

The Role of Metasomatic Breeds in Ore Bodies Forecasting to Depth (Beshkuduk)

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Abstract: Hydrothermal mineralization in the deposit has a wide development. It occurs itself in three stages: pre-ore, ore and post-ore. In the pre-ore phase, quartz-albite-sericite-chlorite metasomatites occurred. In the ore stage, two stages are distinguished: the earlier quartz-pyrite-arsenopyrite stage with gold and quartz - the bleachers association. The minerals of these stages are confined to tectonic troublesome zones, zones of vein silicification, quartz and shale breccias. In the placement of products of hydrothermal metasomatism, a certain horizontal zonality is detected. There is a consistent sequential change of zones with distance from the quartz veins and faults.

Keywords: Metasomatic, Biotite, Quartz, Albite, Sericite, Chlorite, Main Mineral, Associated Mineral, Pyrite, Arsenopyrite, Postmagmatic, New Formations.

I. INTRODUCTION

The Beshkuduk deposit is an integral part of the Karakutan ore field, located in the Ziaetdinskymountains of the Republic of Uzbekistan. The geological structure of the deposit is determined by the development of metamorphosed sedimentary - effusive rocks of the Katarmay Formation of the Lower Devonian (D₁ kt₃) and dike formations. Sedimentary - effusive sediments are metamorphosed in the greenschistfacies of regional metamorphism and are composed of two types of rocks - shale and volcanogenic rocks of olivine-basalt composition. Intrusive rocks are represented by quartz diorite dykes, granodiorite - porphyries and lamprophyres.

The Beshkuduk deposit is located on the north wing of the Katarmay anticline, which is complicated by small folds and rupture faults. In the Karakutan ore field, hydrothermal mineralization has a wide development. It is covered in varying degrees in the works of V. L. Shadrin (2002, 2004) and others [1].

II. METHODS OF METASOMATIC ROCKS STUDYING.

Metasomatically altered near-ore rocks in the Beshkuduk deposit have been studied by us on the surface along ditches, along sections cut across the stretching of the ore bodies and zones and along the core wells.

When studying metasomatically altered rocks in the cores of the wells, samples were taken.

The distance between samples in wells in homogeneous rocks with the same hydrothermal metasomatism was 10 m. If within 10 m an alternation of different degrees of intensity of hydrothermal measured rocks was observed, then the distance between the samples decreased (sometimes to 10 cm). When studying vein ores in ditches and cuts, samples from altered rocks were taken along the line across the strike to both sides of the vein. The distance between the samples in the astillenwas -1–10 cm, and with the distance from the veins evenly increases to 20-30 m[2].

Transparent thin sections were studied under the microscopic standard methods: the mineralogical and petrographic composition of the altered rocks, the types and intensity of postmagmatic changes, the relationship of certain types of changes among themselves, the forms of the new formationsminerals, the selective selection of them when replacing rock-forming minerals.

III. RESULTS OF WORK.

In the Beshkuduk deposit, hypogenic mineralization is characterized by distinctly local distribution, complex composition and formationperiod. It, basically, is inclined in zones of tectonic dislocation and quartz veins[3].

Hydrothermal mineralization is divided into pre-ore, ore and post-ore stages. In the pre-ore phase, biotite — quartz and quartz-albite — sericite-chlorite stages — metasomatic rock alteration — are distinguished; in the ore stage, two stages have appeared: quartz-pyrite-arsenopyrite with gold and quartz-polymetal with gold. The last one formed the following mineral associations: quartz-pyrite-sphalerite, quartz-galenic, quartz-bluestone, and quartz-antimonite. The main mass of gold was separated in the quartz-pyrite-arsenopyrite stage with gold, less - in the quartz-polymetallic stage. A special feature of the quartz-polymetal stage is high silverness.

In the post-ore phase, two stages were formed: quartz-tourmaline and quartz-carbonate. The minerals of these associations are of limited development. The bulk of the near-ore changes precedes gold mineralization. Within ore bodies, syn-mineralmetasomatic formations are noted in insignificant quantities. After ore metasomatites have a limited development.

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Metasomatites of the pre-ore stage were formed under the influence of the processes of hypogenic early alkaline, acid leaching and sedimentation associated with it. Biotite - quartz and quartz-albite-sericite-chlorite metasomatites are characteristic for the pre-ore stage. Biotite-quartz metasomatites have a limited development. In Beshkuduk, quartz-albite-sericite-chlorite metasomatites are widely developed.

They are mainly distributed in metaterrigenous rocks and less - in igneous rocks.

