

The petrology and Ar-Ar Dating studies of the early Proterozoic Huang-Yuan Massif in the Central Qilian, China

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Abstract

The study area is located at about 50km northwestern to Hsineng, Northwestern China(Figure1). This area belong to Huang-Yuan Massif which is located in the central part between the North Qilian and central-south Qilian Mountains. For this area, we study the petrology、mineral chemistry、⁴⁰Ar-³⁹Ar dating, and hope to know the P-T Paths and metamorphism age.

The main rock types of studies area are metapelites and metabasites. The mineral assemblages of the metapelites are Bio+Mus+Feld+Qtz+Grt±Sill±Chl±Op±Tur±Cal±Sph±Zir±Ap±REE. Micas define schistosity. Feldspar and quartz as the porphyroblasts or matrix. Garnet is porphyroblast. Sillimanite of the sillimanite zone and micas together form prefer-oriented, while sillimanite of contact metamorphism is of the matrix, some sillimanite of contact metamorphism with micas form schistosity due to ductile shear. The mineral assemblages of the metabasites are Amp+Plag+Qtz±Bio±Grt±Ep±Cpx±Op± Sph±Zir±Ap. Amphibole define schistosity. Garnet was produced by contact metamorphism. Epidote was produced by fluidization of ductile shear zone or saussuritization. Cpx in the meta-gabbro have irregular grain boundary by ductile shearing. The rocks have been mylonited in the ductile shear zone. The peak metamorphism of studied area is amphibolite facies-granulite facies transition zone. The retrograde metamorphism lower to zeolite facies(Figure2).

The result of EDS analysis:(1) The T-P of core and rim of pre-tectonic₁ garnet of Timihe are 400~430°C、7.9~8.8kbar, 630~665°C、8.3~9.4kbar, respectively. (2) The T-P of core and rim of inter-tectonics_{1,2} garnet of Sanchabeizhigou are 480~500°C、5.4~5.6kbar, 550~580°C、6.1~6.5kbar, respectively. (3) The T-P of core and rim of inter-tectonic_{2,3}~syn-tectonic₃ garnet of Gualahe are 430~470°C、5.1~5.7kbar, 450~520°C、8~9kbar, respectively. (4) The T-P of core and rim of inter-tectonics_{1,2} garnet of Tunxiahe are 430~480°C、6.7~7.1kbar, 540°C、7.9~8.4kbar, respectively. (5) The T of core and rim of pre-tectonic₁ garnet in the Sill zone of Baokuhe are 720~750°C, 750~780°C, respectively. The T-P in the Grt zone of Baokuhe are 480~500°C、4~4.4kbar, 570~600°C、5.4~5.8kbar, respectively. The T from core to rim of post-tectonic₃ garnet is 514 to 372°C(Figure2).

The ⁴⁰Ar-³⁹Ar datings of the muscovite and biotite extracted from the metapelites reveal that the plateau ages are 424.9±2.42Ma and 421.46±4.21Ma respectively (Figure3). They show that the Argon isotope system of the Precambrian basement rocks were resetted by the Caledonian orogeny.

