ZHANG Shuzhi, GAO Shunbao, ZHANG Yongchao, LUAN Kang and JIANG Xiaojia, 2017. Geochronology and geochemistry of the ore-bearing intrusion in the Longgen Lead-Zinc deposit in Tibet and its geological significance. *Acta Geologica Sinica* (English Edition), 91(supp. 1): 105-106.

Geochronology and geochemistry of the ore-bearing intrusion in the Longgen Lead-Zinc deposit in Tibet and its geological significance

ZHANG Shuzhi[1], GAO Shunbao[2,*], ZHANG Yongchao[2], LUAN Kang[2] and JIANG Xiaojia[3]

1 *School of Earth Science and Resources, China University of Geosciences, Beijing 10083*
2 *Geological Survey, China University of Geosciences, Wuhan, Hubei 430074*
3 *Faculty of Earth Resources, China University of Geosciences, Wuhan, Hubei 430074*

1 Introduction

The Longgen Lead-Zinc deposit is located in the southern Gangdise-Nyainqentantanglha plate and belongs to the western section of the Nyainqentantanglha copper-lead-zinc-silver metallogenic belt. In this paper, we report bulk major and trace elements and zircon U-Pb isotopes of granite porphyry related to Pb-Zn mineralization in the Longgen deposit to constrain the geochronology, geochemistry and its geological significance.

2 Geology of Ore Deposit

The Longgen Lead-Zinc deposit has 2.34 Mt lead and zinc ore resources, including 75015 t lead metal resources at an average grade of 3.21 % and 56788 t zinc metal resources at an average grade of 2.43 %. The strata are mainly composed of the middle Permian Xiala Formation and to a leser extent of Eocene Nianbo Formation (Fig. 1). Meanwhile, monzonitic granite porphyry is the main rock, which contains the phenocrysts of quartz (20～35 %), plagioclase (15～20 %), potassium feldspar (10～15 %) and biotite (0～5 %), the matrix of amounts of quartz and feldspar, with minor a bit of apatite, zircon and Fe–Ti oxides. Clearly, the monzonitic granite porphyry dyke intrude into the Xiala Formation. Orebody is primarily located in contact zone and local structural fracture zone between the monzonitic granite porphyry and limestone of the Xiala Formation.

3 Geochronology

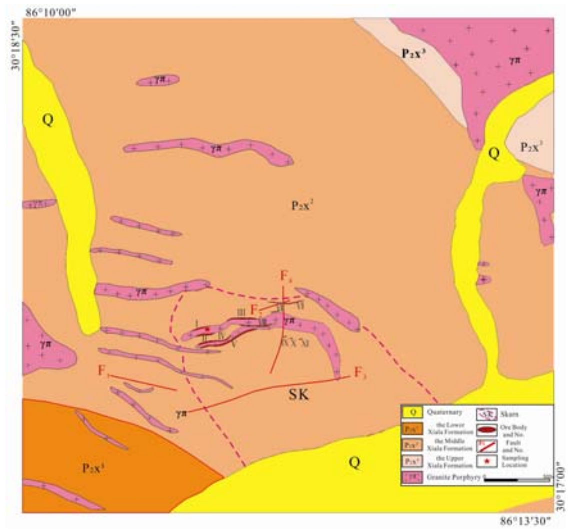

Fig. 1 Geological map of Longgen deposit (modified after regional geological survey team, Tibet, 2015). Sampling location for zircon U-Pb dating is shown.

Zircon U-Pb age of the monzonitic granite porphyry is 62.9±0.8 Ma (MSWD = 2.4, n = 17)(Fig. 2) which is consist with the age of the Chagele Lead-Zinc-Copper- olybdenum deposit (62.1±1.1 Ma; Gao et al., 2012) on the western segment of this metallogenic belt, the age of the Sinongduo Lead-Zinc deposit (68.2±0.3 Ma; Liu et al., 2010) on the middle segment of this metallogenic belt, the age of the Yaguila Molybdenum-Lead-Zinc deposit (65.8～68.6 Ma; Li et al., 2010) on the eastern segment of this metallogenic belt, which show that those magmatic emplacement are probably at the same time in the copper-lead-zinc-silver metallogenic belt, forming at syn-collision stage between India and Eurasia after northward sudduction of the Yarlung Zangbo oceanic basin.

4 Geochemistry and Petrogenesis

* Corresponding author. E-mail: gaoshunbao2002@163.com.