A comparative study of ore-altered rocks in gold deposits in Western Uzbekistan shows [3] that the metasomatites occurred in Beshkuduk by their origin are due to a single act of the ore hydrothermal process. In Beshkuduk, we selected quartz - albite - sericite - chlorite formation of metasomatites. They are represented by quartz, quartz — albite, quartz-sericite, and quartz-chlorite facies varieties of metasomatite

In the distribution of products of hydrothermal metasomatism in Beshkuduk, a certain horizontal and vertical zonality is noted[4]. There is a consistent sequential change of zones with distance from the quartz veins and faults. The quartz facies constitutes the innermost part of the metasomatic zonality. In this part of the quartz is 95-98% of the breed. The thickness of the quartz facies reaches 2-3 m. Quartz metasomatites are gradually replaced by quartz-albite. In the marginal part of the facies, the albite content reaches 40%. The quartz-albite facies is replaced by a quartz-sericite, which gradually turns into a quartz-chlorite facies of metasomatites. The last two facies in the field are difficult to recognize.

The study of the postmagmatic processes development nature around faults, quartz veins and veinlets shows that in all cases there is an identical development of metasomatic zones. When allocating areas for the development of silicification and albitization, all occurrences of quartz and albite formed during the entire hydrothermal process are combined. Silica on the entire area of the ore manifestation is occurred unevenly. Quartz veins and veinlets are oriented mainly parallel to shale, and also cut them. Strong silicification (40-90%) has a limited development and leads to a zone of faults of the latitudinal and north-west bearing (Fig. 1). Quartz develops in the form of veins and metasomatically. The apparent thickness of changes varies from 1 to 10 m, with a length of up to 100-120m. The thickness increases in places of bending faults. In the quilts of quartz veins and highly quartz zones marked quartz veinlets.

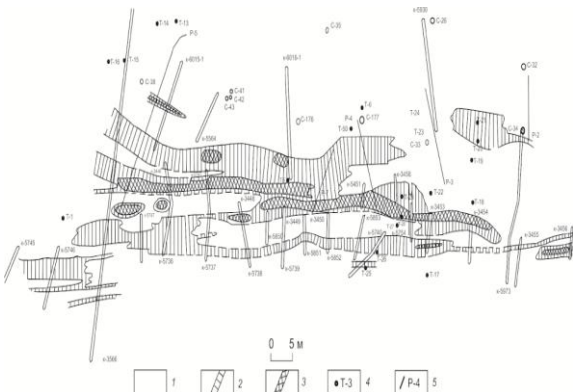


Fig. 1. Distribution of silicification in the ore occurrence of 4 Beshkuduk deposits.

Silica: 1 to 5%; 2 - 6-20%; 3 - more than 21%. 4 - observation points, 5 - ditches and lines of mineralogical sections

Their thickness reaches up to 1-3 sm. The strongly quartz zones are located among the middle quartz zones (5-40%). The thickness of the averagely silicified zones reaches up to 30-40m. Weakly quartz intervals (1-5%) have a significant distribution.

Albitization in Beshkuduk is inferior to silicification. Weak albitization (up to 5%) exposed all rocks of the field. The moderately albitized (more than 5%) zones have a limited development and are exposed to faults of the latitudinal and northwestern bearing, and to areas of strong silicification. The thickness of the average albitized zones varies from 1 to 10 m, the length reaches up to 200 m

Within the Beshkuduk deposit, near-vein metasomatism is widely occurred, which develops in almost all types of rocks, but with varying degrees of intensity. With the intensive development of metasomatism along the cracks, up to four zones appear (Table 1). The sequence of zonality from the center to the periphery is as follows: quartz, albite, sericite, chlorite, and transition zones. The boundaries between the zones are sharp; the sericite zone is particularly clearly separated from the albite zone.

Table 1 Near-vein metasomatic zonality occurred in Beshkuduk deposit

Metasomatic core	Main mineral	Associated Mineral
Quartz	Quartz	Pyrites
Albit	Albite	Quartz, pyrite
Sericite	Sericite	Albit, quartz, pyrite
Chlorite	Chlorite	Sericite, albite, quartz

The long and intensive period of metasomatic processes leads to an increase in the thickness of metasomatic zones. By virtue of this, the thickness of internal zones increases due to external ones.

The above sequence of zones is sometimes not occurred, i.e. separate zones develop poorly or settle out. The abundance of cracks leads to the merging of metasomatic zones and the formation of quartz - albite-sericite-chlorite metasomatites. Comparison of postmagmatic formations convinces us that the near- vein metasomatic zonality is a particular occurrence of the general zonality developed around quartz veins and along faults.

In the studied part of Beshkuduk, there is a spatial relationship of gold ore bodies with zones of pre-ore rock alteration, due to the inheritance of the circulation paths of the solutions during the formation of the deposit. Near-ore changes contribute to an increase in permeability (Yanishevsky, Grigoryan and others, 1963) of rocks, which contributes to the localization of ore mineralization.

Gold mineralization, like metasomatically altered rocks, has a local distribution. Low gold content (0.09 g / t) spatially splashes to slightly quartz and weakly albitized rock intervals. The increased gold content (0.1-0.9 g / t) is confined to the average quartz intervals of metasomatites.

