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幌満岩体斜長石かんらん岩に含まれる斜長石・かんらん石集合体中のSrの2次元分布：変形速度指標としての評価

Two-dimensional distribution of Sr in a reaction texture in plagioclase lherzolite from the Horoman complex, northern Ja

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Many reaction textures, which are usually noticed as domains of finer grain size than the main part, are often found in mantle peridotites. They are principally attributable to pressure and temperature changes induced by motion of the mantle and are regarded as a record of a part of large-scale mantle dynamics. Reaction texture can provide us a clock recast from microstructural or chemical variations in the reaction products. Such variations could provide us a useful tool to understand processes that could have taken place contemporaneously with the reaction, such as partial melting, ductile deformation, and introduction of hydrous fluid. In this study, we have examined trace element distribution in plagioclase-rich seam in plagioclase lherzolite from the Horoman peridotite complex, which could provide us information on deformation that the Horoman complex underwent during its ascent.

A plagioclase lherzolite sample collected from the Lower Zone of the Horoman complex was examined with EPMA and SIMS. The sample consists of olivine, orthopyroxene, clinopyroxene, plagioclase-rich seams, and rare isolated chromite spinel. The seams, which are composed of olivine, plagioclase, and chromite spinel with minor pyroxenes, were derived from garnet through two-pyroxenes and spinel aggregate by consecutive decompression from the garnet to plagioclase stability fields via the spinel stability field (Ozawa and Takahashi, 1995; Ozawa, 2004). The grain size of seam minerals is much smaller than the size of the host part. The seams are flattened parallel to the foliation and strongly elongated defining remarkable lineation.

SIMS analyses of plagioclase in a thin section parallel to the lineation and vertical to the foliation shows spatial variation in trace elements. Particularly remarkable distribution is noticed for Sr increasing from the middle of a seam towards the both ends. The maximum concentration contrast is a factor of two. There is no detectable variation in Sr within each plagioclase grain even if it shows marked Na/Ca zoning. The systematic increase of Sr toward the tips of seam is most plausibly attributed to strong elongation of plagioclase-rich seam during the formation of plagioclase. When plagioclase first appeared by reaction among two-pyroxenes and spinel, Sr was strongly partitioned into plagioclase from clinopyroxene grains occurring near the reaction site by rapid diffusion because of higher temperature, which is substantiated by remarkable negative anomaly of Sr in isolated clinopyroxene grains (Takazawa et al., 1996; Yoshikawa and Nakamura, 2000). The two important requirements to reproduce the Sr distribution are (1) equant or weakly strained two-pyroxene spinel aggregate and (2) formation of plagioclase only in the aggregate margin or limited homogenization of Sr in the aggregate, both at the initiation of deformation. Elongation of seam took place contemporaneously with diffusive homogenization of Sr over the

period of initiation of reaction at high temperature until when temperature dropped rapidly (Ozawa, 2004) to hamper diffusive transportation. Because of the two robust constraints, we can estimate strain rate of the seam, if we can properly estimate the time scale of Sr diffusion in the seam, which is possible from transversal homogeneity. The Sr distribution in plagioclase-rich seam can be used as a tool to correlate thermal history and deformation history and further to estimate strain rate during exhumation of the upper mantle. Other reactions induced by a pressure change can be similarly useful strain rate indicators.

キーワード:マントルかんらん岩, SIMS,反応カイネティクス, Sr拡散,歪速度,変形

Keywords: mantle peridotite, SIMS, reaction kinetics, Sr diffusion, strain rate, deformation