The ore-bearing granite porphyries of the Longgen deposit has high SiO_2 (72.02～74.26 wt.%), high K_2O (K_2O/Na_2O = 1.55～2.06 wt.%), high Al_2O_3 (Al_2O_3 = 12.43～13.80 wt.%), poor P_2O_5 (P_2O_5 = 0.05～0.07 wt.%), suggesting that they belong to high-k calc-alkaline series. The A/CNK varies from 0.94 to 1.15, which shows that it is metaluminous to weakly peraluminous rock. No obvious negative correlation between P_2O_5 and SiO_2, suggests a evolution trend of "S" type granite (Chappell, 1999).

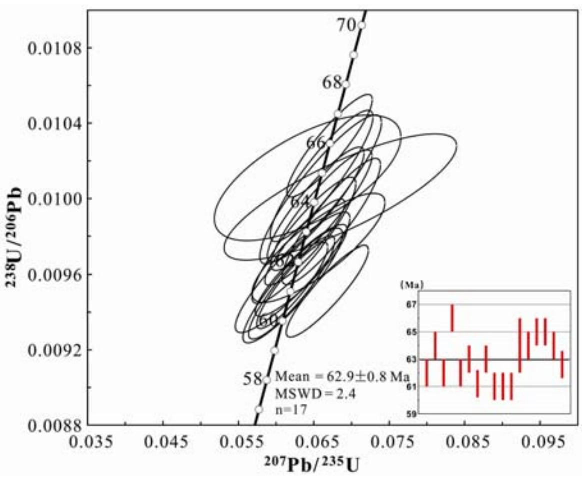

Fig. 2 U-Pb concordia diagram of zircons from ore-bearing rocks in Longgen deposit, Tibet.

The ΣREE varies from 191 ppm to 205 ppm and the chondrite-normalized REE patterns of ore-bearing rocks are right-leaning type that light and heavy rare earth differentiation are distinct (LREE/HREE = 9.89～10.56), light rare earth enrich ($(La/Yb)_N$ = 11.30～12.66) and heavy rare earth loss that fractionation is not significant ($(Gd/Yb)_N$ = 1.41～1.60). Moreover, all samples display strong negative anomalies of Eu implying probably that plagioclase played a role in the processes of partial meleing and subsequent fractional crystallization. Most samples show variable depletions in Nb, Ta, Ti, P, and Sr, and clear enrichments in Rb, Th, U, K contents, relative to neighboring elements and at the same time lose Ba relative to Rb and Th, indicating the magma occurred high degree of crystallization and differentiation.

In the Rb vs. Y and Rb vs. Th diagrams, the ore-bearing granite porphyries have a negative poorly correlation among Rb, Th and Y and high consistency with the evolutionary trend of "S" type granite. In the different tectonic environments diagram of Nb vs. Y elements for granites, the ore-bearing granite porphyry samples fall into volcanic arc and syn-collision granite area and in the Rb vs. Y+Nb discriminant diagram for different tectonic environments of granite, the ore-bearing granite porphyry samples fall into syn-collision granite area and around, suggesting that the ore-bearing granite porphyry of the Longgen deposit probably belongs to syn-collision granite.

5 Conclusion

The Longgen ore-bearing granite porphyry probably belongs to metaluminous to weakly peraluminous, high-k calc-alkaline rock series, have the characteristic of "S" type granite, and the magma occurred high degree of crystallization and differentiation, which formed at syn-collision stage between India and Eurasia after northward sudduction of the Yarlung Zangbo oceanic basin.

Acknowledgements

This research was financially supported by grants from the Commonweal Project from the Ministry of Land and Resources (No.201511015), China Geological Survey (No.DD2016027-2). We gratefully acknowledge Professor Youye Zheng and Professor Xiang Sun for their critical reviews and constructive comments which greatly improved this manuscript.

References

Chappell, B., 1999.Aluminium saturation in I-and S-type granites and the characterization of fractionated haplogranites. *Lithos*, 46(3): 535-551.

Gao Shunbao, Zheng Youye, Tian Liming, Zhang Zhong, Qu Wenjun, Liu Minyuan, Zheng Haitao, Zheng Lei and Zhu Jihua, 2012. *Geochronology of magmatic intrusions and mineralization of Chagele copper-lead-zinc deposit in Tibet and its implications.* Earth Science-Journal of China University of Geosciences, 37(3): 507-514(in Chinese).

Li Fenqi, Gao Ming, Tang Wenqing and Liang Ting, 2010. *U-Pb zircon LA-ICP-MS age of the Yaguila molybdenum-bearing intrusion in Tibet and its geological significance.* Geology in China, 37(6): 1566-1674(in Chinese).

Liu Bo, Dong Suiliang, Li Guangming, Zhang Hui, 2010. *Geochronology and geochemistry characteristic of the ore-bearing intrusion in Sinongduo Lead-Zinc deposit in Tibet and its geological significance.* Mineral Deposits, 29(Supp.1): 472-473(in Chinese).