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Zircon U-Pb Age and its Geological Implications of Huangbaicha Leucogranite in North Qinling Terrain

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1 Introduction

The early Paleozoic orogenic event of the North Qinling Terrain is the key to understand the tectonic evolution of the Qinling orogen before the early Mesozoic final amalgamation of the south margin of North China Block and the north margin of South China Block along the Mianxian-Lueyang suture zone (Meng and Zhang 1999; Zhang et al., 2001; Dong et al. 2011, 2016; Zhang et al., 2013, reference therein). Nevertheless, the early Paleozoic tectonic evolution of North Qinling Terrain is still poorly constrained, especially in terms of the timing of oceanic crust spreading, subduction, and subsequent collision leading to the closure of Shang-Dan Paleotethys. Among the various types of granites, the highly fractionated leucogranite is a strong peraluminous felsic intrusion linked to anatexis of continental crust, and have always drawn much attention of the geologists all over world (Guo et al., 2007; Wu et al., 2015; Sun et al.,2016; Gao, et al., 2017; Liu et al., 2017; Liu et al., 2018). However, At present, little clear Paleozoic age of leucogranite has been reported in the North Qinling Terrain so far. So in this study, we provide petrological and chronological evidence of Huangbaicha leucogranite located in North Qinling Terrain for further understanding geodynamic background and structure evolution of the orogenic processes of North Qinling Terrain.

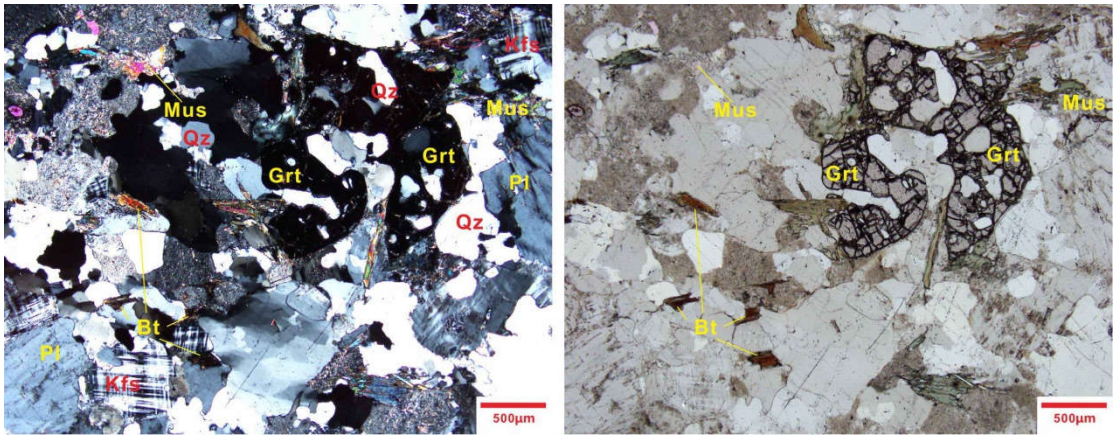

Fig.1 Microphotographs showing mineral assemblages of the garnet-bearing two-mica leucogranites from Huangbaicha pluton in the North Qinling Terrain

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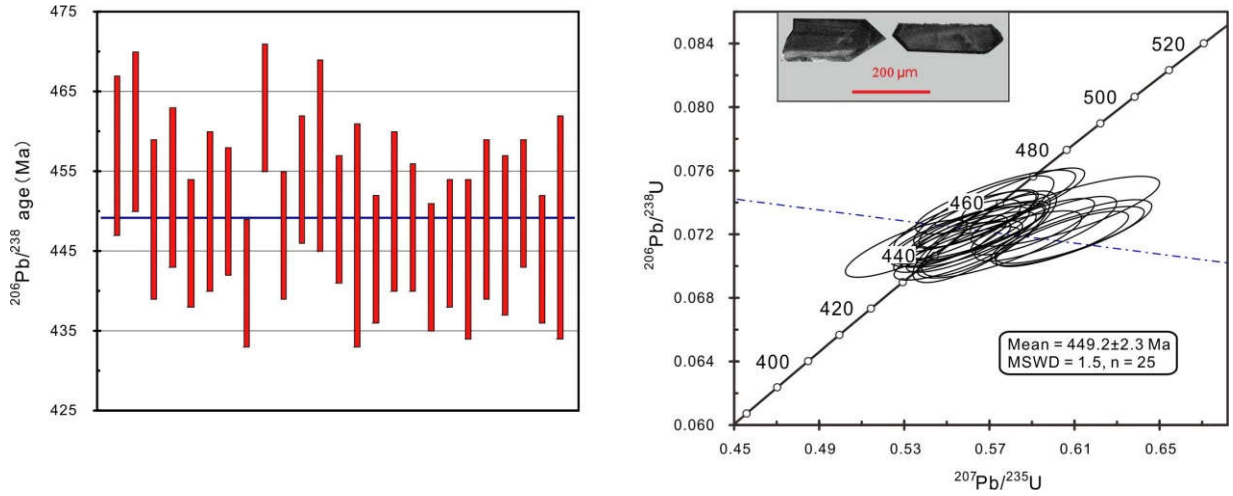

Fig.2 Representative CL image and LA-ICP-MS dating result of zircons for the garnet-bearing two-mica leucogranites from Huangbaicha pluton in the North Qinling Terrain

Sample and Result

Huangbaicha leucogranite pluton spatially distributed Huangbaicha village between the Luanzhuang Town and the Yuling Town in the Danfeng County, Henan Province. Geologically, it occurred with an irregular stock between the Shang-Dan suture zone and Zhu-Xia ductile shear zone in eastern North Qinling Terrain. Detailed field mapping showed the Huangbaicha pluton had a obvious intrusive contact with gneisses and the overlying sedimentary rocks from Qinling Group in the North Qinling Terrain, and the extended direction of the intrusion was basically consistent with that of regional tectonic line. Our microscopic petrography (Fig. 1) shows that Huangbaicha garnet-bearing two-mica leucogranite consists mainly of K-feldspar (35-40%), plagioclase (~20%), quartz (~30%), muscovite (5-8%), as well as little biotite (3-5%) and garnet (~4%).

Zircons separated from the garnet-bearing two-mica leucogranites in this study are mostly euhedral-subhedral columnar crystals, 100-250 μm in length, with aspect ratios of 2:1 to 4:1. CL images reveal oscillatory growth zoning, a characteristic attained during magmatic crystallization. All zircons show chemical zonation with the higher Th/U ratios (0.17-0.38). LA-ICP-MS U-Pb dating of twenty-eight analytical spots for zircons from the garnet-bearing two-mica leucogranites yield a group of concordant $^{206}Pb/^{238}U$ ages between 463 and 441Ma, with the weighted mean age of 449.2±2.3 Ma (MSWD=1.5, n=25) (Fig. 2). The leucogranites and its emplacement age indicate that North Qinling Terrain might form in a setting of continental marginal arc at ~450 Ma and the collision might finish prior to ~450 Ma in the North Qinling Terrain, and then evolved into the post-collision orogenic stage. This results may shed lights on the tectonic evolution of the Qinling Orogen in the Early Paleozoic. However, further study is still needed on the distribution, scale, geochemistry and petrogenesis of leucogranites in North Qinling Terrain.

Acknowledgements

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Types of magmatic sulphide deposits in China are shown in Table 1 and distribution of typical magmatic sulfide deposits in China is seen in Fig. 1.

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