High δ^7Li peridotite xenoliths from ca. 2.52 Ga high-Mg diorites: metasomatism above an Archean subduction zone

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The Li isotopic compositions have been obtained on peridotite xenoliths and their host ca. 2.52 Ga high-Mg diorites from the late Archean high-grade metamorphic terrane in the Yinshan Block, North China Craton. The reported peak P–T conditions of regional granulite-facies metamorphism are T = 760–870 °C and P = 0.95–1.1 GPa (Jin et al., 1991). Metamorphic zircons from two peridotites yield a consistent U–Pb ages of ca. 2.5 Ga.

Peridotite xenoliths show low Li concentrations (4.0–5.1 ppm) and extremely high δ^7Li values up to +12‰. In contrast, the host high-Mg diorites show a broader range of Li concentrations (3.0–10.5 ppm) and lower δ^7Li values (4.0–5.8‰) that are typical for magmatic arc rocks (5–22 ppm, 2–5‰, Tomascak et al., 2002). Different Li isotopic composition of peridotites and high-Mg diorites suggests that there is little Li isotopic exchange during the entrainment of the xenoliths in the host high-Mg diorites or during high-T (>760 °C) granulite-facies metamorphism. Therefore, the heavy Li isotopes of the peridotite xenoliths may reflect the signature of the peridotite xenoliths before they became entrained in the high-Mg diorites.

High δ^7Li values are typical for seawater. High δ^7Li values in the peridotite xenoliths may be indicative for metasomatism of the mantle wedge by materials derived from seawater-altered oceanic crust. Such an explanation is in line with low Fo values of olivine (81–84) and typical arc geochemical signatures of peridotite xenoliths (LREE-enriched, LILE-enriched and HFSE-depleted trace element patterns).

Jin, W., et al. (1991). Acta Petrologica Sinica **7**, 27–35.
Tomascak, P. B., et al. (2002). EPSL **196**, 227–238.