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LA-ICP-MS Zircons Dating of Baishiya Body in Xiao Mountain, Western Henan Province, and Its Geologic Implications

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Xiaoqinling, Xiao Mountain and Xiong'er Mountains are one of important endogenic metallization belts in eastern Qinling orogen belt in Henan Province (Luo et al., 2000). The endogenic metallization in Xiao Mountain, however, is weaker obviously than Xiaoqinling Mountain and Xiong'er Mountain. The comprehensive research works of petrogenesis about granites in Xiao Mountain are not be completed, as well as the geologic explorations work related to there granitic bodies. The age of Baishiya body in north Xiao Mountain was reported in this paper, and the geologic implications of clustered of two groups of zircons U-Pb age in concordia diagrams was discussed. The petrogenesis and mineralization potential of Baishiya body were analyzed.

Xiao Mountain lies in south margin of north China craton (Fig. 1a), and mainly geologic unites are Taihua grout(Ar), Xiong'er group(Pt_2) and Guandaokou group (Pt_2) (Fig. 1b). The most extensive magmatism in Xiao Mountain is volcanic rock of Xiong'er group (Pt_2), and small magma activity products are occurred (Bereau of Geology and Mineral Resources of Henan Province, 1989). There are two major area of granitic magmatism in Xiao Mountain, small bodies of Yinjiagou, Babaoshan, Yechangping, Houyaoyu, Qinchi, Gelaowan and Liuguan are in south Xiao Mountain, and bodies of Xiaomeihe, Hangou, Houhe, Longwogou and Baishiya are in north Xiao Mountain (Fig. 1b). The Ag, Au and Pb deposits of quartz vein type and structural altered rock type are major deposits in north Xiao Mountain, such as Bankuan Au-Pb deposit, Shenjiayao Au deposit, Yeqiaohe deposit Dafangshan Au deposit, Huluyu Au deposit and Tangshancun Au deposit (Fig. 1b).

Baishiya body whose area is about 0.06km^2 lies in north Xiao Mountain. It was intruded into volcanic rocks of Xiong'er group (Pt_2), and was unconformable overlapped by Quaternary (Fig. 1c). Baishiya body was comprised of porphyriod monzonitic granite, and the pyrite, galena and limonite can be observed in quartz veins intruded into body. The samples of BSY03 is porphyriod monzonitic granite with massive structure. There are more than 1000 zircon grains were selected from sample BSY03, and most of them are colourless and transparent with integrated crystalline. The zircon size of long axis is ranged from 100μm~250μm, and rhythm stripes are obvious, compact and symmetrical in CL images. Zircons dating was completed in LA-ICP-MS laboratory of Peking University.

Total 30 zircon grains was analyzed by LA-ICP-MS method. The $^{206}Pb/^{238}U$ range of them is from 134Ma to 151Ma, Th/U ratios are from to 0.11 to 0.41, and assay results of 30 spots are in $^{207}Pb/^{235}U$-$^{206}Pb/^{238}U$ concordia diagrams (Fig. 2a). The weighted average age of 30 spots is 145±2Ma (95% Conf.) with MSWD=3.8 (Fig. 2b). It is obvious feature that the age of 30 spots are clustered and formed two groups (Fig. 2b). Group I is comprised of 4 spots whose $^{206}Pb/^{238}U$ age range is 134Ma~137Ma, and weighted average age is 135±3Ma (95% Conf., MSWD=0.3. Group II is comprised of 26 spots whose $^{206}Pb/^{238}U$ age is from 141Ma to 151Ma, and weighted average age is 145±2Ma (95% conf., MSWD=2.3) (Fig. 2c).

If the weighted average of 145±2Ma calculated by 30 zircon spots in BSY03 could be considered the age of Baishiya body, and the age range 134Ma~151Ma should be regarded as the time limitation of Bashiya granitic magma activity. The occurrence area, however, is only about 0.06km^2, and small volume granitic magma will lose heat energy rapid and consolidate in short time, rather than

