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The Post-ore Changes and Preservation of the Porphyry Copper Deposit in the Geza Arc, Yunnan

LIU Xuelong[1*], ZHANG Na[1] and LI Wenchang[1,2]

1 *Faculty of Land and Resource Engineering, Kunming University of Science and Technology, Kunming 650093, China*
2 *Yunnan geological survey, Kunming 650051, China*

1 Geological Background

Geza island arc belt is one of the important tectonic units in the archipelagic arc-basin system in the Sanjiang area, which located in the eastern edge of the Dege-Zhongdian continental blocks Ganzi-Litang and the southern of Yidun arc. It began at Ganzi-Litang oceanic crust westward subduction in the Late Triassic, experienced intracontinental convergence and post-orogenic extensional phase in Yanshanian, and showed a strong thrust-nappe structure and large-scale strike-slip translation activities by the effect of the collision uplift of the Qinghai-Tibet Plateau in the Himalayan. In this area, there were strong magmatic activities, significant geophysical and geochemical anomalies, superior metallogenic geological conditions, the rich mineralization and a lot of deposits. It was a newly discovered copper polymetallic ore concentration area of China in recent years, in which the Pulang porphyry copper deposit is a typical representative of Indosinian porphyry copper deposit. In the late Triassic, oceanic crust occurred westward subduction, Hou and Yang(2004) suggested that the subduction time limit of oceanic crust in 235～210 Ma. In the Geza area, the subducted oceanic crust formated the stressed island arc and outputed the porphyry copper deposits related compressional tectonic environment because of the slowed angle subduction.whereas, in the northern of Yidun arc. As the faster and steep angle diving, where formated extensional island arc and outputed extensional environment-related massive sulphide deposits(Mo *et al*.,2001; Li *et al.*, 2007; Liu et al.,2013).

2 The analysis of Apatite Fission Track Geochronology Thermal

In recent years, many scholars used fission track method to study regional uplift and erosion, and explored the relationship between the erosion degree and the deposits' changes and preservation. Applicating the fission track method can not only recover the evolutionary history of the tectonic uplift, but also get the denudation, erosion rates and other quantitative data. Through contrast study of the mineralization depth and the erosion of deposits, analysis the regional evolution of post-ore changes and preservation. In the Geza metallogenic belt, the main mineralization porphyry of apatite fission track ages distributed in 12 ~ 68Ma, from the different rock mass of fission track age distribution, its fission track ages significantly less than the age of rock formation, also smaller than the age of the copper mineralization polymetallic deposits. The mineralization temperature range is 120～459 ℃ in copper-polymetallic deposits of the Geza arc,but the apatite closure temperature is 110 ℃, which is much lower than the formation temperature of granite and metal ores. Therefore, the apatite closure temperature affected by the tectonic events after the diagenesis and mineralization, its fission track ages ages recorded the tectonic-magmatic events since the granite and copper polymetallic deposits formation.

3 The Uplift and Erosion Since Indosinian

This institute obtained ages of apatite fission track for the sample experienced a closed time to now. Take the average temperature of apatite closure is 100 ℃ ,the nowadays surface temperature is 15 ℃, and the geothermal gradient to 30℃/ km calculated denudation rate. In this paper, we take into account the impact of paleo-geothermal gradient in calculation of the erosion rate. So, the results of denudation rate is also more accurate and reliable by the apatite fission track testing. The calculations of denudation rate shown that the erosion have some differences in different sub-porphyry belt. Gezan-Xuejiping porphyry belt has the minimal erosion

* Corresponding author. E-mail: xuelongliu@foxmail.com

Table 1 The comparison table of emplacement depth and erosion depth of the main porphyry in Geza arc

Rock (ore) body	Emplacement depth（km）	The average depth of emplacement（km）	Erosion depth （km）	The average depth of Erosion（km）
Pulang	0.84～3.85	2.56	1.91～2.48	2.19
Sunnuo	4.50～6.72	5.16	2.53	2.53
Xuejiping	4.36～6.41	4.82	1.50～1.81	1.62
Chongdu	2.18～2.82	2.59	2.04	2.04
Hongshan	2.97～4.62	3.60	1.91～2.72	2.10

and a smaller erosion rate change; The degree of erosion is middle in Qiansui-Pulang porphyry belt; The denudation rate is generally higher in the Yaza-Zhuoma mineralization porphyry belt. Meanwhile, the denudation rates also showed a characteristic of a higher altitude with height, the greater erosion rate of the rock mass. The denudation rates of Langdu rock mass is the largest in the region, but the amount of erosion is moderate. Disuga is the highest mineralization porphyry in this area, its outcropping of porphyry is large and weathering and erosion is intense. Therefore, the amount of erosion is also the largest in the region, with an average of 2.65km.

4 Changes and Preservation Condition After the Formation of the Deposits

Acidic porphyry is closely related to the formation of porphyry copper-polymetallic deposits in Geza area, it should be said that the degree of erosion of rock masses represents erosion situation since the formation of porphyry deposits in this area. In this paper, we calculated and comparative analysised the emplacement depth and extent of erosion of the main mineralizationin porphyry in Gezan metallogenic belt, the results was shown in Table 1. The average depth is general less than the average emplacement and erosion of each mineralizationin porphyry which more favorable to the preservation of major porphyry deposits since the formation.

Based on the findings of this article, the overall erosion magnitude less than the depth of magma emplacement of the main mineralization porphyry from the Triassic (228 ~ 199Ma) in the Geza arc. In the region, erosion depth of the deposit is insignificant at the same level of erosion in the large or super-large deposit such as Pulang copper deposit, chundu copper deposit, Hongshan copper deposit. In the east porphyry belts, the overall depth of erosion of Yaza polymetallic deposit, Zhuoma copper deposit, Langdu copperdeposit is a higher level which controlled by the effects of high altitude and fault activity. The erosion depth of the Sunnuo copper deposit and Disuga copper-polymetallic deposit are very largr which mainly due to the impact of altitude and control. Because of the low elevation coupled with no major faults mining activity and the surface runoff is not developed, the erosion of the Xuejiping copper deposit is smaller.

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