Geophysical Research Abstracts, Vol. 8, 06000, 2006
SRef-ID:

Light element (Li, Be and B) concentrations in peridotites from the Mid-Atlantic-Ridge; ODP Leg 209

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Despite the key importance of altered oceanic mantle as a repository and carrier of light elements to depth, its inventory of these elements has hardly been explored. In our present project we are systematically studying the abundance, partitioning and mobility of Li, B and Be in rock-forming minerals from hydrothermally altered oceanic mantle under different pressure-temperature conditions. In order to constrain the enrichment of oceanic mantle in light elements by hydrothermal alteration and thus probably the major input of light elements in subduction zones we have studied samples dredged from the ocean floor.

The samples presented in this study are altered spinel harzburgites from ODP Leg 209 (sites 1272A and 1274A) at the Mid-Atlantic Ridge (MAR) between 14°N and 16°N (Bach et al., 2004; Kelemen et al., 2004). The degree of serpentinisation varies between 70-100% in site 1272A and from 50-97% in site 1274A and is controlled both by geographic location and by fault zones (e.g. a 50m wide in 1274A). Despite the high degree of serpentinisation we still find primary phases in the samples (olivine $>=$ orthopyroxene $>>$ clinopyroxene).

Our preliminary light element results obtained by SIMS (Secondary Ion Mass Spectrometry) show lithium contents of olivine and orthopyroxene ranging between 0.45-1.3 ppm and 0.38-1.0 ppm, respectively. This seems to be consistent with values for normal unaltered mantle minerals (e.g. Eggins et al., 1998; Woodland et al., 2004). The Li contents of clinopyroxene (0.44–2.8 ppm) are within the upper range of values published for unmetasomatised mantle clinopyroxene (only xenolith data available; Seitz & Woodland, 2000; Woodland et al., 2004). The Li characteristics of our samples differ from published data for non-metasomatised mantle by their higher concentrations in clinopyroxene compared to olivine. This reverse Li partitioning could be explained by a reaction with a mafic silicate melt in the mantle or by an interaction with a high-temperature fluid under the ridge. B and Be abundances (e.g. orthopyroxene: 1-100 ppb for B and 0-4.2 ppb for Be) are near the detection limit but comparable to previously published data for unmetasomatised mantle (Kaliwoda, 2004).

The average contents of serpentine minerals are 0.17 ppm (Li), 0.4 ppb (Be) and 30 ppm (B). Compared to the primary phases they are similar in Be, slightly depleted in Li and strongly enriched in B. The different behavior of the light elements could be explained by the different order of magnitude existing between mineral-fluid partition coefficients of Li and B (Brenan et al., 1998) and the higher (20 times) enrichment of B in seawater compared to Li (e.g Morozov 1968; Uppstroem 1974), while Be is not very fluid-mobile.

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