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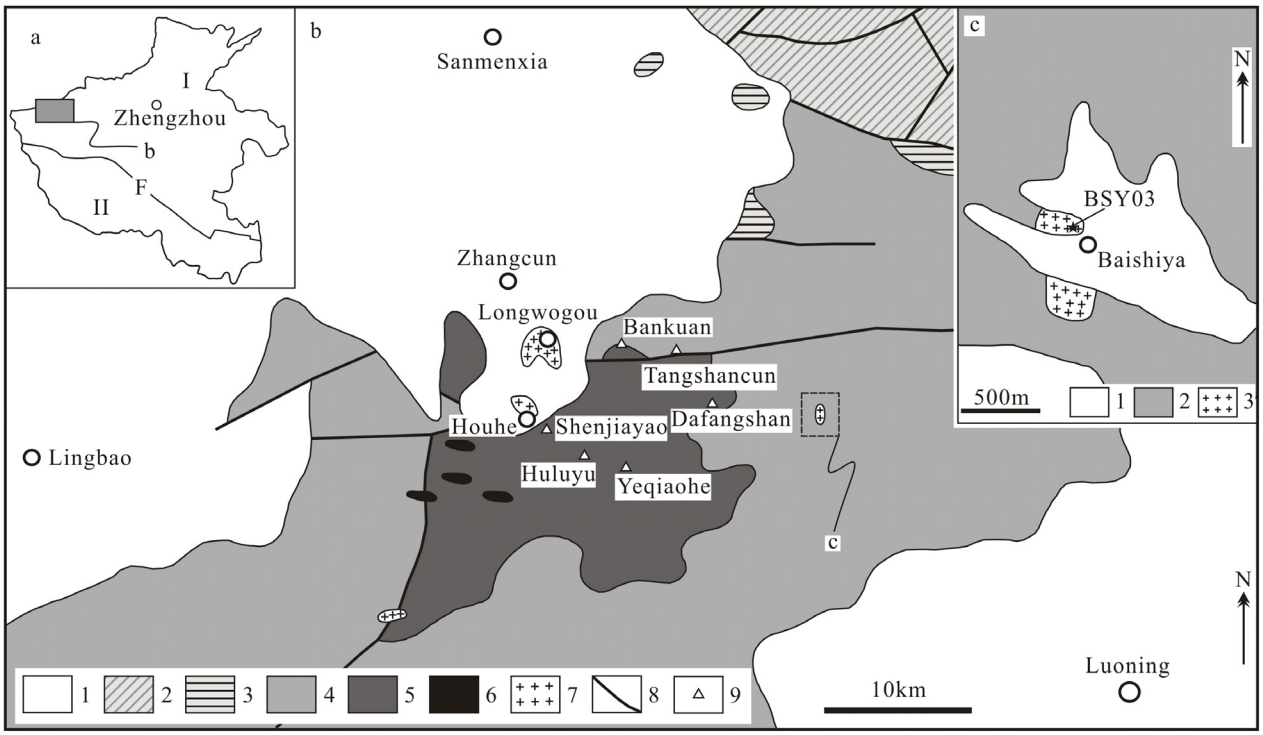

Fig.1 Simplified geologic map of Baishiya body in Xiao Mountain, western Henan Province

a-Simplified tectonic geologic map of Henan Province (After Bereau of Geology and Mineral Resources of Henan Provine(BGMRH), 1989), I-North China Craton, II-Qinling orogen beltb, F-Luanchuan-Queshan-Gushi huge faut belt; b-Simplified geologic map of Xiao Mountain (Simplified after BGMRH, 1989), 1-Cenozoic, 2- Paleozoic, 3-Guandaokou group (Pt_2), 4-Xiong'er group (Pt_2), 5-Taihua group (Ar), 6-Diorite (Ar), 7-Yanshanian granite, 8-Faults; c-Simplified geologic map of Baishiya body (After BGMRH, 1995), 1- Cenozoic, 2- Xiong'er group (Pt_2), 3-Baishiya body.

