Kang Congxuan,Yang Xianzhong,Cai Yitao,Zong Wen and Zhu Xiaoting, 2017. Geological and geochemical characteristics of Middle Jurassic granites in Bengbu uplift, Southeast of North China craton. *Acta Geologica Sinica* (English Edition). , 91(supp. 1): 83-85.

Geological and geochemical characteristics of Middle Jurassic granites in Bengbu uplift, Southeast of North China craton

Kang Congxuan[1,2*],Yang Xianzhong[1],Cai Yitao[1] , Zong Wen[3] and Zhu Xiaoting[1]

1.*Nanjing Institute of Geology and Mineral Resourcer ,Nanjing 210016,China；*
2.*School of Earth Sciences and Engineering,Hohai University, Nanjing 211100,China;*
3.*Geological Survey of Jiangsu Province,Nanjing 210049, China*

1 Introduction

The early formation and evolution of the North China craton has been widely concerned by scientists. The Bengbu uplift belt is located in the southeast of the craton, the research degree of the belt is relatively low and received increasing attention from many scholars in recent years. Through the author's practical work and combined with previous research results (Li et al., 2010; Song et al., 2016; Xu et al., 2004, 2006; Yang et al., 2005, 2006, 2007, 2009), a systematic discussion was carried out for the geological and geochemical characteristics of the Middle Jurassic granitic intrusions of this area in this article (Table 1).

2. Regional geological setting

The eastern part of the Bengbu uplift approach the Tan-Lu fault zone, and the Dabie orogenic belt is close to the south, the granites are widespread. With the development of granite geochronology in recent years, the intrusive rocks in this area are identified as two diagenetic period of Paleoproterozoic and Mesozoic. (Qiu et al., 1999; Jin et al., 2003; Yang et al., 2005; Xu et al., 2004). The Middle Jurassic intrusions mainly exposed in Huaiyuan, Bengbu and Fengyang area, most intrusions in east-west direction, nodular tumor.

3.Rock geology

The Middle Jurassic intrusion in this area are composed of Tushan、Jingshan and Laoshan granites etc, mainly distributed in Huaiyuan-Bengbu-Laoshan area.

Jingshan and Tushan intrusions are exposed separately on the surface which may branched from same intrusive body in deep area. The intrusions distribute along the east-west extension of the Bengbu anticlinorium covering an area of 17km^2. Marginal facies of intrusions show the medium to fine grained texture and interior facies show the medium to coarse grained texture. The wall rock belongs to Wuhe group Xigudui formation and Zhuangzili formation which composed of plagioclase amphibolite and biotite plagiogneiss interbedded with marble, respectively. Intrusions have residual equal tabular, porphyritic and porphyroid textures, appearing micro crystal texture and gneissic-like structure in matrix. All the minerals are arranged in one direction from phenocrysts to matrix which displays a gneissic structure.

The outcrop of Laoshan intrusion covers an area of 7.4km^2. The stock is of monzonitic granite and extends northwestward. The wall rocks are of Zhuangzili formation and Fengshanli formation. The skarn occurs on the contact zone of intrusion and upper part of Zhuangzili formation. Intrusive rock shows porphyry texture with micro crystal texture in matrix. Quartz phenocrysts generally appear in round and irregular shape according to erosion. Felsic matrix appears micro crystal texture and shows gneissic structure with phenocrysts.

4.Geochemical characteristics of intrusive rock

The Middle Jurassic intrusive rock chemical composition changes of SiO_2 content in 72.34-74.02%; Total alkali (Na_2O+K_2O) is 8.12-8.88%, indicate that the magmatic evolution alkali siliceous differentiation more completely, reflects the magma evolution in the direction of alkali silicone. Projection points all fall on the alkaline rhyolite area in TAS diagram, rittmann index δ=

* Corresponding author. E-mail:kangcongxuan@sina.com

Table 1 Intrusion age statistical chart of middle Jurassic intrusion, Bengbu uplift belt

sample	sampling point location	lithologies	U-Pb age (this text)	previous data
JS-1	Jingshan south slope of huayuan in Bengbu	Monzonite granite-porphyry	162.8 ± 1.8 Ma	167±5.8Ma(SHRIMP U-Pb), Guo S S et al.,2005; 163±2.3Ma(Rb-Sr), Xu X et al.,2005; 160.2±1.3Ma(SHRIMP U-Pb),Xu W L et al.,2004; 165.5±1.5Ma（LA-ICP-MS U-Pb）,Li Y et al.,2010; 163Ma(biotite 40Ar/39Ar),Qiu R L et al.,1999
JS-2	Jingshan western slope of huayuan in Bengbu	Gneissic porphyritic monzonitic granite	160.4 ± 1.3 Ma	
TS-1	Northern tushan of huayuan in Bengbu	Gneissic adamellite	162.6 ± 2.3 Ma	
LS-1	Northeast of laoshan in Bengbu	Monzonite granite-porphyry	161.1 ± 4.6 Ma	159Ma(SHRIMP Zircon U-Pb) Wang A D et al.,2009; 148Ma（SHRIMP Zircon U-Pb）Li Shuguang et al., 2014;162±2Ma、160±2Ma（LA-ICP-MS U-Pb）Song L H et al.2016

1.63-2.78; Aluminum saturation index (A/CNK) is 0.98-1.01; Low Alkali silica ratio, relative higher of siliceous components, projection points are fall on transition area of quasi aluminium – aluminum in A/CNK-A/NK diagram; SiO_2-K_2O diagram display as high-K calc-alkaline series; K_2O-Na_2O diagram shows I type granite attribute; Na_2O/K_2O=1.09-1.54, rich characteristics of sodium, magmatic differentiation is obvious, indicate magma has strong mafic minerals separation, suggest that it could be a mafic rock series or supracrustal rock series products of low degree partial melting, or the result of strongly magmatic differentiation.

