Geology, Alteration and Mineralization of Saindak Porphyry Copper Gold Deposit, Chagai Hills Pakistan

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1 Introduction

The Saindak Cu-Au mine is one of the largest porphyry deposits in Pakistan, it is located in W Asia metallogenetic zone of Tethys metallogenetic domain, belonging to Chagai—Raskoh Fe, Cu, Au metallogenetic zone, which is one of 5 main metallogenetic zones of Pakistan. The known regional ore deposit is generally distributed concentrically along a certain structure position in group, in zone, forming the important Cu, Fe multimetallic metallogenesis concentration area. In this metallogenetic zone, the known main ore deposits are Saindak porphyry Cu-Au deposit, Chilgaz and Dasht-e-kain Pb, Zn, etc, multimetallic deposit. Among them, the porphyry Cu-Au deposit is the most potential ore deposit. The total reserves in Saindak have been estimated at 237,024 tons of Cu, average grade 0.40%, 9777 kilogram of Au, average grade 2.1g/t.

2 Geological Setting

The Saindak porphyry Cu-Au deposit is in the middle section of Turkey-Middle Iran-Gangdise central plate, which is formed a N-ward curved arc structure by the subduction compression of SW Arabian Plate and SE Indian Plate. In this area, the main outcropping strata are a series of Tertiary sandstone, slate and intermediate-basic volcanic rocks, and there are a great amount of intermediate-basic subvolcanic facies ultra-hypabyssal rock intrusion accompanying the eruption of intermediate-basic volcanic rock, the main lithological characters are andesite porphyrite, diorite porphyrite, quartz diorite porphyrite, etc. and there are the formation of sedimentary exhalative Fe-Cu deposit and the middle-low T hydrothermal deposit related with volcanic rock accompanying the great amount of intermediate-basic volcanic rock eruption, the formation of a great amount of porphyry Cu-Au deposits accompanying intermediate-basic subvolcanic facies ultra-hypabyssal rock intrusion; and there is the formation of sandstone Cu in the back-arc basin.

3 Geology, alteration and mineralization

3.1 Geology

The main strata are Tertiary Eocene Saindak Formation (E₂s), Oligocene Amalaf Formation (E₃a) and Quarternary (Q). Except Q, they are intruded by biotite quartz diorite porphyry body(stock) and andesite porphyry, diorite vein and dike. Among them, Saindak Formation is the main strata intruded by the ore-bearing porphyry body(Fig.1).

3.2 Alteration Type

The main alteration types are silicification, sericitization, clay grouting, chloritization, saussuritization (epidotization), gypsification, potassium feldspar alteration, albitization, biotitization, etc.

3.3 Geology of Ore Body

The orebody is in the Saindak model “biotite quartz diorite porphyry” body, the metallogenesis takes place in accompaniment of the alteration, the tube, big lenticule ore body composed of fine vein disseminated ore is formed in the centre of rock body, whereas the veined ore body is in the margin. The main metallogenetic element is Cu, with many associated useful components, Au, Ag, Mo, S, Pb, Zn, etc.

4 Conclusions

The ore deposit of orefield is on the NE limb of Chagai Volcanic-Plutonic Rock Zone of N-wards curved arc structure zone formed by the subduction compression of SW Arabian Plate and SE Indian Plate. There are the
andesite volcanic rock zone, and the associated epigenetic, ultra-epigenetic intermediate-basic porphyry(porphyrite) body, the porphyry(porphyrite) and orebody (metallogenesis) are mostly controlled by the regional NW and near EW fault, which are mostly formed in the intersection of faults. The orebody (metallogenesis) is generally in the potassium alteration silicification zone, sericitoitization and pyritization zone, strong magnetitization and superimposition place of various alteration, very few in the propylitization and pyritization

Fig. 1 Geological map of the Saindak porphyry Cu-Au deposit
zone (Cu metallogenesis weak).

The zonation of metallogenesis element, from inner to the outer, from lower to the upper successively Cu(Au, Mo)→Cu(Au)→Pb-Zn.

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References