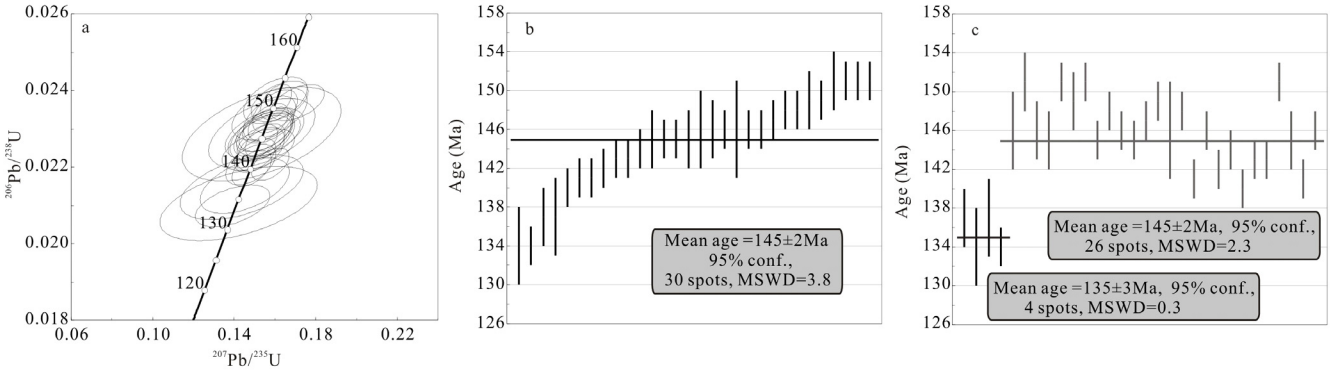

Fig. 2 LA-ICP-MS zircon dating results of BSY01 from Baishiya body

a-Concordia diagrams for U-Pb age of 30 zircons in BSY03; b-Weighted average age of 30 zircons; c-Weighted average ages of two groups for 26 zircons and 4 zircons.

17Ma time scale. It is unfit to calculate the weighted average age by using all 30 grains for sample BSY03, and the age of 145±2Ma has no any geologic implications.

Porphyric structure of magma rocks has suggested that the magma has undergone two stage of magma crystallization (Deng et al., 2004; Luo et al., 2007). It is useful to construct the model of clustering to two groups of 30 zircon spots in sample BSY03 of porphyriod monzonitic granite. There is a huge granitic magma chamber named G1 under Baishiya area that activity began in ~151Ma, which experienced stable cooling and consolidated continuously in about 10Ma, and it is still incomplete consolidation in ~141Ma. The $^{206}Pb/^{238}U$ age of 26 spots in group II is the recorder of cooling and consolidation history for huge magma chamber. In ~135Ma calculated by $^{206}Pb/^{238}U$ age of 4 spots in group I, deep fluids named M2 was injected into G1, and experiences the magma mixture. It makes magma chamber G1 revival to some extend, and some small volume mixed magma can be separated and consolidated. Baishiya body is the one of products of complex interaction between magma and fluid during injection, mixture and separation. The formation age of Baishiya body is ~135Ma in early Cretaceous.

The LA-ICP-MS zircon ages of both Longwogou body and Houhe body in north Xiao Mountain are 128±1Ma (Lu et al., 2013a), which is close to age of Baoshiya body. Longwogou body belongs to adakitic granite, and it is one of products of lithosphere collapse (Lu et al., 2013b). According to the spatial and temporal relationship of three bodies, Baishiya body is the product of lithosphere collapse in north Xiao Mountain, which is the deep trigger of magma units of M2 mixed with G1 huge magma chamber. The Ar-Ar mineralization ages of Liushugou Au deposit in north Xiao Mountain are 133.0±2.7Ma and 126.0±2.5Ma (Zhu et al., 1999), which suggested the nearly same time of formation of Au mineralization and small granitic bodies.

During the formation of Longwogou, Houhe and Baishiya bodies, there are nearly same time products of granitic magma and mineralization in Xiaoqinling and Xiong'er Mountains. Ages of Wenyu and Niangniangshan bodies in Xiaoqingling Mountain are 130.6±1.4Ma and 133.7±1.4Ma, respectively (Zhao et al., 2012), and ages of Au deposits are from 126.9±0.3Ma to 132.2±2.6Ma (Xu et al., 1998; Li et al., 2002; Wang et al., 2002; Li et al., 2007). In Xiong'er Mountain, ages of Huashan batholith are 127.6±1.1Ma~131±1Ma (Mao et al., 2010; Xiao et al., 2012; Meng et al., 2012), small granitic bodies of Qiyugou, Leimengou and Houpinggou are 136.6±2.3Ma, 136.2±1.5Ma and 134±1Ma, respectively (Yao et al., 2009; Li et al., 2006; Ye, 2006; Mao et al., 2010). The mineralization ages of Qiyugou Au deposit, Leimengou Mo deposit, Haopinggou Ag-Pb deposit and Tieluping Ag-Pb deposit are 135.6±5.6Ma, 136.2±1.5Ma, 134.9±0.8Ma and 134.6±1.2Ma, respectively (Yao et al., 2009; Li et al., 2006; Ye, 2006; Gao et al., 2011).

As mentioned above, zircon U-Pb age of Baishiya body is 135±3Ma in early Cretaceous. Zircons U-Pb ages are clustered and formed two groups in sample BSY03 is the recorder of magma mixture. Baishiya body is one of products of lithosphere collapse in north Xiao Mountain which has become the trigger of discharging of deep fluids. Baishiya area is one of exploration targets in north Xiao Mountain.

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Key words: Baishiya, mineralization potential, clustered of two groups, magma mixture, Xiao Mountain

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