Multi-stage evolution of the orthogneiss from Baizhangyan, North Dabie, China

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Orthogneiss is a wildspread rock type in Dabie ultrahighpressure (UHP) orogen. Previous dating results suggested that the orthogneiss in North Dabie Complex (NDC) experienced multi-stage metamorphism. The protolith was formed in about 700 to 800 Ma; and then experienced the UHP meta-morphism when the Yangtze craton was subducted under the North China craton at Triassic. During the large-scale Cretaceous thermal event, the isotopic systems of the orthogneiss were reset, showing similar ages to intrusions. The above age information was derived from isotopic dating of gneisses from several localities, and its interpretation is therefore ambigous. For example, some authors explained the Cretaceous ages as the formation time of gneisses in NDC.

In this work we used SHRIMP technique to examine zircons from a single orthogneiss sample from Baizhangyan, NDC, and obtained an evidence of multi-stage evolution of this orthogneiss. BSE images of zircons from this gneiss reveal four different domains: the dark gray and metamict domains are generally cores, whereas the gravish and white domains are inner and outer rims. The total of 32 spots were measured in the four domains. Seven measurements in the dark gray domain give weighted mean 206Pb/238U age (t206pb/238U) of 729±42 Ma, with Th/U ratios of 0.37 to 1.4, and low U and Th concntration of 35 - 138 ppm, and 19 - 121 ppm, respectively. Four spots in the gravish domain give $t_{206Pb/238U} = 215\pm21$ Ma, Th/U ratio = 0.013 to 0.028, [U] = 1047 - 1699 ppm, [Th] = 22 - 32 ppm. Seven spots in the white domain give $t_{206Pb/238U} = 127 \pm 10$ Ma, Th/U ratio = 0.012 to 0.035, [U] = 322 - 5203 ppm, [Th] = 4 - 184 ppm.

The rock clearly experienced a multi-stage evolution history. Th/U ratios higher than 0.4 in the dark gray domains suggest a magmatic origin. The date for the dark gray domain therefore represents the time of the protolith formation. The grayish and white domains give Th/U ratios within the range of fluid-precipitated zircons (lower than 0.1), so the ages obtained from the rims represent the timing of a later thermal event involving fluids. The grayish domains are formed during exhumation of the UHP slabs at Triassic, whereas the white domains were produced by the thermal event at Early Cretaceous.

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The geochemical characteristics during mylonitization in Tan-Lu fault belt, East China

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Introduction

The area for this study is in the joint part of Tan-Lu fault belt with the East Qinling-Dabie orogenic belt in east part of China (Mattauer et al., 1985; Yang et al., 1998). In this study the author chose ductile shear zones for chemical and isotope compositions from the mylonites and wall rock gneiss in order to characterize the relationship of deformation and fluid-rock interaction during mylonitization.

Results

The mylonites are enriched by factors of 1.32-1.87 in elements such as TiO₂, P₂O₅, MnO, Y, Zr and V and depleted in SiO₂, Na₂O, K₂O, Al₂O₃, Sr, Rb and light REE compared to their protolith gneiss. The immobile element enrichments are attributed to enrichments in residual phases such as ilmentite, zircon, apatite and epidote in mylonites and are interpreted as due to volume losses from 15-60% in ductile shear zone. Modeling calculated results of the ratio of the fluids to rocks flowed through the ductile shear zone ranges from 196 to 1192 by assuming different degree of fluid saturation. With the increasing differential flow stress, the mylonites show the increase of δ^{18} O in quartz, K-feldspar and fluid.

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