P-T path of amphibolite and blueschist tectonic blocks in serpentinite mélange from the Kamuikotan metamorphic rocks

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The high-pressure metamorphic rocks formed at relatively high-pressure and low-temperature (high-P/T type) are distributed over the central Sorachi-Yezo belt of Middle Hokkaido and are called Kamuikotan metamorphic rocks. Serpentinite mélange including various types of tectonic blocks is distributed extensively in the Kamuikotan metamorphic rocks. It is necessary to elucidate the pressure-temperature paths (P-T paths) of tectonic blocks of serpentinite mélange to discuss tectonics of the subduction zone (subduction channel) which those rocks experienced.

In this study, We sampled five tectonic blocks in serpentinite mélange from the Kamuikotan Gorge and the Horokanai-Etanbetsu areas around Asahikawa city, then described the mineral assemblages in these samples and analyzed the compositional zoning of amphibole, garnet and epidote constituting these rocks using SEM-EDS.

As a result of SEM-EDS analyses, the five rock samples are classified into the following four types from the viewpoint of the P-T paths. The amphibolite samples are characterized by P-T paths where temperature decreased from an epidote-amphibolite facies to greenschist facies, which is also evidenced by the facts that rutile is replaced by titanite and the compositional zoning of the amphibole varies from actinolite-magnesiohornblende in a core to actinolite in a rim. The amphibolite samples have P-T paths where pressure increased to a blueschist facies following the temperature decrease mentioned above, and then pressure and temperature decreased to a pumpellyite-actinolite facies, based on the presence of pumpellyite and the compositional zoning of the amphibole varying from magnesiohornblende or actinolite-magnesiohornblende to glaucophane via actinolite from core to rim. The blueschist sample has P-T paths where pressure and temperature increased, and then decreased in a blueschist facies, based on the facts that epidote is replaced by lawsonite and the compositional zoning of the amphibole varying from glaucophane in a core to actinolite in a rim. The garnet-epidote amphibolite has P-T paths where temperature increased to an epidote-amphibolite facies and then temperature decreased and/or pressure increased to a blueschist facies, based on the facts that titanite inclusion in garnet is replaced by rutile and that rutile is replaced by titanite in matrix, and the compositional zoning of the amphibole varying from magnesiohornblende in a core to glaucophane in a rim.

All five samples record a variety of retrograde metamorphism, suggesting the cooling of the subduction zone. About the garnet-epidote amphibolite, because quantity of Mn in garnet shows a bell-shaped compositional growth zoning indicating temperature increase, the component of Ps ($Fe^{3+}/(Fe^{3+}+Al^{3+})$) of epidote inclusions in garnet decreases from inclusions in garnet core to inclusions in garnet rim and the component of Ps of epidote in matrix increases, this rock has the record from part of the prograde metamorphism to part of the retrograde metamorphism successively. Probably, the origin of the garnet-epidote amphibolite is gabbro constituting the lower oceanic crust, and after it subducted, the subduction zone was cooled while it was detached from the sinking slab and abided in the place, and it might be subjected to the metamorphism of a blueschist facies. Though the origin of other amphibolite

might be basalt constituting the upper oceanic crust, these P-T paths can be explained in similar tectonics. It will be necessary in the future to clarify the tectonics of the subduction channel more closely by analyzing quantitative mineral chemistry, giving age determination and revealing the P-T paths quantitatively which the amphibolite suffered.

Keywords: Kamuikotan metamorphic rocks, subduction channel, compositional zoning of mineral, pressure-tempetarute path