Characterized by low total rare earth, with right-inclining REE distribution curve, ∑REE=25.45- 37.89×10^{-6}, with an average of 32.75×10^{-6}; (La/Yb) N=2.84-12.43, with an average of 6.86; relative enrichment of LREE and relative defect HREE, LREE/HREE=1.48-5.65; Faint europium negative anomaly (0.55-0.73), maybe the result of plagioclase in late-stage crystallization; Systematic enrichment of LILE and depletion of HFSE. Mantle type of element Ni、Cr show considerable losses in contrast to crustal type element V、Mn, indicate that magma source mainly shell source basal fusible component, the product of melting, Th has significant negative anomaly, Nb、 Ta、 P and Ti et al., have self-evident loss, reflects the continental crust of source rock characteristics of anatexis, projection points all fall on the syn-collisional granite area in Ta-Yb and R_1-R_2 diagrams, related to the compression environment of its formation.

5. Conclusion

(1). LA-ICP-MS zircon U-Pb dating of the Middle Jurassic granites was 160.4 ± 1.3Ma-162.8 ± 1.8Ma, consistent with previous studies, but more accurately determine the age range. It is the earliest unit for the area of Yanshanian in this region.

(2). Geological and geochemical characteristics show that Middle Jurassic granites in the area was formed from partial melting of the shell source basement rock series in the syn-collisional compression environment.

Acknowledgements

This paper belongs to the project "A study on gold mineralization and prospecting direction in east Anhui province" (item code: 2014-K-5).

References

Yang Debin, Xu Wenliang, Wang Haiqing, Pei Fuping and Ji Weiqiang, 2006. Petrogenesis of Late Jurassic Jingshan granite in Bengbu uplift, Anhui provine: constraints from geochemistry and Hf isotope of zircons. *Acta Petrologica Sinica*, 22(12): 2923-2932 (in Chinese) .

Xu Wenliang, Wan Haiqing, Pei Fuping and Gao Shan,2004. Processes and mechanism of Mesozoic lithospheric thinning in eastern North China Craton: Evidence from Mesozoic igneous rocks and deep-seated xenoliths. *Earth Science Frontiers*, 11: 309-317(in Chinese with English abstract) .

Wang Andong, Liu Yican, Gu Xiaofeng, Li Suguang and Xie Heqiang,2009. Zircon SHRIMP U-Pb dating for Garnet-bearing Gneissic granite at Laoshan,Bengbu: Implications for recycling of the sub ducted continental crust of the south China block. *Jmineral Petrol*. 29(2):38-43 (in Chinese) .

Yang Debin, Xu Wenliang, Pe Fuping and Wang Qinghe,2009. Petrogenesis of Paleoproterozoic K-Feldspar Granites in Bengbu Uplift: Constraints from Petro-Geochemistry, Zircon I-Pb Dating and Hf Isotope. *Earth Science-Journal of China University of Geoscience*. 34(1):148-164 (in Chinese) .

Xu Wenliang, Yang Debin and PeiFuping,2006. Age of the Wuhe complex in the Bengbu uplift: Evidence from LA-ICP-MS zircon U-Pb dating .*Geology in China*. 33(1): 132-137 (in Chinese with English abstract).

Yang Debin, Xu Wenliang and Pei Fuping,2005. Formation time and magma source of granites in Bengbu uplift: Evidence from LA-ICP-MS zircon U-Pb dating and tracing. *Geochimica*, 34(5): 443-454 (in Chinese with English abstract).

Yang Debin, Xu Wenliang and Wang Qinghe,2007. Petrogenesis of the Mesozoic granite in Bengbu uplift: Constraints from zircon Hf is tope. *Acta Petrologica Sinica*, 23 (2): 381-392 (in Chinese with English abstract).

Song Lihong, Zhu Guang, Zhao Tian and Lin Shaoze,2016. Deformation Records in Late Mesozoic Plutons in the Bengbu Uplift in the Southeastern North China Craton and Their Tectonic Implications. *Geological Review*. 62(2): 400-418. (in Chinese)

Li Yin, Han Feng, Ling Mingxing, Liu Jian, Li Xianhua, Li Qiuli and Sun Weidong,2010. Geochronology, Geochemical Characteristics and Geodynamic Significance of the Jingshan and Tushan Granites in the Bengbu Uplift. *Geotectonica et Metallogenia*. 34(1): 114-124 (in Chinese) .

Jin Ke, Xu Wenliang, Wang Qinghai, Gao Shan and Liu Xiaochun, 2003. Formation Time and Sources of the Huaiguang "Migmatitic Granodiorite"in Bengbu, Anhui Province: Evidence from SHRIMP Zircon U-Pb Geochronology. *Acta Geoscientia Sinica*. 24(4):331-335. (in Chinese)