

Paper Number: 4143

Geology and Alteration Controls of Cu-Au Porphyry Style Mineralization of the Ryabinovoe Ore Field (Central Aldan, South Yakutia)

Shatova N.V.¹, Shatov V.V.¹, Molchanov A.V.¹, Terekhov A.V.¹, Seltmann R.²

¹Russian Geological Research Institute - VSEGEI, St. Petersburg, Russia

²Natural History Museum (NHM), London, UK

e-mail: narlin.ros@mail.ru

The Ryabinovoe ore field is located in the northwestern part of the Elkon Horst in the Aldan Shield in South Yakutia (Russia). Copper-gold porphyry style mineralization of the Ryabinovoe deposit is associated with high potassium intrusive rocks of the Ryabinovy stock composed of aegirine-augite alkali-feldspathic syenite, syenite-porphyry, and nordmarkite of the Aldan Suite and lamprophyre and eruptive breccias with lamprophyre matrix belonging to the hypabyssal Tobuk Suite. The stock is a large intrusive body of 7x6 km in size, intruding granite-gneiss and gneiss of Archean-Proterozoic age.

Total gold resources of the Ryabinovoe deposit within the framework of two ore sites (Muscovitovy and Novyi) are estimated at 30 t, with grade of 2 g/t. Copper grades vary from 0.5 to 1%. The ores also contain molybdenum and silver with grades of economic interest.

Emplacement and long-term magmatic-hydrothermal evolution of the Ryabinovy syenite stock were accompanied by zonation of mineral alteration of granite-related type, expressed in the inner parts of the stock by halos of aegirine-feldspathic metasomatite (feldspathic alteration) and gumbleites (quartz-K-feldspar-sericite-ankerite alteration), and in the near-intrusion space, by marginal halos of skarn, fenitic, and propylitic alteration. The geometry of the geochemically anomalous field reflects the concentric zonal pattern of mineral alteration.

The core of this coupled mineral and element zonation within the intrusion is composed by AuAgCuBi and BaMo halos associated with gumbleites, and its periphery - in the marginal stock area characterized by Precambrian host rocks - by positive geochemical halos of NbZrYUTh, LREE, MREE, HREE, CoNiCr, and SbHgAs composition, which is caused by skarn and fenitic alteration and their subsequent replacement in propylitic assemblages.

Ore formation in the deposit is characterized by a high enrichment of potassium (up to 12-15%) and loss of sodium (up to 0.2-0.7%). That is because the high potassium character of alkalic specialization of the stock rocks complies well with high potassium specialization of gumbleitic alteration accompanying Au-Cu porphyry style mineralization in the Ryabinovy deposit.

Gumbleitic alteration haloes in conjunction with positive anomalies of AuAgCuBi and BaMo composition can be used as criteria for predicting gold-copper porphyry mineralization within the Ryabinovy ore field. The occurrence of gumbleitic alteration at the Muscovitovy and Novyi ore sites in the Ryabinovy deposit coincides with the formation of gold-copper-porphyry mineralization.

Alkaline igneous rocks, breccia formations, wallrock alteration types, and gold-sulphide mineralization in the Ryabinovy deposit were first isotopically dated using three independent geochronometers - U-Pb,

Rb-Sr, and Re-Os. It has been shown that the rocks of the Ryabinovy Stock formed in the age range of 130-147 Ma, and wallrock alteration and mineralization took place at 129-130 Ma.

