Epithermal deposit is a kind of most significant Au, Ag and base-metal deposit that can be generally grouped into high sulfidation, intermediate sulfidation and low sulfidation types base on the sulfidation states of sulfide assemblages (Hedenquisit et al., 1998; Sillitoe et al., 2003). The high sulfidation is one type of the most important Au-Cu deposits, that characterized by minerals assemblages of engarite, pyrite, covellite, digenite, Chalcocite, Bornite, Chalcopyrite et al., and alteration assemblages of quartz, kaolinite/dickite, alunite, barite, sericite et al. (Sillitoe et al., 2003). It’s very lucky that the first high sulfidation epithermal deposit——Southern Tiegelong deposit in Tibet Plateau was discovered through the work in 2013 (Tang et al., 2014).

Southern Tiegelong deposit located in Duolong ore region of Ban-nu Belt, North Tibet, China. There are 2 mainly kinds of porphyry, that are granitoporphyry and quartzdioriteporphyrinitevaded in middle-Cretaceous, andconduced mineralization at the same time. Jurassic Sewa formation (J 1, J 2 s) feldspathicquartzsandstone and Cretaceous Meiireiqeuo formation (K, m) andesite are wall rocks, and the feldspathicquartzsandstone are mainly ore body. The deposit not only enriched genetic types of ore deposit in Tibet Plateau, but also hold a super huge amount of mineral resources with over 550mt Cu and 30t Au.

1 Minerals

Some filed documentation, microscope observation and EMPA work have done to identify the ore minerals and alteration minerals. Some typical andrepresentativeHigh-sulfidation deposit minerals are found, such as engarite, covellite, digenite, tennantite, bornite, chalcopyrite, pyrite, molybdenite, geerit, spionkopite (Fig. 1-a, b, c), and so on. Through the work, some Cu-S group minerals such as covellite and digenite replace bornite and chalcopyrite can be observed, which suggests that high epithermal mineralization overprint the porphyry mineralization. What very interesting is that some new Cu-S, and Cu-Fe-S group minerals was discovered (Fig. 1-a), but never reported in any other research. Therefore, it should be very significant to do some working on the ore minerals. Besides the ore minerals, quartz, alunite, kaolinite, dickite (Fig. 1-d) are identified as the typical altered minerals. Some other altered minerals such as barite, rutile (Fig. 1-e, f) and goyazite et al. exist in Tiegelong deposit.

2 Alteration

There are four main different kinds of alteration types divided in the deposit. The Fig. 2 here show a SE cross-section that expose the output state of porphyry and different alteration belts, the ore-forming granite porphyry plunging to eastand the alteration belt surrounding around it. The ore-forming granite porphyry and wall rocks close to it are all sericitization altered and accompanied by some kaolinization, where appears strong altered feldsparphenocryst and some kaolinite veins. Along with the porphyry to shallow parts develops quartz-alunite-kaolinite/dickite alteration belt, it shows abundant alunite + kaolinite/dickite veins and silicified quartz. This belt exhibition variational output state containing fine crystalloidalunite veins intergrowth with kaolinite/dickite, crumbly pink alunite and scale-like alunite developing between the gaps of quartz. Surrounding the porphyry and quartz-alunite-kaolinite/dickite belt, kaolinite-dickite...
alteration belt distributed, where kaolinite and dickite veins and flakes develop with very few alunite. Wall rocks in the east and deep parts of the deposit are silicified alteration and accompany by some sericitization, a small number of kaolinite observed as well. The alteration distribution shows a close relationship to the porphyry and suggests both porphyry and epithermal deposit feature.

3 Fluid feature

Fundamental fluid inclusion search are focus on quartz-alunite-kaolinite/dickite alteration and sericite-kaolinite alteration belt. The fluid inclusion temperature and salinity analysis results demonstrate in Fig. 3, it shows quartz-alunite-kaolinite/dickite belt formed at a condition that temperature is in 160~360°C, concentrating in 240~280°C (Fig. 3a), and salinity is distributed in 2 diverserange:0~8% and 28~36% (Fig. 3a”). This analysis indicate the quartz-alunite-kaolinite/dickite alteration forms in a low-middle temperature and a low salinity, but the high salinity may be caused by porphyry fluid mixing. Because the high-sulfidation mineralization always form in a low salinity condition (Sillitoe et al., 2003). However, the fluid in sericite-kaolinite alteration shows a relatively higher temperature (240~560°C) (Fig. 3b) and salinity (4~40%) (Fig. 3b”). The research indicate that the granite porphyry fluid make big contribution for the forming of the deposit and the mix of meteoric water and porphyry fluid may led to ore minerals and alteration minerals form.

4 Conclusion

1) Southern Tiegelong deposit is the first high sulfidation-porphyry Cu-Au deposit with high sulfidation overprinting the porphyry deposit in Tibet plateau. It develops so many typical minerals such as enargite, covellite, digenite, alunite, kaolinite, dickite, barite, rutile, quartz.
kaolinite, barite and so on.

2) The deposit forms in a low-middle temperature and low-middle salinity condition which indicate the mix of meteoric water and porphyry fluid make a big difference in high sulfidation deposit.

Acknowledgements

Thanks for TibetJinglongmining mines ltd, Chinalco offering me field working and life environment and condition as well as some subsidization.

References

