GOLD - SULPHIDE MINERALISATION OF RUDNY ALTAY (KAZAKHSTAN)

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Introduction

The Rudny Altai is part of the fragments of the ancient Kazakhstan paleocontinent. The gold - sulphide mineralisation is located in the magmatic rocks of Zmeinogorsk complex of Late-Carbonous - Late Perm age. The Sekisovska deposit is 40 km north-east from the city of Ust Kamenogorsk within Aleysk subzone of Rudny Altai structural-formational zone in the area of south-east depression of Aleysk anticlinorium. Intrusive formations of Zmeinogorsk complex are of dominating significance within the described area. Zmeinogorsk complex is of Late-Carbonous- Late Perm age where volcanogenic-sedimentary formations of Frasnian and Fammenian stage and Vise stage are developed.

Samples and methods

Sampling from ore-bearing rocks and ore bodies to determine the chemical composition by methods ICP MS, identification of patterns in the distribution of basic ore minerals and useful impurities. Microprobe analysis using a scanning electron microscope JSM 6390LV with an energy dispersive attachment, comparative characteristics of ore mineralization of the studied deposits.

Results

The Sekisovskoye ore field is associated with Shemonaikha- Sekisovsk horst-anticline, complexifying north-eastern wing of Aleyskiy anticlinorium represented by hard block massive of Pre-Hercynic basement that is considerably raised and complicated by ebb Middle Paleozoic downfolds. North-east wing of Shemonaikha-Sekisovsk horst-anticline is complexified by the fault with the same name. The fault refers to north-west extension which is basic magma-excretory structure of Zmeinogorsk complex first phase intrusion at the moment. It is clearly fixed according to the area of gabbroid intrusives ratio along the faults zone (180 km^2) and in the remaining part of Aleysk anticlinorium (30 km^2). As a whole Shemonaikha- Sekisovsk zone of faults can be considered as decisive in location of granitoids of Zmeinogorsk complex. Well-known facts of ore concentration in junctions of different ruptural structure are proved for Sekisovskoye ore field.

Intrusive rocks of Sekisovsk massif are involved in the structure of ore field. There are magmatics of all four phases of Zmeinogorsk complex formation. But there are more than 90% of granodiorites and diorites of the second phase and plagiogranites of the third intrusion phase.

First phase rocks are found only in south-east and north west part of ore field and rock pillars are formed among magmatics of late phases. Shape of gabbro phases is complicated and extended in north-west direction. Their size is from 300-500 m up to 2000 m.

Rocks of second intrusion phase make up 35-40 % of ore field central part, and they are rather limited at flanks. Bodies of granodiorites and diorites are usually extended in north-west and meridional direction and are present in the form of xenolites of different sizes in the rocks of the third and fourth intrusion phases [18,60]. Their size is from 10-20 m up to 2-4 km.

Third phase rocks form most part of ore field (more than 60%) at flanks where plagiogranites predominate. They are very big bodies (from 100 m up to 1-2 km) of irregular shape that comprise numerous magmatics xenoliths of early phases.

Fourth phase rocks are developed in junctions of faulting of different directions at south-east and north-west flanks of ore field. They form bodies of 0,5x1,0 up to 1,0x2,0 km size.

Magmatic rocks of the Sekisovsk massif combined in two series: gabbro-diorite (gabbro, gabbro-diorite, diorite), and plagiogranite (granodiorite, plagiogranite, granite). Post granite dikes of middle mafic rocks and of acidic composition are widely developed on ore field. They are inclined to junctions of different faultings.

Ore-bearing rocks at the deposit are breccias of tubular, elongated shape with the sizes from 40x100 meters to 120x500 m. Their traced depth exceeds 950m. The ore-bearing explosive breccias are composed of fragments of magmatic rocks (diorite, plagiogranites and transitional differences between them) cemented by finely divided material either of the same or of veined composition (quartz, quartz-carbonate bonnies and veins with inclusions of ore minerals - pyrite, sphalerite, galena, with the predominance of the first one).
The gold is unevenly distributed and forms a kind of nest- ripple type of mineralization. Higher concentrations of gold occur where different types of breccias are in contact as well as the breccias are in contact with the host diorite and felsic dykes. Five mineralized gold zones are distinguished at the breccias.
The main ore bodies are not contoured by down dip, the bodies have a band-like and a phacoidal shape with the predominance of length of the dip over the width of the strike. The average thickness (competence) of ore bodies varies from 0.58 m to 3.28 m. The orientation of ore bodies along the strike coincides with the orientation of the ore zones (breccias).
Two mineral parageneses are developed in primary ores. Gold-iron-copper- rare metals paragenesis (gold I, quartz, magnetite, pyrrhotite, marcasite, pyrite, scheelite, bismuthine, molybdenite, chalcopyrite) is characteristic for the early breccias (at medium and deep levels).

Conclusions

Decrease of gold concentration in all types of breccia is noted. The depth of breccia is 2.5 – 6 times. There is also typical increase of gold concentration close to breccia joints of different types breccias with magmatics, including post-granite dikes.
Ore bodies in volume represent steeply dipping geochemical ripples. They embed subconcordantly to breccia bodies. As it is deeper area size of ripples decreases, it can prove a big vertical extension of ore.
The most productive horizon for the deposit is from +320 m up to -40 m. There is the increasing tendency for ore densification into depth from east to west. Coincident projection of ore-geochemical ripples show plunge of ore-geochemical pillars. This implies practical conclusion about possible new ore pillars deeply embedded at west flank of the deposit. East flank of the deposit is evidently of little promise.

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