WATER IN OMPHACITE OF ECLOGITE FROM THE SOUTHERN TIANSHAN

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The late Paleozoic western Tianshan high pressure (HP) and low temperature (LT) belt extends for about 200 km along the southern central Tianshan suture zone. It is part of the orogenic belt formed by subduction/collision between the Yili-Kazakhstan-Kyzylkum and the Tarim-Karakum plates. Eclogite facies rocks occur as lenses, as laminae, massive blocks or as thin layers intercalated with blueschists and marbles. PT estimates of the eclogite facies mineral assemblage garnet + omphacite ± phengite + quartz ± Na-amphibole indicate T = 490 - 570 °C at P = 18 - 21 kbar.

We studied omphacite samples from an eclogite (sample NO. SW32-36) of the Akeyazhi area from the southern Tainshan, western China. There are granoblastic crystals and fibroblastic aggregates of omphacite. The former has relatively higher jadeite- and lower aegirine-components when compared with the latter. Moreover, the large omphacite crystals are generally zoned with the jadeite-component increasing and the aegirine-component decreasing from core to rim. Fibroblastic omphacite shows a similar composition when compared with the rim of granoblastic crystals, generally the aegirine-component is higher while jadeite-component is lower. The compositional zoning of omphacite implies prograde growth conditions.

Out of doubly polished thin sections (0.1 mm thick) inclusion- and crack-free omphacite crystals with at least 150 - 200 μm in their shortest dimension were extracted, cleaned with ethanol and dried at 100 °C for 3 hours. Using a Nicolet Magna-IR 750 and IR-plan Advantage Fourier Transform Infrared Microscopic Spectrometer, omphacite was measured from 3000 to 4000 cm^{-1} with an IR light source, KBr beam-splitter and a MCT detector at room temperature; 128 scans were accumulated for each spectrum with 4 cm^{-1} resolutions. Apertures of 100 × 100 μm were used for selecting sample areas for measurement.

Four hydroxyl absorptions occur at the regions 3650 - 3660, 3620 - 3630, 3510 - 3520 and 3430 - 3440 cm^{-1}. It implies that a hydrous component commonly exists in the omphacites. The bands centered at 3430 - 3440 cm^{-1} are blunt, which is attributed to the overlapping of water molecules (H_2O). Our data show that OH concentration in the fibroblastic omphacites is lower than in the granoblastic omphacites. However, the large omphacite crystals have comparatively high OH and low H_2O concentrations in the rim, while relative low OH and high H_2O concentrations were recorded for the core.

The results of IR studies on omphacite crystals suggest that the comparatively high H_2O and low OH concentrations measured in the core of the omphacites, indicate the presence of fluid inclusions. It further indicates that the OH solubility increased with increasing pressure during prograde growth of the omphacites. This indicates that H_2O, which was released by dehydration of blueschists during the transition from blueschist to eclogite, participates and promotes the formation of eclogite. In the earlier stage, fluid inclusions were trapped as H_2O during pervasive fluid flow. However, during later stages, OH was incooperated into the omphacite structure because the H_2Ocontent had decreased as the result of the formation of omphacite veins.