GUO Zhouping and BAI Yun, 2014. Geochronology and Geochemistry of Andesites in Langlike Cooper Deposit, North Qilian Mountain, China. *Acta Geologica Sinica* (English Edition), 88(supp. 2): 982-983.

Geochronology and Geochemistry of Andesites in Langlike Cooper Deposit, North Qilian Mountain, China

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1 Geology

The Langlike cooper deposit, the central of the Lenglongling anticlinorium in the North Qilian orogenic belt, is located in the northeast portion of the Xianmi,Menyuan,Qinghai Province.The volcanic group of Langlike cooper deposit is a neutral to intermediate-basic metamorphic volcanic rocks - clastic rocks, mainly marine andesitic lava and basaltic andesitic lava.

2 Characteristics of Rock and Geochemical

2.1 Rock characteristics

Andesite rock is gray-green, massive structure and porphyritic structure, spherical particles of the matrix structure. Most of the Phenocrysts are plagioclase (20% ~30%), with small amounts of pyroxene (<2%). Plagioclase phenocrysts main plate-like and granular, chlorite is locally metasomatism; matrix of tiny plagioclase and minor pyroxene; pyrite content of about 5%.

2.2 Geochemical characteristics

According to geochemical analysis of andesite of the Langlike cooper deposit, major elements of rocks have higher MgO content and $Mg^{\#}$ values, with obvious characteristics of magnesium-rich. $K_2O < Na_2O$，$Na_2O \gg K_2O$，DI=43.72~61.45. Rocks belong to calc-alkaline series and samples are in the range of magnesia series on the SiO_2-FeO^T/(FeO^T+MgO) diagram .

Andesite REE contents are low, LREE and HREE fractionation are not obvious, Eu anomaly is not obvious, the characteristics of andesite are very similar to the oceanic tholeiite in abundances. LILE in Trace elements enrichment of different elements, HFSE are relative loss, Nb, Ta, Ti obvious loss, Nb / La ratios are less than 0.8, similar to the compositional characteristics of island arc volcanic rocks, significantly enriched in Cr, Ni.

Andesite of the Langlike cooper deposit have features like high SiO_2, high Mg, high $Mg^{\#}$ values, low-Ti and low-K, Its major element content, trace element content and other ratios characteristics are similar to some high Meian andesitic rocks of the world(Deng JF, 2010).It showed that andesite growth in Langlike cooper deposit have the characteristics of magnesium-rich.

3 Isotopic Dating

According LA-ICP-MS zircon U-Pb dating tests for andesite of the Langlike cooper deposit, based on the test data, Th / U ratio obtained is between 0.29 to 0.55, with an average of 0.37. the overall display the characteristic is magmatic zircons. After adjusting for zircon $^{206}Pb/^{238}U$ surface age range of useful is between 470.1 ± 6.24 Ma ~ 488.2 ± 6.35 Ma, the weighted average age is 479.2 ± 3.4 Ma (MSWD = 0.40), the weighted average error is consistent with the single analysis error, groups concentrated in concordia diagram, it should be andesite diagenetic age and belong to the Ordovician volcanic product.

4 Discussion

Known primarily magnesium-rich andesites more in the modern oceanic island arc and basin series volcanic belt, this is an identifying characteristic of island arc rocks (Tatsumi, 2006; Kay, 1978; Roger, 1985; Tang J G, 2010; Deng JF, 2010). Generally believed that magnesium-rich andesite is subducted basaltic oceanic crust dehydration melting magma of SiO_2-rich, magma ascent during contact with the wedge mantle peridotite reaction and contamination , formed a magnesium-rich, low FeO/MgO

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or high $Mg^{\#}$ values magmaa ,the magmaa ejection ground surface or emplaced in the shallow crust formed high-Mg andesite (Deng JF et al., 2010). Experimental petrology data demonstrated that Formed Mg-rich andesite is entirely a product of hydration SiO2-rich melt and mantle peridotite (Deng JF et al., 2007), this condition can only appear in subducted oceanic crust island arc environment.

Study shows that the Caledonian orogenic belt in the North Qilian can be traced from the Neoproterozoic , and it was extended into ocean basin due to rifting in the precambrian base plus futher cleavage from the late Cambrian to Early Ordovician (Wang Q, 1976; Xiao XC, 1978; Xia LQ, 1996,1998,2001; Zuo GC, 1987; Xu ZQ, 1994 et al.), the ocean basin closure occurred in roughly the Late Ordovician (445 ~ 428 Ma), throughout North Qilian Caledonian orogenic forming a typical trench - arc - basin systems configuration pattern of plate tectonics, the volcanic belt in Menyuan exactly corresponds with volcanic island arc in Minle South-Huzhu North-Yongdeng Shihuigou area (Xia LQ et al., 2001). According age data obtained by volcanic isotopic(479 Ma), time limits will also be represented by the North Qilian ocean basin expansion and early demise. Thus creating the formed provenance and tectonic environment of magnesium-rich andesitic rocks.

5 Conclusions

(1) Geochemical research data shows that the andesites of Langlike copper ore in North Qilian orogenic have the characteristics of magnesium-rich.

(2) LA-ICP-MS zircon U-Pb dating results show that the diagenetic age of andesite in Langlike cooper deposit is 479.2 ± 3.4Ma, belonging to Early Ordovician.

(3) The output of magnesium-rich andesitic rocks proved that Lenglongling volcanic rocks and the associated copper deposit are clearly the products of magmatic in arc tectonic environment.

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