CUI Yinliang, XU Heng, ZHOU Jiaxi, ZHANG Miaohong, JIANG Yongguo and ZENG Min, 2017. Alkaline Prophyries in the Chenghai-Binchuan Tectono-Magmatic Belt, Western Yunnan Province, SW China. *Acta Geologica Sinica* (English Edition), 91(supp. 1): 74-75.

Alkaline Prophyries in the Chenghai-Binchuan Tectono-Magmatic Belt, Western Yunnan Province, SW China

CUI Yinliang[1, 2, *], XU Heng[3], ZHOU Jiaxi[4], ZHANG Miaohong[3], JIANG Yongguo[1] and ZENG Min[2]

1 *Yunnan Nonferrous Metals Geological Bureau, Kunming 650051, Yunnan, China*
2 *Faculty of Land Resource Engineering, Kunming University of Science and Technology, Kunming 650093, Yunnan, China*
3 *Nonferrous Metal Geological Survey, Yunnan Nonferrous Metals Geological Bureau, Kunming 650216, Yunnan, China*
4 *State Key Laboratory of Ore Deposit Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang 550081, Guizhou, China*

1 Introduction

Sanjiang tectonic-magma belt is one of the most potential resources' metallogenic belts in China. Cenozoic alkali-rich porphyry-type gold polymetallic mineralization system is a significant characteristic of this belt. Chenghai-Binchuan tectonic belt, located in the western margin of the Yangtze block, is an important part of Jinshajing-Red River alkali-rich porphyry belt. However, compare with other parts of the Jinshajing-Red River metallogenic belt, the diagenesis and mineralization studies in the Chenghai-Binchuan belt were relatively weak. The new discovery of porphyry-type Cu-Au deposits, such as the Fenshuiling, Xiaolongtan and Bijiashan deposits in the Chenhai-Binchuan belt, which indicates this belt has good metallogenic conditions and great ore prospecting capacity (CUI Yinliang et al., 2002). Therefore, it is necessary to strengthen the diagenesis and mineralization studies in the Chenghai-Binchuan metallogenic belt. In this study, we describe the ore deposit geology in detail and report systemic petrological, petrogeochemical and geochronological data of three alkaline porphyry-related Cu-Au deposits, in order to reveal the petrogenesis, magma source characteristics, geodynamic setting and genetic relationship between alkaline porphyry and Cu-Au ores (XU Heng et al., 2015, 2016).

2 Methods

The major, trace and rare earth elements analyses were all completed at State Key Laboratory of Ore Deposit Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences. Major elements were determined by X-ray fluorescence (XRF) with analytical uncertainty of 10%. Trace elements were measured by inductively coupled plasma mass spectrometry (ICP-MS), with analytical uncertainties of 5% for the REE, and10% for the other trace elements (Liu Y S et al., 2008). Zircon U-Pb geochronology analysis was conducted by using a laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) at State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences. Zircon Lu-Hf isotope analysis was completed by the laser ablation multiple collector inductively coupled plasma-mass spectrometry (LA-MC-ICP-MS) at MLR Key Laboratory of Metallogeny and Mineral Assessment, Institute of Mineral Resources, Chinese Academy of Geological Sciences (Qi L and Gregoire D C, 2000).

3 Results

1. Alkaline porphyries in the three studied deposits consist of felsic porphyries and lamprophyres. The felsic porphyries include (biotitic) granite diorite porphyry, potassium feldspar granite porphyry, diorite syenite porphyry, and (biotitic/quartz) monzonite porphyry. The distributed scales and quantities of lamprophyres were gradually decreasing spatially from south (near to the Jinshajing-Red River) to north (far away from the Jinshajing-Red River).

2. Felsic porphyries have features of alkali-rich (average

[*] Corresponding author. E-mail: cyl186@163.com

value of Na_2O+K_2O is 9.32%), K-rich (average ratio of K_2O/Na_2O is 1.96) and quasi-aluminous to weak peraluminous (average ratio of A/CNK is 0.96) in major elements, and high content of Sr (average value is 866×10-6) and high ratios of Sr/Y (mean 68) and La/YbN (mean 39), low contents of Y (average value is 13×10-6) and HREE (average value is 9.78×10-6) in trace elements, which are similar to those of adakitic rocks. The studied felsic porphyries enriched in LILE (Rb, Sr, Ba, U and Th) and LREE, and depleted in HFSE (Ta, Nb and Ti), with weakly negative Eu (mean 0.77) anomalies. Major elements of the lamprophyres were featured in alkali-rich (average value of Na_2O+K_2O is 7.6%), high K (average ratio of K_2O/Na_2O is 4.18) and low Ti (mean 0.60%), and the trace elements of the studied lamprophyres are similar to felsic porphyries.

