Abstract: The peridotite xenoliths are widely distributed in the Cenozoic basalts, Eastern China. However, their petrogenesis is hotly controversial. The peridotite xenoliths of Nanjing are found embedded in Cenozoic alkali basalt. Most of the xenoliths are rounded and small to moderate in size (typically 5~10 cm in diameter), though larger ones have been found. Nearly all small xenoliths are harzburgite and dunite. However, the big ones have zoned structure: lherzolite core and harzburgite or dunite rim with new growth clinopyroxene (Cpx) as eyeliner along their margins. Petrology, mineralogy, and Major and trace element compositions of the Nanjing peridotite xenoliths in the Cenozoic basalts are measured to provide an insight into the nature of their mantle sources and processes. Our works suggest that they were suffered from a partial melting process and subsequently underwent a process of melt-peridotite interaction. The evidences of partial melting are as follows. Firstly, the lherzolite core is mostly composed of olivine (Ol) + orthopyroxene (Opx) + Cpx with minor spinel (Spl), however, the harzburgite or dunite rim is mostly composed of Ol + Opx with minor Cpx. Secondly, from the lherzolite core to the harzburgite or dunite rim, Ol and Opx contents are gradually increased, inversely, Cpx contents are decreased, and the Spl disappears. Thirdly, Mg# values of Ol are increased from the core (~89.5) to the rim (>92) of the peridotite xenolith, but FeO contents (from 11.0 to 8.1) in Ol are opposite. Forthly, Mg# (from 90 to 93) and Cr# (from 4 to 17) values of the Opx are increased, but its Al2O3 contents (from 5.0 to 2.0) are decreased from the core to the rim. The evidences of melt-peridotite interaction are mostly from clinopyroxenes. The clinopyroxenes can roughly divided into two groups: original clinopyroxenes of the peridotite and new growth clinopyroxenes.

Mantle Partial Melting and Melt-peridotite Interaction: A Case Study of Peridotite Xenoliths in Cenozoic Basalt of Nanjing, SE China

XU Haijin*, SONG Yanru and XIONG Zhiwu

School of Earth Sciences, China University of Geosciences, Wuhan 430074


* Corresponding author. E-mail: xuhaijin@cug.edu.cn

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generated by melt-peridotite interaction. The original clinopyroxenes are generally in the inner of peridotite xenoliths such as lherzolite. They are mostly coarse-grained, euhedral and bottle-green. However, the new growth clinopyroxenes generally occur as eyeliner along the margin of the peridotite xenoliths. They are generally fine-grained, irregular and light green. Compared with the original clinopyroxenes, the new growth ones have low Na$_2$O and Al$_2$O$_3$ and high CaO contents. The Nanjing peridotite xenoliths in the Cenozoic alkali basalts suggest that the SCLM beneath eastern China might be a fertile mantle which has had a complex history, and is now a mixture of refractory and fertile mantle domains modified by a number of events.

Key words: peridotite xenolith, partial melting, melt-peridotite interaction, basalt, Nanjing

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References


About the first and corresponding author
XU Haijin, male, born in 1976 in Zizhou City, Shaanxi Province; PhD; professor of China University of Geosciences (Wuhan). He is now interested in the study on metamorphism, anatexis, and magmatism of the orogenic belt. Email: xuhaijin@cug.edu.cn; phone: 1027-67883002, 15327190076.