Geochemical relationship of Haybi volcanics and amphibolites in the metamorphic sole of Oman ophiolite

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We conducted geochemical examinations of the Haybi volcanics and amphibolites of metamorphic sole from the Sumeini Window in the basal part of the northern Oman ophiolite to understand the protolith of amphibolites and their geochemical relationship to the Haybi volcanics.

By examination of whole rock compositions using discrimination diagrams and C1 chondrite-normalized patterns of rare earth elements (REE) Haybi volcanics can be divided into either OIB or E-MORB type. OIB-type basalts are pillow lava and lava sheet of alkali basalt to bsasanite and is located beneath E-MORB type that is blocks of trachyandesite to dacite enclosed in metachart. On the other hand, amphibolites can be divided into N-MORB to E-MORB type. Amphibolites with E-MORB affinity are geochemically similar to E-MORB type volcanic rocks. Whole rock Nd isotope ratio and La/Yb ratio of amphibolites show a broadly negative correlation that is similar to those of volcanic rocks from Kerguelen islands. These variations generally can be explained by a mixing between MORB source mantle and isotopically enriched mantle followed by various degrees of melting.

Our results indicate that the N-MORB, E-MORB and OIB type volcanic rocks were distributed on a oceanic crust prior to the thrusting of Oman ophiolite. Then, N-MORB and E-MORB were subducted beneath ophiolite so that they were metamorphosed to amphibolite by thermal metamorphism and accreted to the base of the ophiolite. On the other hand, OIB-type volcanic rocks and part of E-MORB that are free from thermal metamorphism and accreted beneath metamorphic sole at relatively lower temperature and formed the Haybi Complex.