The Microstructure and Composition of Picrolitic Antigorite Veins in Serpentinites from the High-P Metamorphic Yuli Belt in Eastern Taiwan

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Fluid activity plays a key role in many subduction zone processes such as in melt formation and elemental cycling. Serpentinite is an important component of the subducting oceanic lithosphere as well as the mantle wedge and the hydration and dehydration reactions of serpentine minerals have a major impact on the hydrodynamics of the subduction zone. Recently, it has also been suggested that fluids released from serpentine minerals could be the cause for seismicity occurring in subduction zones at intermediate depths (~50-300 km).

In order to study the nature of fluid flow in the subduction zone, we collected and analyzed serpentinite samples from Yuli belt, which is a high pressure metamorphic belt in eastern Taiwan. Yuli belt is mainly composed of pelitic, psammitic and chloritic schists, but also contains various other lithologies including several occurrences of serpentinites and meta-mafic rocks. The samples presented in this study were collected from the Juisui area, which is known for hosting several occurrences of glaucophane-bearing rocks suggesting that these rocks represent a relatively deep section of the subduction zone with peak metamorphic pressures around 10–13 kbar. Based on field observations, such as intensive quartz veining in the pelitic schist and Na-metasomatism in the contact of the pelitic schist and the serpentinites, it appears that the rocks in the Juisui area have been subject to widespread fluid infiltration.

Our study focuses on describing the microstructure and composition antigorite veins, which occur in the serpentinite bodies. Because antigorite is a high temperature serpentinine mineral, we interpret that the veins represent fluid flow occurring in the deeper parts of the subduction zone. The picrolitic antigorite veins have a fibrous appearance but are in fact composed of elongated splintery antigorite. The thickness of the veins ranges from a few millimeters to several centimeters. Various vein structures have been observed, including syntaxial and crack-seal veining. We also discovered several generations of cross-cutting antigorite veins suggesting multiple pulses of fluid flow. Unlike the matrix, the veins do not contain any magnetite. However, dolomite is often associated with the picrolitic antigorite veins and cross-cutting relationships imply that the CO_2-rich fluid entered the serpentinite around the same time that the antigorite veins formed. We will discuss the composition of the antigorite veins and the possible nature of the fluids that created them further in this presentation.

Keywords: Yuli belt, Serpentinite, Picrolitic antigorite veins, Subduction zone fluid flow

