The nature of crustal components in mantle sources for Cenozoic continent basalts in southeastern North China Craton

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Cenozoic continental basalts in the southeastern part of the North China Craton exhibit depleted Sr-Nd isotope compositions and OIB-like trace element patterns. It is intriguing what kinds of crustal componenet were involved in mantle sources for the intraplate basalts. An integrated interpretation of major-trace elements and stable-radiogenic isotope data for these intraplate provides new insights into this issue. Different types of correlations occur between such variables as Ba/Th, Sr/Y, $\varepsilon_{Nd}(t)$, $(La/Yb)_N$ and SiO_2, suggesting two types of crustal components in the mantle source: altered oceanic basalt and seafloor sediment. The aletered oceanic basalt yields adakitic melt that is characterized by high $(La/Yb)_N$, Sr/Y and $\varepsilon_{Nd}(t)$ but low Ba/Th and SiO_2, whereas the seafloor sediment yields sialic melt that is characterized by low $(La/Yb)_N$, Sr/Y and $\varepsilon_{Nd}(t)$ but high Ba/Th and SiO_2. The OIB-type trace element patterns are interpreted as involvement of the oceanic crust that underwent partial melting outside the rutile stability field. These basalts exhibit low Fe/Zn and high Fe/Mn ratios, suggesting pyroxene-rich source lithology. The depleted Sr-Nd-Hf isotope compositions indicate involvement of juvenile lithospheric mantle.

We propose that westweard subduction of the Pacific plate beneath the Eurasian continent serves as the geodynamic mechanism for slab-mantle interaction in oceanic subduction channel for formation of the mantle sources. A MASH mechanism is used to account for petrogenesis of these continental basalts. The subduction-modified oceanic basalt and sediment become melted (M) during subduction to mantle depths of over 100 km. Then the melts assimilated (A) the SCLM wedge peridotite to generate a variety of ultramafic metasomes. These metasomes would be stored (S) at bottom of the SCLM wedge for a long time (maybe 50-100 Myr or longer). Finally, when the continental lithosphere was in extension during the renewed subduction of Pacific plate beneath the Eurasian continent in the Cenozoic, these metasomes were heated (H) by upwelling of the asthenospheric mantle, generating the intraplate basaltic melts.

Evidence for the hydrothermal fluid origin of Sanqisan uranium deposit in China

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Sanqisan uranium deposit is a typical carbonate-siliceous-pelitic rock-type uranium deposit in Southwestern Guangxi. Through studies of the ore geological features, trace elements, isotope geochemical characteristics and petrology, this paper presents the evidence of hydrothermal activities, and draws the conclusions that magmatism has great significance for the formation of Sanqisan deposit, with the general basic geological features the same as the normal hydrothermal type uranium deposits. 1) Many siliceous bodies, as well as the multiphase quartz vein, have been found in field. The siliceous bodies, with a relatively high uranium content, appear in lenticular shape and a different scope, the big one being 2-3 m thick, 5-6 m long, the small one being only dozens of centimeters. 2) According to microscopic observation, the newly found pyroclastic and phyllite detritus indicate that there are signs of magma activity (or volcanic activity), and show that the main ore-bearing structure is relatively violent with large scale. 3) There are signs of multiphase hydrothermal activity, such as quartzitification, pyritization, carbonatization, etc., which intersperse with each other. 4) From the trace element analysis results, the content of some elements, such as Ni, As, Mo, Zn, Cd, Co, etc. are significantly high, more than 10 to hundreds times higher than the crustal abundance value, and the concentrating coefficient of Sb is 4630. 5) The carbon and oxygen isotopic compositions of hydrothermal calcite of the Sanqisan deposit show obvious genetic characteristics of deep magmatic source. The variation range of $\delta^{13}C$ is -0.709‰~ -3.172‰, and that of $\delta^{18}O$ is -12.451‰~ -14.516‰. 6) According to the U-Pb zircon dating, the ages for the diabase dykes in Sanqisan uranium deposit are 90Ma and 32-47Ma, which are in accordance with the age of the Sanqisan uranium deposit, indicating great significance of magmatism for the mineralization of Sanqisan deposit.

This work is supported financially by the National Natural Scientific Foundation of China (Grants No. 41173059).

DOI:10.1180/minmag.2013.077.5.24