

Petrogenesis of Quaternary volcanic rocks in the Halaha River and Chaer River area in Daxing'an Mountain range, North China

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The Halaha River and Chaer River area (HC for short), middle of the Daxing'an Mountain range, is in the north of the North-South Gravity Lineament. 28 Quaternary volcanoes, which scattered along a Quaternary NE strike fault, are found in this area. Based on studies of the volcanic field characteristics, in conjunction with geological dating by K-Ar, it is identified that the volcanism occurred in four periods: Early Pleistocene, Middle Pleistocene, Late Pleistocene and Holocene. Quaternary volcanic rocks in this area, mainly alkaline basalt, cover an area of ca. 1000 km². Based on studying of the geochemistry with the Quaternary volcanic rocks in HC, this paper attempts to bring mantle sources and magma genesis in this area to light. The volcanic rocks in HC is of alkali one in sodium series, dominated by alkali olivine basalts. They resemble alkali basalts in Datong, as shown by trace elements distribution patterns, and generally exhibit OIB-like characteristics. They show nearly homogeneous Sr-Nd-Pb isotopic composition similar to the prevalent mantle. All data show that basalts of HC have a garnet lherzolite mantle source, low degree partial melting in which at different depth result in the primitive magma. Regional extension triggered asthenospheric upwelling, which may lead to the genesis of magma and subsequent volcanism.

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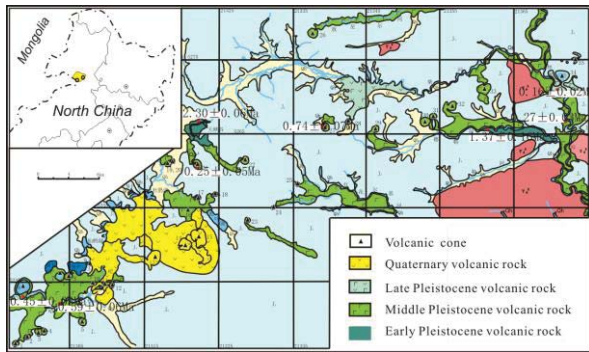


Fig.1 Quaternary volcanic rocks in Halaha River and Chaer River area in the Great Xing'an Range, North China

⁴⁰Ar/³⁹Ar geochronology of fluid inclusions

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Theme 23: General Geochemistry Sessions Geochronology: the role of fluids

Our primary purpose to date fluid inclusions by ⁴⁰Ar/³⁹Ar *in vacuo* crushing was to develop a new approach to obtain ore-forming ages of hydrothermal deposits. We succeeded in dating the mineralization ages of W-Sn, Au, Cu and Pb-Zn deposits using this novel technique on quartz, siliceous breccia and sphalerite [1-4]. Our results indicate that the ⁴⁰Ar/³⁹Ar stepwise crushing technique is very useful to determine the ore-forming ages, however, some samples probably contain too low K-concentrations to be analysed.

Since 2000, we've been investigating the fluid evolution of the Dabieshan eclogites during UHP metamorphism and retrograde metamorphism by the ⁴⁰Ar/³⁹Ar progressive crushing on garnet, amphibole and quartz [5-7]. The fluid inclusions of garnet revealed the age messages of the Paleozoic UHP metamorphism, and the amphibole and quartz recorded that the retrograde metamorphism of the Dabieshan eclogites occurred from Permian to early Jurassic.

Due to the lack of suitable minerals for dating, the timing of hydrocarbon charging of reservoirs is one of the most difficult problems in geochronology. We recently applied the ⁴⁰Ar/³⁹Ar progressive crushing into dating the natural gas emplacement in the Songliao Basin, NE China. The igneous quartz from the Cretaceous volcanic rocks that host the gas reservoir contains abundant secondary fluid inclusions with high K contents and high methane pressures, providing an excellent closed system for ⁴⁰Ar/³⁹Ar dating. The dating results of the igneous quartz by crushing precisely constrained the gas emplacement at 42.4±0.5 Ma [8].

The crushers were improved again and again to make the crushing tubes and dropping pestles shorter and smaller in diameters. It is very important to crush the mineral grains as homogeneously as possible to obtain a good dating result. ⁴⁰Ar/³⁹Ar geochronology of fluid inclusions is very useful for us to understand various geological processes with fluids.

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