

オマーンオフィオライト地殻—マントル遷移帯
におけるアンチゴライト脈形成と流体流動
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Antigorite vein formation and fluid flow
in the crust-mantle transition zone in the Oman ophiolite

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Antigorite is high temperature polymorph of serpentine minerals. In contrast to the common occurrence of antigorite within the ultramafic rocks within related to the subduction zone, it is still unclear its formation conditions within the oceanic lithospheres and ophiolites (Cluzel et al., 2020; Rouméjion et al., 2019). In this study, we report the multi-stage serpentinization and novel occurrences of antigorite veins with brucite salvage in completely serpentinized dunite from the crust - mantle transition zone of the Oman ophiolite, taken from Oman Drilling Project drill hole CM1A (Wadi Zeeb, Northern Sharqiyah). Based on the mass balance and thermodynamic consideration, we discuss the time integrated fluid flux during the antigorite vein formation during the obduction of the Oman ophiolite.

Along the hole CM1A, the dunite in the crust-mantle transition zone (160-313 m) is pervasively serpentinized with lizardite + brucite + magnetite (Yoshida et al., 2020). This earlier-stage texture of serpentinite are cut by the distinct antigorite vein networks, that is continuous networks over 100 m by X-ray CT on Chikyū. Interestingly, the antigorite veins have the salvage of brucite, where enriched in magnetite. The wormhole structure of magnetite shell and antigorite was observed in the reaction zone, which could be act as fluid pathways in the process of forming the reaction zone. The relic of the mesh-like texture of the earlier stage serpentinization were preserved, suggesting the volume-constant replacement during the reaction zone formation. The mass balance relationship indicates the loss of silica and gains of magnesium and water are required to form brucite salvage after lizardite. Given the formation of the antigorite vein with brucite salvage at 350 °C and 200 MPa, thermodynamic calculations revealed that (1) pH at reaction front was 5.85 (high compared to neutral pH (= 5.10)), and (2) the time integrated fluid flux is estimated to be $2.3 \times 10^2 \text{ m}^3(\text{fluids}) / \text{m}^2(\text{rock})$. Our results suggests that substantial flow of the alkaline fluids occurred through fracture networks at the stage of the obduction of the Oman ophiolite

Keywords: Serpentinization, Oman Ophiolite, Antigorite, Fluid flux

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