Intervals containing more than 1 g / t bear on the places of development of medium, strong silicification and average albitization. Industrial gold ore bodies are confined mainly to heavily silicified and moderately albitized intervals of rocks developed in the fractured zone.

Within the Beshkuduk deposit, 11 ore bodies have been identified, which are spread over a large area. But despite this, a certain zonality is planned in the placement of industrial types of ores. Ore bodies (1, 2, 6, 10 and 14) located in the central part of the deposit are of the gold-bearing type.

Gold is abundant in these ore bodies, while silver is less. Ore bodies developed in the eastern (ore body 11) and in the western (ore body 3) flanks belong to the gold-silver type, where the silver content reaches 228 and 1040 g / t.

The study of gold deposits shows that the physical and chemical process of ore formation occurs under standard physical and chemical conditions with the formation of standard mineral parageneses in accordance with certain laws and rules (A.E. Fersman, L.N.Ovchinnikov, S.T. Badalov and others). For gold deposits there is a single theoretical sequence of formation of metasomatites, the main paragenesis of gold, industrial types of ores and the morphology of ore bodies.

The study of the Beshkuduk, Karakutan, Mardzhanbulak, Sarmich, Guzhumsay and Zarmitan deposits and their comparison with the gold giants Kumtor and Muruntau show that they have developed quartz-kalifeldspath-albite-sericite-chlorite metasomatite. They are represented by quartz-kalifeldspath, quartz-albite, quartz-sericite, and quartz-chlorite facies differences. In Zarmitan, all the facies differences of metasomatites have been block out. In the remaining deposits, various facies differences were block out. In Beshkuduk, quartz-chlorite and quartz-sericite facies differences are mostly block out by erosion, quartz-calispit differences are not block out by mine workings.

In ore deposits, ore bodies are represented by three morphological types: 1 - continuous linear steeply dipping vein-quartz mineralized zones, ore mineralization in them forms lenses, veinlets, nests and phenocrysts. Veins in the sandstone veins, nests and phenocrysts in the central part represent 2-rod quartz veins, ore mineralization in them. 3-veinlet-stockwork type, ore mineralization forms veinlets and phenocrysts. These morphological types of ores gradually replace each other vertically.

In Beshkuduk, gold ore bodies are represented by two morphological types — vein-quartz mineralized and quartz-vein. Comparison of the types of mineralization of Beshkuduk with other gold deposits shows that quartz-vein ore bodies with depth should be converted into stock-vein and stock-type types. V. A. Khrenov, L. P. Plaksina (1969) in Zarmitan the following ore stages are distinguished: gold-bismuth - telluride, pyrite-arsenopyrite with gold, gold - sulphide-polymetallic. In the last stage, gold is isolated - arsenopyrite and silver-polysulfide-sulfo-antimonite substage.

In Beshkuduk, the ore stage is represented by two stages: quartz-pyrite-arsenopyrite with gold and quartz - polymetallic with gold. Comparison of gold deposits shows that in Beshkuduk at a depth, like Zarmitan, gold-bismuth — telluride mineralization is expected.

IV. CONCLUSION

Near-ore-altered rocks are indirect and direct search signs for finding gold ore bodies [5]. The indirect search signs are the formation of the pre-ore orogenic hypogenic mineralization stage. These include quartz - albite - sericite - chlorite metasomatites. Direct search signs of gold mineralization are quartz veinlets with orthoclase, albite, pyrite, arsenopyrite, sphalerite, galena and other ore minerals.

Beshkuduk is a large gold deposit. At the depth, all ore bodies should merge to form an ore industrial type in the central part of the deposit, turning into gold-silver on the flanks. At a depth of quartz-polymetallic mineralization should be replaced by gold-bismuth-telluride, forming vein-stockwork and stockwork morphological type of mineralization in the quartz-kalifeldspath facies of the quartz-kalifeldspath-sericite-chlorite metasomatite.

REFERENCES

1. Boymukhamedov H.N. The place of Zirabulak - of the Ziaetdin Mountains in the metallogenic history of Western Uzbekistan, Uzbek geological journal, Academy of Sciences of the Ukrainian SSR, 1960, No. 1.
2. Velikiy A.C. To the methodology for the study of circumferentially altered rocks. Subsoil Exploration, No. 3, 1951.
3. Shermukhamedov T.Z., Tulyaganova N.Sh. Features of metasomatic rocks developed in the Beshkuduk deposit. Scientific and practical journal "Geology and Mineral Resources" No. 4-2012, 112-115 pp.
4. Shermukhamedov T.Z., Tulyaganova N.Sh. "Zoning of products of hydrothermally altered rocks" Ore metasomatic systems of orogenic areas "Materials of a scientific conference". Tashkent, 2010, May 5-7, pp. 292-294.
5. Shermukhamedov T.Z., Tulyaganova N.Sh. "Metasomatic search criteria for gold ore bodies". "Modern problems of rational subsoil use." Tashkent-May 26, 2011.142-143 p.

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