Chloritite bodies from the Oman ophiolite: A new aspect of the hydrothermal system beneath ocean ridge flanks

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We have found many chloritite bodies more than 15 from the upper gabbro unit to the extrusive unit from the northern Oman ophiolite. The size of these bodies are variable ranging from a huge body (e.g., 200x400) to smaller ones, but many of them are usually larger than several tens m in diameter. The chloritites in the deeper level shows stock-like body consisting of Fe-rich chlorite with minor titanite and apatite, While those from the SDC (sheeted dike complex) show more elongated bodies containing variable amount of quartz which occurs as veins or fills interstices between the chlorites. Epidote appears only at the margin of the bodies and rapidly decreases inside the bodies within a few tens cm. Some chloritites contains epidosite enclaves, suggesting that the chloritization occurred after the formation of the epidosites. The appearance of chloritites from the upper gabbro unit (foliated gabbro and massive gabbro) indicates that the chloritization occurred at off-axis environments.

Geochemical data indicate that a severe leaching in Si, Ca, Na, and LILE elements and a large uptake in Fe and H_2O are accompanied with the chloritite formation. SiO_2 is removed from the deeply situated chloritites, but presipitates quartz in the shallower chloritites probably due to a lowering of temperature.

Cu contents of most of the chloritites and surrounding host rocks are highly depleted as less than 5 ppm, however, the Cu contents of some chloritites from a shallower level exhibit very high Cu-contents up to 1,000 ppm. The Cu contents of gabbroic rocks are correlated to the degree of high-temperature hydration. With increasing degrees of hydration, the Cu-contents are rapidly decreased. These lines of evidence suggest that the chloritites may be a root of massive sulfide deposits. We conclude that a hydrothermal circulation in the lower oceanic crust beneath ridge flanks is vigorous and may produce a highly focused discharge zone which have generated huge chloritite bodies in depths and massive sulfide deposits on the seafloor.