3. Temperatures of felsic porphyries magma formed at the Fenshuiling, Xiaolongtan and Bijiashan deposits are 730 to 785 °C, 758 to 789 °C and 749 to 779°C, respectively, based on zircon saturation temperature calculations. The εHf(t) values of the studied felsic porphyries were negative (mostly between -7.5 and -2.5), and the two stage model ages were range from 672 to 1608 Ma.

4. LA-ICP-MS Zircon U-Pb ages of the six felsic porphyries samples and one lamprophyres sample were range from 35.6 and 34.5 Ma, and 33.6 Ma, respectively, which are corresponding with late collision peaked ages of the Tibetan Plateau (40-26 Ma).

4 Conclusions

1. Although felsic porphyries in the three studied deposits have different rock-forming minerals, they have similar structures and geochronological compositions. This suggests that these porphyries were derived the same source. The variation of distributed scales and quantities of lamprophyres were related to intrusion action.

2. All felsic porphyries belong to the high-K calc-alkaline rock series, which originated from the same crust-mantle mixed source related to subduction. Lamprophyres were potassic to ultra-potassic calc-alkaline rocks, the magma source of which was different from that of the felsic porphyries, but the two type rocks had the same formation tectonic settings.

3. Felsic porphyries in the studied deposits have similar diagenetic temperatures and locations of magma source. The mesoproterozoic ancient crust contributed more materials to the magma source of felsic porphyries than mantle materials.

4. Felsic porphyries and lamprophyres are the products of magmatic activities in Late Eocene. Both of them were formed under the change from extrusion to extension (40-26 Ma) in the late collision of India-Eurasia. This is consistent with the geodynamic setting of the Jinshajiang-Red River porphyry metallogenic belt, suggesting a giant potential for finding more porphyry-type Cu, Au and Mo deposits in the studied area.

5. Lamprophyres formed at about 80 km through low degree (2-10%) partial melting of phlogopite-bearing spinel-garnet lherzolite transitional phase enriched lithospheric mantle that metasomatized by fluids derived from subduction slab. Felsic porphyries originated from the bottom of thickened lower crust at about 53 km, which formed via low degree (10%) partial melting of garnet amphibolite lower crust, and mixed by a few underplating of enriched lithosphere mantle melting components (lamprophyre magma).

Acknowledgements

This study was financially supported by the geological survey program of China Geological Survey (1212011120607) and the basic research program of Yunnan Nonferrous Metals Geological Bureau (20131300001). Thanks are given to Prof. Huang Zhilong, Li Feng and Gao Jianguo for useful suggestions and discussions.

References

Cui Yinliang, CHEN Xiansheng, ZHANG Yingxu and HE Langtao, 2002. Ore-forming condition and characteristics of gold deposit related to alkali-rich porphyry in the Cenozoic in West Yunnan. *Geitectonica et Metallogenia,* 26(4): 404–408.

Liu Y. S, Hu Z. C, Cao S, 2008. In situ analysis of major and trace elements of anhydrous minerals by LA-ICP-MS without applying an internal standard. *Chemical Geology*, 257(1-2): 34–43.

Qi L., Hu J., Gregoire D. C., 2000. Determination of trace elements in granites by inductively coupled plasma mass spectrometry. *Talanta*, 51(3): 507–513.

XU Heng, CUI Yinliang, ZHANG Miaohong, ZHOU Jiaxi, LIU Lichao, CHEN Liang, LIANG Tingxiang, RONG Huifeng, 2015. Geochemistry and geochronology of the lamprophyres in the Bijiashan ore deposit, Dali City, Yunnan province: implications for source region and diagenetic environment. *J. Mineral Petrol*, 35(3): 41–51.

XU Heng, CUI Yinliang, ZHOU Jiaxi, ZHANG Miaohong, LIANG Tingxiang and JIANG Yongguo, 2016. Geochemistry and Zircon U-Pb Age of the Alkali-rich Porphyry in the Fenshuiling Ore District, Yongsheng City, Yunnan Province, and its Geological Implications. *Geitectonica et Metallogenia,* 40(3): 614–624.