and chalcopyrite develops along the fractures. Pyrite has a zonal structure with closely parallel growth zones.

Also, pyrite of the quartz-carbonate mineral association is classified as post-ore and is included in the composition of quartz-carbonate veinlets in an amount of up to 5%. The amount of impurity elements is insignificant.

Arsenopyrite is the second most abundant and main gold concentrating mineral. It makes several generations. Arsenopyrite is part of the gold-pyrite-arsenopyrite mineral association and constantly grows together with pyrite. Often it fills the central part of lens-shaped aggregates, while pyrite develops along the periphery. Arsenopyrite forms dissemination; less often, chain-like accumulations of foliation are observed. The size of the crystals varies from 1.5 to 3 mm, although smaller ones are also found. The crystal habit is bipyramidal, less often short-columnar. Arsenopyrite contains inclusions of nonmetallic minerals, pyrrhotite. It is part of the quartz-arsenopyrite mineral association and is found in small quantities in quartz veins. The shape of the crystals is bipyramidal, individual crystals reach a size of 0.7 mm-1 cm. Structural etching revealed a zonal structure without traces of deformation.

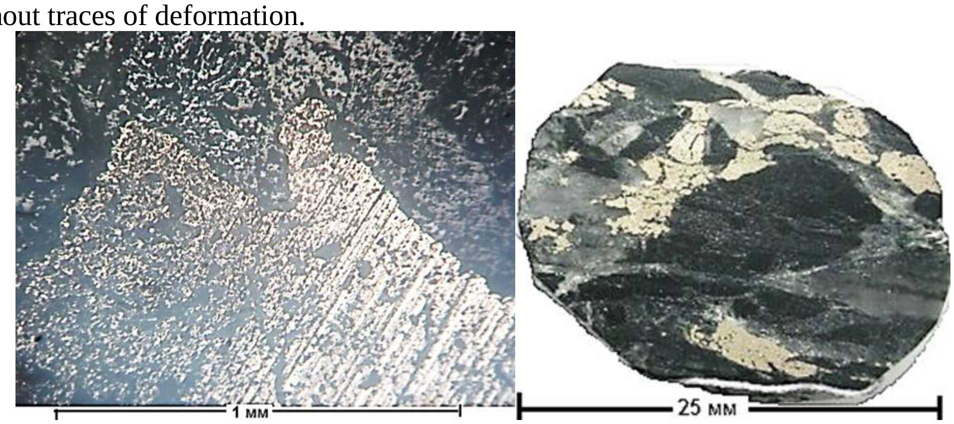

Figure 2: Types of ores of the Balpantau deposit. Breccia of silty andesitoid shale with veined accumulations of pyrite (troilite), chlorite and albite, hornfelsed.

Chalcopyrite, sphalerite, pyrrhotite, and galena are found quite often, but do not form significant accumulations. Some of these minerals are satellites of gold, and some are part of silver-containing associations.

Chalcopyrite occurs constantly, in small quantities. Several generations of the mineral are noted.

Sphalerite is present in small quantities in the carbonate-chalcopyrite-silver association, accounting for less than 5% of its volume. Veined and disseminated sphalerite is noted, usually with emulsion dissemination of chalcopyrite. Sphalerite is characterized by a high content of cadmium, the presence of lead and copper.

Pyrrhotite occurs sporadically in the form of microinclusions in early sulfides and as part of a carbonate-chalcopyrite-silver association together with chalcopyrite and sphalerite. Pyrrhotite forms xenomorphic or lamellar precipitates with irregularly indented edges. Some of the grains have been transformed into a pyrite-marcasite aggregate. Among the impurity elements, nickel, cobalt, silver, and zinc are noted.

Galena is rarely found at the endocontacts of felsic dikes with terrigenous rocks. It forms nest-like clusters in thin quartz veinlets.

Marcasite occurs sporadically in the form of thin “curly” veins, nested clusters, and tabular grains. Associated with pyrrhotite, develops along pyrite.

Fahl ore occurs in the form of single grains (0.005 - 0.01 mm) in arsenopyrite, pyrite; intergrowths with chalcopyrite occur.

Covelline and chalcocite are observed in natural type II ores in the form of rare grains of xenomorphic or lamellar forms. Covelline is constantly associated with chalcocite; replaces it along the periphery and cracks.

Iron hydroxides are the main minerals of natural type II, 2 subtypes. It is represented by goethite, forming pseudomorphs after pyrite, and ocherous loose accumulations of limonite. Ocher accumulations of scorodite are observed together with limonite.

Quartz is the most common mineral in both early and late mineral complexes. A significant part of the vein quartz belongs to pre-dike formations. Five generations of quartz have been identified in the post-dike group.
Dolomite is part of the gold-pyrite-arsenopyrite mineral association and is developed in the form of metasomatic accumulations of fine-grained aggregates in sandy-shale deposits and less in listvenitized volcanic rocks. The development of dolomite-1 is spotty; nodule accumulations are often observed, which are associated with pyrite and arsenopyrite.
Calcite is part of the quartz-carbonate-sericite-pyrite and quartz-arsenopyrite mineral associations. In the latter, its amount reaches 10-15% of the volume of the association. Forms nests and massive clusters. Sulfides of this association are often associated with carbonate, and upon oxidation it acquires a brown color.
Sericite is a common mineral at the deposit, occurring in pre-alteration stage minerals and in the quartz-feldspar-gold mineral association. The largest accumulations of sericite-1 are observed in shales. Sericite develops together with quartz, forms thin veinlets, accumulations along cracks, and replaces feldspar in metapsammites and clay interlayers in shales. In turn, it is replaced by carbonate.
Albite is observed in the quartz-feldspar-gold association and is closely associated with native gold-2 and chalcopyrite (Pic.2).

RESULTS AND DISCUSSION

The amount of newly formed minerals alterations, which changes the composition of carbonaceous shales, especially in areas of their contact with other rocks.
Sulfide-carbonate-quartz veins determine the gold content of the area. Gold in quartz veins is constantly in association with Fe and As sulfides, iron-containing carbonate.
The presence of veinlet sulfide-quartz mineralization in areas of metasomatically transformed rocks increases the content of useful components in these rocks.
In the oxidation zone, native gold is confined to areas of oxidized sulfides - limonite, scorodite, As-bearing limonite, limonitized carbonate, quartz.

REFERENCES

Anonymous (2001). Stratigraphic Dictionary of Uzbekistan. Tashkent: HydroEnGeo.
Korjinski DS (1956). Dependence of the activity of components on the acidity of the solution and the sequence of reactions during post-magmatic processes. *Geochemistry* **7** 3-10.
Shabynin LI (1973). Magnesian scarp formation. - M.: Nauka.