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Trace element distributions of the hydrothermal altered oceanic crust in the Oman ophiolite

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Hydrothermal alteration processes of oceanic crust at mid-ocean ridges cause significant changes in elemental budget and vertical distribution. Although previous studies have been reported chemical compositions of oceanic crustal rocks from dredged and/or drilled modern seafloor and ophiolite, available depth-successive data is still limited. In this study, concentrations of trace elements were determined for a complete section of oceanic crust in the Oman ophiolite in order to investigate elemental mobilization during hydrothermal alteration. Pillow basalts altered at low temperature ($<100^{o}$C) were highly enriched in B, As, Rb, Cs, Ba, U, and moderately enriched in Pb, suggesting that these elements were adsorbed onto and/or incorporated into secondary minerals, such as smectite and calcite. Mn and Zn were enriched in the transition zone between pillow lava and sheeted dike complex, and depleted in base of sheeted dike complex. On the other hand, Cu and Pb of the sheeted dikes were generally depleted. Dolerite dikes in gabbro altered at high temperature ($>300^{o}$C) showed enrichment of U, indicating addition of U to rock during high temperature alteration. In contrast to the previous views that both Li and B are leached from rocks during hydrothermal alteration at high temperatures, the lower oceanic crust altered $>300^{o}$C (even at $>450^{o}$C) showed B-enrichment relative to fresh rocks. This suggests that the altered oceanic crust is a large sink of B and source of Li.

Keywords: oceanic crust, hydrothermal alteration, trace element