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The Lead Isotope Characteristics and Tracing of Ore-bearing Porphyry in the Geza metallogenic Belt , Yunnan

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1 Geological Background

Geza island arc is located in the southwest Sanjiang tectonic igneous rock belts, it was a products of Ganzi-Litang oceanic crust diving to Zhongdian Landmasses in late Triassic and the importance of newly discovered copper polymetallic belts in the recent years in China. The regional strong tectonic-magmatic activity throughout the island-arc orogenesis from beginning to the end, the rich mineralization developed in the different times and circumstances of island arc orogenesis, where outputed the superlarge sized Pulang porphyry copper deposits, Xuejiping large sized porphyry copper deposits and Hongshan large sized skarn-porphyry copper polymetallic deposits. Based on the development stage of island arc orogenic, the distribution of intrusive rocks, composition, geochemical characteristics, Geza granits belt can be divided into three belts. Lithogeochemical characteristics shown that the porphyry(porphyrite) and island-arc granite rocks have the same rock series (high-K calc-alkaline) and the same genetic type (I-type granite); these rocks trace elements similar to the granite of island arc, the similarities of porphyry and local acidic volcanic rocks in the main elements. The formation of porphyry and porphyry-related deposits adapted from magmatic hydrothermal which came from the upper mantle and lower crustal. It is because of aggregation, migration, proliferation,and alteration of ore-forming hydrothermal making the porphyry copper mineralization can be achieved.

2 Pb Isotope Characteristics of Intrusive Rocks

Radiogenic isotope signatures provide key genetic information relating to the source, age, and tectonic setting of magmas associated with porphyry copper deposits. Pb isotope signatures help to distinguish potentially fertile from barren stocks, provide constraints on the geochemical processes controlling the evolution of mineralizing stocks during magma transfer through the crust, and information on the origin of hydrothermal fluids.

The model, Zartman and Doe (1979)according to the discriminant ability of Pb isotope patterns described the initial Pb isotopic composition of several variations which related to(associated with) the tectonic setting. They pointed that Pb concentration can establish three kinds of reservoirs(the upper crust, lower crust and upper mantle).Doe, Zartman and Anines (1988) mapped the Pb isotope evolution curves with time. The Pb^{207}/Pb^{204}-Pb^{206}/Pb^{204}can well determine the upper crust, lower crust and mantle, while Pb^{208}/Pb^{204}-$Pb^{206}/Pb^{204}$is a good distinction between the upper crust, lower crust and mantle source region of the structure. Geza island arc several typical porphyry deposits Pb isotopic data in Table5. It is show that Pb^{206}/Pb^{204} 17.680～19.165, Pb^{207}/Pb^{204} 15.453～15.773,changes in scope,Pb^{208}/Pb^{204} 37.730～39.654.In the diagram of Pb isotope tectonic environment discrimination(Fig.1),most of samples are normal lead,Pb isotopes focused on the side of orogenic evolution line and the lower crust range, this indicates that material source derives from the depth and with the characteristics of crust-mantle mixed source.

3 Discussion

In period of late Triassic, the mainly body of Geza island arc was formed and developed on the top of a thin crust in the extended state during a long term, the substrate was composed of ancient metamorphic crystalline basement and covered by sedimentary rock series of middle Triassic (Li and Mo.,2001). Meanwhile, Ganzi-Litang oceanic basin began to formand and occurred the

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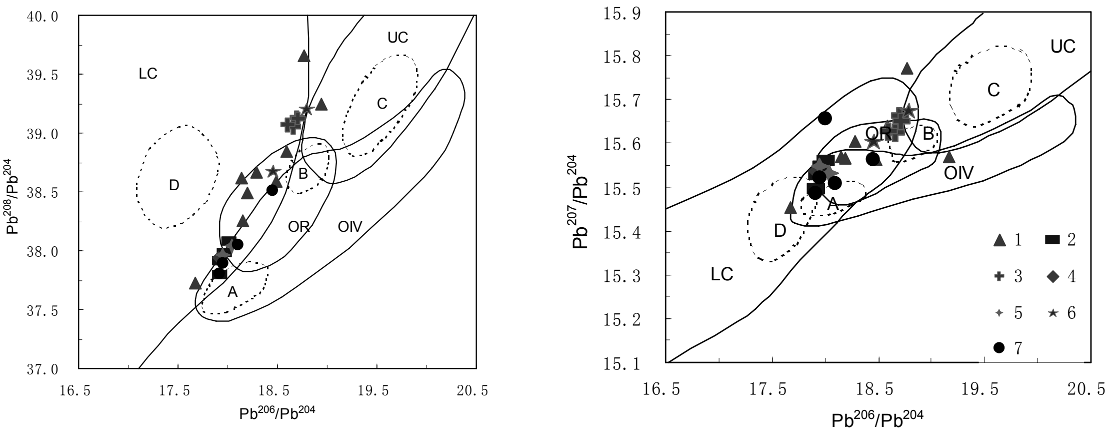

Fig.1. Pb isotope Pb^{207}/Pb^{204}- Pb^{206}/Pb^{204}、Pb^{208}/Pb^{204}- Pb^{206}/Pb^{204} tectonic environment discrimination diagram(after Allegre CJ，1977)

LC—Lower crust; UC—Upper crust; OIV—Ocean island volcanics; OR—Orogenic belt. A、B、C、D show the relative concentration areas of the districts; 1.Pulang; 2.Xujiping; 3.Hongshan; 4.Qiansui; 5.Disuga 6.Yaza 7.Langdu

westward subduction along the trench,which eventually led to the development and formation of Geza island arc (Yang et al.,2002;Li et al.,2007). With the subduction developing, dehydration fluids derived from the subducting slab, which generated metasomatism to the mantle source region, which induced melting of mantle magma and formed the low density and viscosity initial melting zone. Mantle material diapir rising and segregation generated the calc-alkaline magma,the magmatic differentiation upwelling or invasion formed calc-alkaline island arc volcanic rocks or the shallow-super shallow intermediate-acidic porphyry series,that were island arc magmatic rocks.As mentioned before, Geza arc is a compressive arc, in the compressive stress field, the low density feature of primary arc calc-alkaline magma determine the occurrence of multi-stage magmatic fractional crystallization.In the upper mantle zone,becaues the magma density is less than the mantle lead to the upward migration. However, in the crust-mantle boundary, becaues the magmatic fluids intercepted by crustal low density dam occurred the fractional crystallization and emplacement.

4 Conclusions

The material sources of petrogenic and metallogenic derived from the mantle and the lower crust in the area, which have the crust-mantle mixed source characteristics, the mineralization and magmatic activities has relatively closed relationship.

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