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オマーンオフィオライト、北部フィズ岩体の基底部かんらん岩に記録されたスラブ由来流体による交代作用
Metasomatism during subduction initiation recorded in basal peridotites of the northern Fizh massif, Oman ophiolite

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The Oman ophiolite is one of the best preserved sections of oceanic lithosphere worldwide. It lies on more than 400 km along the north eastern coast of the Arabian Peninsula. The Oman ophiolite and its underling metamorphic sole are regarded as being direct analogues of obducted oceanic lithosphere and subducted oceanic crust that formed by overthrusting (e.g. Boudier et al., 1989, Ishikawa et al., 2002). This idea is supported by the presence of granitic rocks and boninite dykes in the northern part of the ophiolite, which were generated by the partial melting of the subducting plate sediment cover during metamorphic sole formation (Cox et al., 1999) or by mantle metasomatism by fluid dehydrated from metamorphic sole during subduction initiation (Ishikawa et al., 2002).

We focus on the basal clinopyroxene (Cpx)-rich peridotites in the northernmost Fizh massif in order to discuss the origin of the metasomatic agent and the degree of metasomatism, and to estimate the Cpx trace element and Nd-Sr isotopic compsositions.

The chondrite-normalised multi-element patterns for Cpxs in these rocks are significantly depleted in incompatible elements. The multi-element Cpx patterns were basically reproduced by 4-12% of melt extraction from a spinel peridotite source. However, the highly incompatible element (e.g., Ba, Nb, La, Ce, and Pb) characteristics of the basal Cpx-rich peridotites could not be reproduced by simple melting modelling. Ishikawa et al. (2005) proposed a trace element compositions for fluids released from the metamorphic sole beneath the Oman ophiolite. The enrichment of highly incompatible elements is generally reproduced by the addition of very small amounts of these fluids ($\leq$ 0.3 %) to the residual peridotites.

The Sm-Nd isotopic data plotted on the gabbro isochron (100 Ma) of the Fizh block (as given by McCulloch et al., 1980, 1981) suggests that the basal Cpx-rich peridotites were formed by partial melting contemporaneously with the generation of oceanic crust. Initial Sr isotopic compositions of the Cpxs within the basal Cpx-rich peridotites cover a wide range ($^{87}Sr/^{86}Sr$ = 0.7030-0.7074), in contrast to the rather constant initial Nd isotopic compositions. The initial Sr-Nd isotopic compositions consistently plot on the mixing line between Cretaceous seawater and MORB-type oceanic crust (presented by McCulloch et al., 1980), suggesting a contribution of seawater from the metamorphic sole.

Based on these observations, we propose that small amounts of fluids derived from the metamorphic sole (amphibolites and quartzose rocks) were added to the overlying residual peridotites during the initial stages of subduction.

キーワード: マントル交代作用, オマーンオフィオライト, 基底部かんらん岩, スラブ由来流体, 微量元素組成, Nd-Sr 同位体組成
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