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海洋プレート最上部マントル構造はマントルダイヤピルで形成される
The uppermost mantle structure in the oceanic plate induced by mantle diapir

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This study presents results of microstructural analyses and crystallographic preferred orientations (CPOs) in order to clarify characteristics of harzburgite in the Samail and Hilti mantle sections. The Samail peridotites of seven samples were collected in the Maqsad area across the mantle diapir. The Hilti peridotites of thirteen samples were collected in the zone of the high-T deformation near the paleo-Moho in the mantle section. Thus, we studied twenty samples in Oman ophiolite. Olivine CPOs in the Samail samples are characterized by slightly strong point maximum of [010] and weak girdle distributions of [100] and [001]. Olivine CPOs in the Hilti samples are characterized by two types of the distributions: one type shows slightly strong point maximum of [010] and weak girdle distributions of [100] and [001], and the other type is slightly strong point maximum of [010] and weak point distributions of [100] and [001]. The olivine fabrics have been used to be represented by fabric intencities of each axis such as pfJ so far. However, pfJ does not necessarily reflect olivine fabrics of their whole axes and it strongly depends on a stereographic distribution. Moreover, AG-type has various patterns of distributions in both a-axis and c-axis, so that it is difficult to classify AG-type by any previous methods. In this study, we prefer to classify olivine CPO patterns using Vp-Flinn diagram. It shows that both Samail and Hilti samples are almost identical each other and in the VP-Flinn diagram that olivine fabrics could be classified into three types: 1) A-type like fabric, 2) AG-type like fabric and 3) low Vp anisotropy AG-type like fabric. Grain boundaries have different characteristics between them; the Samail samples showed regular grain boundaries, whereas the Hilti samples showed irregular grain boundaries. It is likely that the temperature in the Oman ophiolite would have been the highest in the mantle diaper beneath the ridge axis and therefore its solidus line could be deeper as moving away from the ridge axis. Therefore, the difference of grain boundary geometries may result from a temperature change in the vicinity of the mantle diapir from vertical flow to subhorizontal flow. The olivine grain sizes are almost constant regardless of their CPO patterns and are in the same range between 0.6 and 2.1 mm in both the Samail and the Hilti samples. It shows that the Hilti samples may have experienced only a small horizontal strain that is not enough to change olivine CPOs except a weak grain size reduction due to dynamic recrystallization. As a consequence, the olivine CPOs could have been formed in the mantle diapir and preserved even in the horizontal structure away from the mantle diapir. The olivine fabric could have been formed by melt effects like MORB in the mantle diaper or diffusion creep.
Keywords: olivine fabrics, lithosphere, uppermost mantle, mantle diapir