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Zircon U-Pb Age and Geochemical Characteristics of Monzonitic Granite Porphyry from Xiaoqiaotou area, Yunnan

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1 Introduction

PThe Ailaoshan tectonic belt is a well-known banded Cenozoic alkali-rich porphyry belt, which developed a large number of copper-gold-molybdenum deposits with a close genetic relationship with alkali-rich porphyry (e.g., Zhang et al., 1997; Wang et al., 2001; Hou et al., 2003; Deng et al., 2014, 2015; Liu et al., 2015; Ding et al., 2016).The Xiaoqiaotou quartz monozygotic porphyry body is located in the Cenozoic Jianchuan pull apart basin in the west of Lijiang river, which is the intersection of the western margin of the Yangtze continental block and the Ailaoshan tectonic belt. We present whole-rock geochemical, and Sr-Nd isotopes and zircon LA-ICP-MS U-Pb age in the paper.

2 Results and Conclusions

These quartz monozygotic porphyry samples are enriched in K₂O (4.79-6.14 wt.%), with high K₂O/Na₂O ratios (1.0-1.4), and belong to shoshonite rocks. All the samples have Al₂O₃ contents from 14.26 to 15.97 wt.% and are metaluminous , with A/CNK [Al2O3/(CaO + Na₂O+K₂O)] ranging from 0.82 to 0.98. These rocks are characterized by enriched in light rare earth elements (LREEs, Rb, Th, U, Pb) and large-ion lithophile elements (LILEs), with depletion of high-field-strength elements (HFSEs, Nb, Ti, Ta) and weak Eu anomalies (Eu/Eu*=0.77-1.10). The Xiaoqiaotou quartz monozygotic porphyies have uniform initial 87Sr/86Sr isotope ratios of 0.706343 to 0.706344 and initial ¹⁴³Nd/¹⁴⁴Nd ratios of 0.512502 to 0.512503,

corresponding to ϵ Nd(t) values of -1.8. Their two-stage depleted mantle model ages (T_{2DM}) range from 988 to 989 Ma.

There are both magmatic zircons and magmatic composite zircons in the quartz monozygotic porphyry from Xiaqiaotou area. The former zircon grains are generally euhedral and mostly elongate and prismatic, up to 200 μ m long, and have well-regulated oscillatory zoning. The oscillatory zonig of the latter zircon is well developed, and are prismatic (100–300 μ m long) with aspect ratios of 2:1–3:1. And the CL images show the core-rim structure with ancient cores. The age of quartz monozygotic porphyry was 34.9±1.0 Ma. Containing inherited zircons of 781±23 Ma indicates that the basement of the Neoproterozoic Yangtze platform inherited zircon.

Due to the high SiO_2 content (67.96 to 69.01 wt.%), the magma of Xiaqiaotou quartz monozygotic porphyry could not directly source from partial melting of the mantle, because direct melting of the mantle cannot produce more acidic rock than that of andesite (e.g., Baker et al., 1995; Lloyd et al., 1985). For the following reasons, the source region of shoshonitic felsic rock is agree with the contemporaneous mafic rock which the magma source originated from metasomatic lithosphere mantle(e.g., Gan and Huang, 2017; Li et al., 2002; Lu et al., 2015; Xu et al., 2001). (1) the formation time of them are Paleogene (e.g., He et al., 2014, Lu et al., 2015);(2) there is a certain continuity between them in Hark diagram;(3) Both have the same distribution of rare earth and trace elements as well as the Sr-Nd isotopic composition.

In the context of the Indian and Asian continental collisions, we conclude that the Xiaqiaotou quartz

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monozygotic porphyry is associated with thinning of over thickened lithospheric mantle along the Jinsha suture.

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