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Zircon Mineralogy and Trace Elements Composition of the Metallogenic Granites in the Nanshankeng Mine,Eastern Nanling

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1 Introduction

Nanshankeng tungsten-tin polymetallic mine, which is located in the eastern Nanling metallogenic belt, is newly discovered by geological investigation and evaluation with prospecting potential（Xiao et al.,2008,2010,2013; Fan et al.,2013）. Our field investigations have identified various stages of granites associated with mineralization, some of which are A-type granites(Yao et al.,2011). In this paper, zircon mineralogy, CL image, BSE image and trace elements composition of biotite monzonitic granite closely related to skarn-type tungsten-tin mineralization are studied.

2 Characteristics of metallogenic granite

The biotite monzonitic granites are mostly batholith or vein types with gray, medium-coarse and massive structures. Zircon LA-ICP-MS U-Pb dating yielded age of 154 Ma to 161Ma for biotite monzonitic granite. Biotite monzonitic granite mainly consists of 25-30% of potassium feldspar, 35-40% of plagioclase, 25-30% of quartz and 5-6% of biotite. Accessory minerals include zircon, apatite, fluorite, rutile, sphene, monazite, octahedrite, pyrite, stibnite, molybdenite, garnet, tourmaline, epidote, allanite, limonite, llmenite and scheelite(Fan et al.,2017 to be published).

3 Zircon characteristics

Zircon is the most common mineral in magmatic rocks, metamorphic rocks and sedimentary rocks. The physical and chemical properties of zircon are very stable and not susceptible to be altered during geological processes such as weathering, transportation and erosion (Belousova EA et al. , 2002; Siebel W et al., 2009), making itself a good mineral to record different geological processes and favoured by mineralogist, geochemist and geologist .

Zircons in biotite monzonitic granites in the Nanshankeng tungsten-tin polymetallic deposit are dominated by transparent crystals. Most are light brown with length ranging from ~80 to ~250 μm and length/width ratios of 1.0 to 2.0. Most of the zircons are anhedral, columnar and fragmented angular in shape, whose crystal form are mainly cylindrical (100) and conical (111)(Fig.1a), while the others are sub-angular, columnar and fragmented in shape, whose crystal form are cylindrical (110) and conical (111) (Fig. 1b).

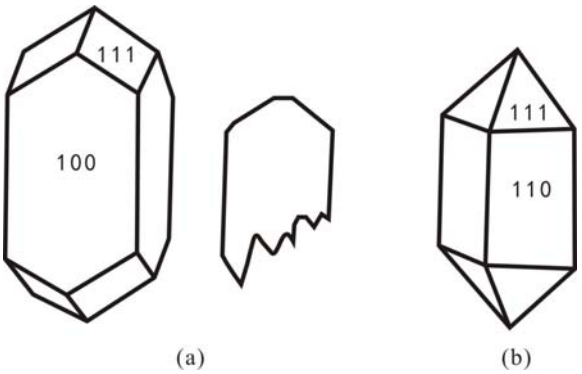

Fig.1 Zircon crystalline form of biotite monzonitic granite
(a), The primary types of Zircon;(b) ,the secondary type of Zircon

Fig.2 presents representative zircon CL and BSE images. These CL images display typical magmatic oscillatory zoning (Fig.2a), with a few black and taxitic zircon. The oscillatory zoning zircons appear with cracks and darkness in the BSE images, while the few radial cracks in the edge of Zircon. The core of all black zircons is basically shown as a hole, and some zircons contain cracks and inclusion inside (Fig.2b).

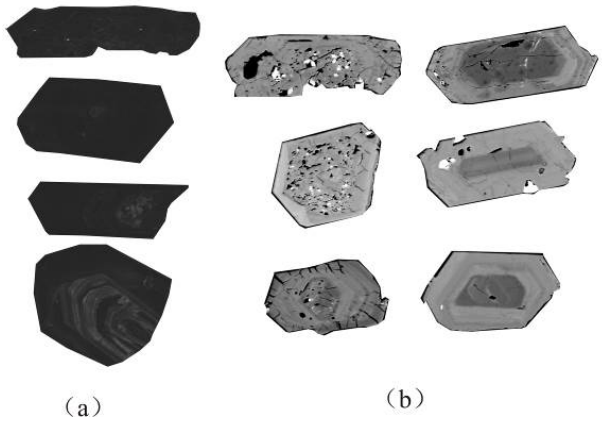

Fig.2 Zircon CL image
(a) and BSE image(b) of biotite monzonitic granite

4 Characteristics of Trace Elements in Zircon

The content of Th and U acquired from LA-ICP-MS analysis indicates that zircon varied from 134 to 4433×10^{-6} and 174 to 2890×10^{-6} respectively. The range of Th/U ratio is 0.43-1.30, and more than 0.1, indicating the magmatic origin of these zircons. All of zircons analysis in this paper have total REE between 527.77 ppm and 2159.22 ppm, rich in HREE with strong positive Ce anomaly (δCe=1.32~76.08) and negative Eu anomaly (δEu= 0.03~0.44)(Fig.3)

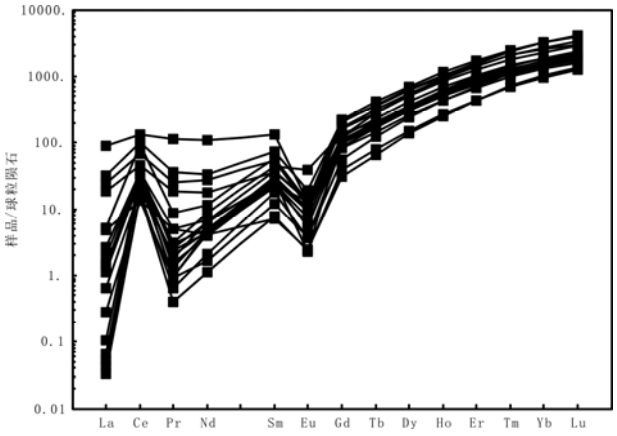

Fig.3 Chondrite-normalized REE patterns for zircon grains (Taylor and McLennan,1985)

5 Conclusion

The zircons from biotite monzonitic granite in Nanshankeng deposit are magmatic origin, and perhaps affected by hydrothermal fluid. The zircons are mainly anhedral, columnar and fragmented angular in shape, whose crystal form is mainly cylindrical (100) and conical (111). Cathode luminescence (CL) image shows that most of the zircons possess oscillatory zoning, while only some of them are all black and plaque with a few bright spots in the core. The oscillatory zoning zircons show cracks and darkness in the BSE images, interior of all black zircon with hole-like, parts of zircon having cracks and inclusion. Most of the zircon has high Th/U ratios, heavy REE enrichment, with strong positive Ce anomalies and negative Eu anomalies. Image features and trace element characteristics show that the zircons from metallogenic granites experienced a complex evolution process.

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