WANG Yiyun, TANG Juxing, WANG Qin, DUAN Jilin, FANG Xiang, SUN Xingguo and YIN Xianbo, 2014. The Mineralized Features and Prospecting Breakthrough of Southern Tiegelong Giant Epithermal Copper (Gold, Silver) Deposit, Tibet. *Acta Geologica Sinica* (English Edition), 88(supp. 2): 802-803.

The Mineralized Features and Prospecting Breakthrough of Southern Tiegelong Giant Epithermal Copper (Gold, Silver) Deposit, Tibet

WANG Yiyun*, TANG Juxing[1,2], WANG Qin[1], DUAN Jilin[3], FANG Xiang[1], SUN Xingguo[4] and YIN Xianbo[4]

1 College of Earth Sciences, Chengdu University of Technology, Chengdu , Sichuan 610059, China;
2 MLR Key Laboratory of Metallogeny and Mineral Resource Assessment, Institute of Mineral Resources, Chinese Academy of Geological Sciences, Beijing 100037, China;
3 Scholl of Earth Sciences and Resources, China University of Geosciences(Beijing), Beijing 100083, China;
4 Golden Dragon Mining Co., Ltd., Lhasa, Tibet 850000, China;

Since the first exploration project had been implemented in 2001, with the low level of exploration, Southern Tiegelong deposit used to be thought as a traditional porphyry copper deposit, leading to the prospecting exploration advanced very slowly before 2013. In 2013, with detailed geological records in the field as well as systematic analysis and testing indoor, the first example giant epithermal deposit in Tibet has been identified at Tiegelong ore district, of which the quantity of metallic copper is 529 mt@0.55% and that of metallic gold and silver, respectively, is 75t@0.08g/t, 1115t@1.17g/t. In the meanwhile, the theories of porphyry metallogenic system mainly containing the epithermal - porphyry deposits can be used to guide the work of prospecting and exploration（Tang Juxing et al., 2014）; besides, these basic theories associated with the practical exploration have a significantly theoretical guidance on the prospecting breakthrough for Southern Tiegelong copper (gold, silver) deposit.

1 Overview of the Deposit

Southern Tiegelong deposit located at Wuma Village Gaize County Ali Section of Tibet Autonomous Region, is another tremendous prospecting achievement at Duolong ore concentrating area in western Bangong Lake－Nu River metallogenic belt, one of important metallogenic belts in Tibet. In this area, some large and ulra-large porphyry deposits have been found, such as Duobuza and Bolong porphyry deposit, which are adjacent to Southern Tiegelong deposit (about 3 km linear distance).

The outcropping strata of the ore district are simple, including Lower Jurassic Sewa formaton altered feldspar quartz sandstone and Lower Cretaceous Mieriqiecuo formation andesite, andesitic porphyry, in addition to a small amount of the Quaternary. There is no intrusive rocks outcropping, but the intrusive rocks exposed in the drilling holes are mainly Cretaceous granite porphyry and quartz diorite porphyry (Fang Xiang et al., to be published). The alteration zones are obviously visible that the upper is argillization zone, superimposed hematite, silicification and carbonation, and the lower is pyrite-phyllic zone, superimposed a great deal of advanced argillic alteration, which is the storage zone of the major orebody.

2 Features of Mineralization

2.1 The Storage Location, Shape, Outputting State and Scale of the Orebodies

According to the spatial relationship of orebodies, they can be divided into six types, including No.KT-1 ~ No.KT-6. Thereinto, No.KT-1 is the main orebody, produced in Lower Jurassic Sewa formation thick massive sandstone with siltstone and the intruded granite porphyry. The main orebody strikes overall NE-SW, elongating over 1600 meters, and the dip of that is gently NW, spreading more than 800 meters. NO.KT-1 almost has no internal dissection, of which the south-west edge is the typical finger boundary and the north-east edge has not been totally controlled. Because of the thick massive orebody, most of the drilling holes did not penetrate it. The average thickness of No.KT-1 in the drilling holes is 426.8m, with an average grade of copper 0.56% and that of gold 0.08g/t, and the maximal and continuous thickness of orebody in the single hole is up to 914.77m (apparent thickness). The elevation of No. KT-1 ranges from 3902m to 4972m, of

* Corresponding author. E-mail: wangyiyun1988@163.com

which the difference in elevation is wide, mostly concentrating between 4200m and 4800m, and the burial depth varies from 87m to 137m, mainly concentrating between 100 and700m. No.KT-2 ~No.KT-6 are five small lenticular orebodies, mainly formed in the Sewa formation, which all located in the north-east part of NO.KT-1.

