Oxygen and hydrogen isotope compositions of the oceanic crust in the Oman ophiolite

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Because of the temperature-dependent fractionation of oxygen isotopes between minerals and water, delta-18O is useful to reconstruct the temperature of water-rock interaction. By contrast, delta-D of secondary hydrous minerals gives information about the source of the fluid. Previous studies have proposed the widespread phase separation in submarine hydrothermal systems on the basis of large chloride variations in vent fluids and fluid inclusions in oceanic crust. However, the behaviors of brine and vapor formed by phase separation are still unclear. In this study, oxygen and hydrogen isotope compositions of oceanic crustal rocks of a complete section through the Wadi Fizh area in the Oman ophiolite were analyzed in order to investigate water-rock interaction at fast-spreading ridges. The oxygen isotope profile of the oceanic crust in the Wadi Fizh area reflects seawater-rock reaction at the temperature range from lower than 250 to higher than 500^{o}C. The 18O depletions in the gabbro section are not affected by retrograde lower-temperature alteration. Therefore, this transect is an ideal dataset to interpret the hydrothermal circulation at fast-spreading ridge system. The hydrogen isotope compositions of actinolite and epidote provide evidence for D-enriched and D-depleted fluid, which imply that supercritical phase separation is probably pervasive in the lower crust.