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Fertile Lithosphere Mantle beneath Yangtze Craton: Evidence from a Garnet Lherzolite from Dahongshan Kimberlite, Hubei, China

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Dahongshan kimberlite field, Hubei Province, China, located in the north vicinity of Yangtze craton, solidified in early Proterozoic. The kimberlites erupted at the Palaeozoic (*ca*326 Ma of K-Ar age in whole rock) are occasionally accompanied by barren lamproites. They are all enriched in light rare earth elements and Sr-Nd isotopes (εNd = -10, εSr = +25). The coupled trace elements and Sr-Nd isotopes indicate that the rocks were originated from an enriched mantle. A unique fresh garnet lherzolite recovered from this kimberlite field provides us an opportunity to directly understand the nature of Palaeozoic lithospheric mantle beneath South China. The lherzolite is less depleted in major element compositions (2.66%Al_2O_3, 2.82%CaO, and 90.9 Mg#) with a forsterite content in olivine around 90.5%. The trace element abundances in peridotite ($(La/Sm)_N$=13 and $(Eu/Yb)_N$=0.48)) as well as in the constituent mineral ($(La/Yb)_{N\ cpx}$=61) reveal that at least two processes had been involved in the lherzolite formation: depletion followed by an enrichment process. Depletion process initiated from low degree of partial melting is also demonstrated by high NiO contents (0.50%) in olivines and relatively high platinum group elements (PGE = 1-2 times of primitive mantle) in whole rock. The lherzolite was also affected by small volume melt, leading to the abnormal enrichments in light rare earth elements. The melt infiltration must be an ancient event due to the coupling of trace elements and Sr-Nd isotopes, consistent with the conclusion from the host rocks. Hypothetical melt responsible for the trace element enrichments in the rock is considered to be the carbonate silicate according to the theoretical calculation by using the newly-published partition coefficient data of clinopyroxene. The Sm-Nd isochron age for the lherzolite derived from garnet, clinopyroxene, and whole rock is 490±9 Ma with an initial $^{143}Nd/^{144}Nd$ of 0.511865, which is much older than the age of kimberlite eruption.

Granulated texture relationship and homogeneous elemental distribution within and between mineral grains indicate that the textural and chemical equilibrium had been reached in the lherzolite though the rock was infiltrated by the LREE- and LILE-rich melt. T-P calculation using Bertrand&Mercier (1986) geothermometry and Nickel&Green (1985) geobarometry shows that the rock was equilibrated at 1042 ºC and 34Kbar, corresponding to 110 km depth. If the geotherm inferred from this garnet lherzolite could represent the bulk situation the geotherm beneath Yangtze craton at Palaeozoic was much higher than the typical cratonic geotherm (40 mWm^{-1}), but still below the oceanic geotherm. This illustrates that the lithospheric mantle beneath Yangtze craton is quite different from the typical old cratons, i.e. Kaapvaal, Siberia, and North China. The barren nature of those kimberlites implies that the thickness of the lithosphere in Dahongshan area at the time of kimberlite eruption is less than 150 km, well within the graphite stability field. Thus it may indicate the presence of very few chances to find large diamond mine around Dahongshan although more evidences are needed to support this conclusion.

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Bertrand P & Mercier J-CC, *Earth Planet. Sci. Lett.*, **77**, 109-122, (1986).
Nickel HG & Green DH, *Earth Planet. Sci. Lett.*, **73**, 158-170, (1985).