2.2 Characteristics of the Ores

Combining the detailed geological records in the field with the identification of rocks indoor, supplemented by energy spectroscopy scanning and electron probe testing, the ores and minerals of Southern Tiegelong deposit have been confirmed. The metallic sulphides mostly are pyrite, enargite, digenite, bornite, chalcopyrite, followed by tennantite and colusite and minute quanitity of galena, and hematite, limonite, malachite and other metallic mineral oxides formed at the top of the deposit. The non-metallic minerals are mainly quartz, alunite, dickite, sericite. Most of the accessory minerals is rutile, with a small amount of barite and apatite.

The most common structures of the deposit are disseminated, veinlet, veins, banded, brecciated structures, and the textures are mainly the ones formed by replacement, locally by solid solution separation.

2.3 Metallogenic Stages

The mineralization of Southern Tiegelong deposit has experienced three metallogenic stages, including sedimentary diagenesis, hydrothermal mineralization and supergene oxidation. According to ore fabric and mineral assemblages, hydrothermal mineralization can be broadly divided into three steps of mineralization:

(1) pyrite+molybdenite+bornite+chalcopyrite step; pyrite and molybdenite were paragenetic in the quartz + alunite +dickite veins or disseminated in the wall rock, and pyrite particles usually containing the circular drops of bornite, chalcopyrite or replaced by other later sulfide and sulfosalt minerals.

(2) enargite + bornite + chalcopyrite + tennantite + colusite step; enargite formed a little earlier, and some of them turned to be tennantite and colusite and often were locally replaced along the edges or fissures by bornite and chalcopyrite, but they were considered to formed by the synchronous ore-bearing hydrothermal fluid. Bornite and chalcopyrite are often mutual oikocryst and chadacryst, forming the texture resulting by the solid solution separation.

(3) digenite + covellite step; the two were often symbiotic, replacing the previous ore minerals.

Judging by the mentioned above, Southern Tiegelong deposit can be considered to high-sulfidation epithermal deposit, based on the typical mineral assemblage covellite-digenite-enargite-alunite.

3 Prospecting Breakthrough

The dating age of diagenesis and mineralization of the deposit indicates that it formed in the Early Cretaceous, and the age of mineralization(U-Pb dating age of LA-ICP-MS zircon,120.2±1.0Ma) is later than that of ore-bearing rock(Re-Os isochron age of molybdenite, 119.0 ± 1.4 Ma) (Fang Xiang et al., to be published). It is similar as that of other large porphyry Copper-Gold deposits at Duolong ore concentrating area, such as Duobuza, Bolong(She Hongquan et al.,2009; Zhu Xiangping et al., 2011), of which the diagenesis and mineralization were controlled by the unified structure - magmatic system(Zhu Xiangping et al., 2012;Duan Zhiming et al.,2013), thus deducing that there might be a large-scale buried porphyry in the deep of or nearby Tiegelong deposit.

In response to the typical mineral assemblages of the deposit, it is likely to have the potential to seek the deep-seated ulra-large porphyry copper (gold and molybdenum) deposit, expected to become a world-class and complex epithermal – porphyry copper-gold deposit.

Acknowledgements (omitted)

References

Duan Zhiming, Li Guangming, Zhang Hui, Duan Yaoyao.2013.The formation and its geologic significance of Late Triassic-Jurassic accretionary complexes and constraints on metallogenic and geological settings in Duolong porphyry copper-gold ore concentration area, northern Bangong Co-Nujiang suture zone, Tibet. Geological Bulletin of China,32 (5):742-750(in Chinese with English abstract).

She Hongquan, Li Jinwen, Ma Dongfang, Li Guangming, Zhang Dequan, Feng Chengyou, Qu Wenjun and Pan Guitang.2009. Molybdenite Re-Os and SHRIMP zircon U-Pb dating of Duobuza porphyry copper deposit in Tibet and its geological implications. Mineral Deposits,28(6):737~746(in Chinese with English abstract).

Tang Juxing, Sun Xingguo, Ding Shuai, Wang Qin, Wang Yiyun, Yang Chao, Chen Hongqi, Li Yanbo, Li Yubin, Wei Lujie, Zhang Zhi, Song Junlong, Yang Huanhuan, Duan Jilin, Gao Ke, Fang Xiang, Tan Jiangyun. 2014. Discovery of the epithermal deposit of Cu(Au-Ag) in the Duolong ore concentrating area, Tibet. Acta Geoscientica Sinica,35(1):6-10 (in Chinese with English abstract).

Zhu Xiangping, Chen Hua'an, Ma Dongfang, Huang Hanxiao, Li Guangming, Li Yubin, Li Yuchang.2011.Re-Os dating for the molybdenite from Bolong porphyry copper-gold deposit in Tibet, China and its geological significance. Acta Petrologica Sinica,27(7):2159-2164(in Chinese with English abstract).

Zhu Xiangping, Chen Hua'an, Ma Dongfang, Huang Hanxiao, Li Guangming, Wei Lujie, Liu Chaoqiang.2012. Geological and alteration of the Duobuza porphyry copper-gold deposit in Tibet. Geology and Exploration,48(2):0199-0206(in Chinese with English abstract).