G122-P003 **Room: Poster Session Hall** **Time: May 20**

Amphibolite mylonite from sinistral shear zones in the Poroshiri ophiolite

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We report on the amphibolite mylonite in sinistral shear zones found in the Poroshiri ophiolite of the upper Chiroro River area, Hidaka Town, Hokkaido. In the upper Chiroro River area, the upper ophiolite sequence composed of metamorphosed sediments and basalts is distributed in the western part, while the lower ophiolite sequence composed of metamorphosed gabbroic rocks is distributed in the eastern part (Miyashita, 1983).

We have found amphibolite mylonite in the metamorphosed gabbroic rocks, in addition to metagabbro and porphyroclastic amphibolite previously described by Miyashita (1983). Amphibolite mylonite occurs in several 5-20 cm wide shear zones within porphyroclastic amphibolite. The porphyroclastic amphibolite protolith contains porphyroclasts of plagioclase +- clinopyroxene in matrix of hornblende and plagioclase which have grown during a metamorphism. Strong shape and crystallographic preferred orientations of hornblende grains suggest their deformation by dissolution-precipitation creep. The amphibolite mylonite contains porphyroclasts of hornblende + plagioclase +- clinopyroxene in matrix composed of monomineralic and mixed layers of fine-grained (smaller than 50 microns) hornblende and plagioclase. Monomineralic plagioclase layers are composed of dynamically recrystallized grains with a distinct crystallographic preferred orientation, suggesting their deformation by dislocation creep. Mixed layers of hornblende and plagioclase grains are derived from porphyroclast rims by a reaction. The quasi-random crystallographic orientations of mixed-layer plagioclase grains are attributable to their deformation by grain boundary sliding. Thus the deformation mechanisms in amphibolite mylonite are in marked contrast to that in porphyroclastic amphibolite, which may be due to their differences in pressure-temperature condition and/or strain rate.

All asymmetric structures observed in porphyroclastic amphibolite indicate a dextral sense of shear, as already reported by Jolivet and Miyashita (1985), and Arai and Miyashita (1994). In contrast, all asymmetric structures in amphibolite mylonite such as foliation deflection, asymmetric pressure shadows around porphyroclasts, alignment of porphyroclasts oblique to foliation, shear bands, and oblique foliation of dynamically recrystallized plagioclase grains, indicate a sinistral sense of shear. Because porphyroclastic amphibolite is the protolith of amphibolite mylonite, local sinistral ductile shearing likely occurred after a regional metamorphism and its simultaneous dextral shearing. The pressure-temperature estimate of the sinistral mylonitization is now in progress.