References

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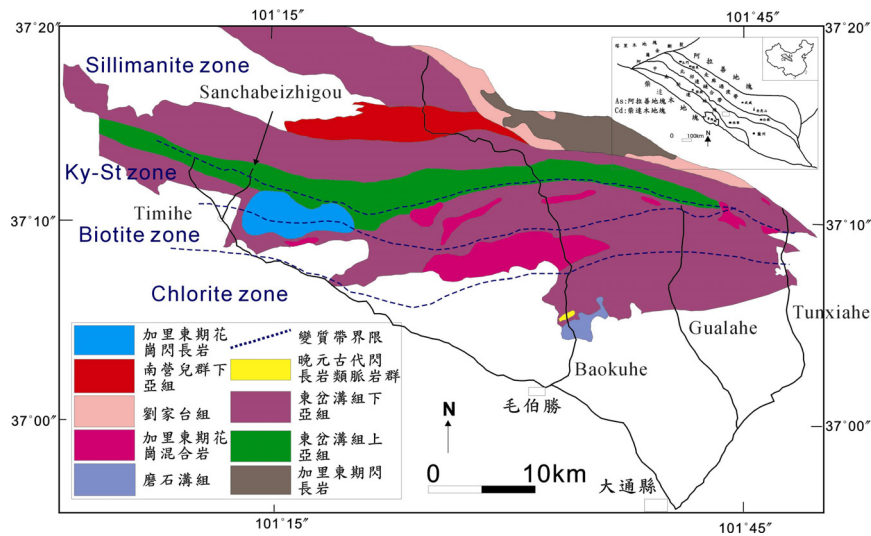
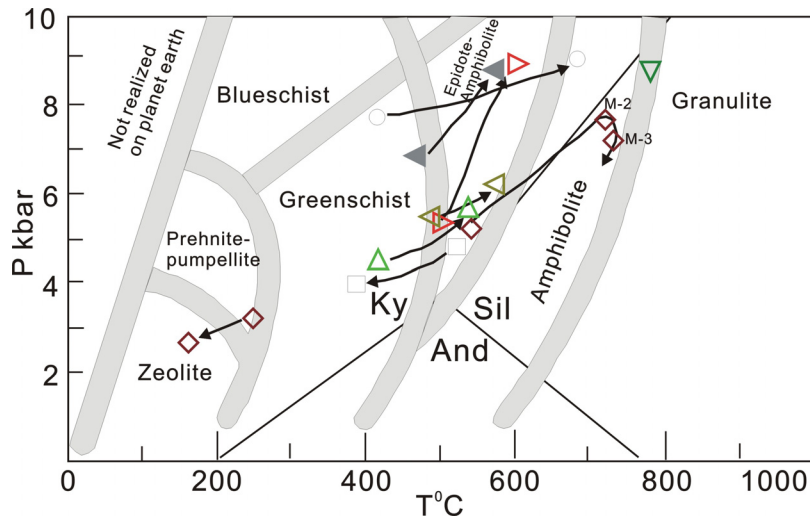


Figure1. Research Area (modify from the 1:200000 Huang-Yuan geological map)



○ Timihe ◁ Sanchabeizhigou ▷ Gualahe ◀ Tunxiahe △ Baokuhe
 ◇ mineral assemblage □ retrograded garnet ▽ minerals assemblage of corona texture

Figure2. The P-T paths of five profiles of research area.

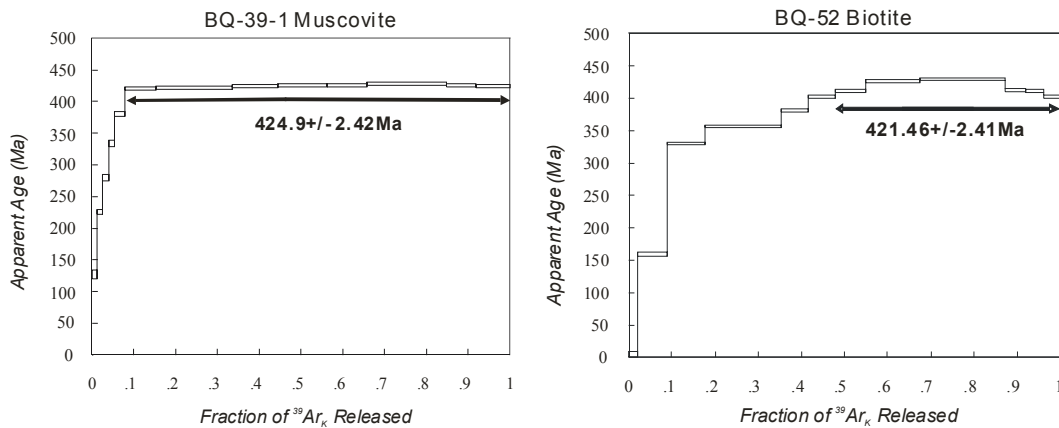


Figure3. Muscovite separate from BQ-39-1 sample and biotite separate from BQ-52 sample (which from Baokuhe profile) show flat age spectra, which yield plateau dates ranging from ~421 to 425 Ma (with 1σ errors of ±1~4.0 Ma).