Melt/rock interaction in the Mesozoic lithospheric mantle beneath the eastern North China Craton: Fe isotopic evidence

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Variations in Fe isotopes in peridotites provides important constraints on the evolution and compositon of the Earth' s mantle. Here we report Fe isotopic composition of mineral separates for a set of mantle xenoliths (spinle peridotie, pyroxenite and wehrlite) from Daxizhuang, eastern North China Craton.

Based on petrographic and geochemical characteristics, the Daxizhuang spinel peridotite can be subdivided into two groups. The Group 1 peridotite (Mg#=89.4 to 90.6) represents mantle melting residues overprinted by later incipient metasomatism. It has relatively low $\delta^{57/54}$Fe (−0.41 to −0.10) relative to normal upper mantle (δ57/54Fe = −0.1 to 0.1) from other localities worldwide, although the Fo contents of the olivines are within the range of normal upper mantle. These observations suggest the abnormal light Fe isotope composition in the Mesozoic lithospheric mantle beneath the eastern North China Craton. In contrast, the Group 2 peridotite（Mg#=84.9 to 88.2） is strongly metasomatised. It has the lowest values with $\delta^{57/54}$Fe ranging from −0.98 to −0.55, similar to recently reported values ($\delta^{57/54}$Fe = −1.04 to −0.32) for Fe-rich peridotites hosted in basalts from other localities worldwide. The $\delta^{57/54}$Fe values of the Daxizhuang pyroxenite and wehrlite vary from −0.66 to −0.39, much lower relative to normal upper mantle from other localities worldwide. The extremely light Fe isotopic signatures with Fe enrichment in Daxizhuang peridotite, pyroxenite and wehrlite most likely reflect kinetic isotopic fractionation caused by diffusion during melt percolation or melt-peridotite reaction. Thus, the Fe isotope date provides further evidence for the existence of melt/rock interaction in the Mesozoic lithospheric mantle beneath the eastern North China Craton

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