

Petrological study of the serpentinite melange from the Nagasaki Metamorphic Rocks in the Nomo Peninsula

*shigeki toyama¹, Tadao Nishiyama¹

1. kumamoto University

The Nagasaki Metamorphic Rocks are low temperature and high pressure metamorphic rocks mainly composed of crystalline schists distributed in Nishisonogi, Nomo and Amakusa. The metamorphic rocks in the Nomo Peninsula consist of three rock units: crystalline schists, serpentinites and metagabbros. The serpentinite melange occurs associated with the serpentinite, and the matrix of the serpentinite melange consists mainly of actinolite schist and chlorite - actinolite schist. This rock is strongly schistose and contains lens-like rock masses as tectonic blocks. The representative mineral assemblage of the matrix is actinolite + hornblende + albite + chlorite + epidote + muscovite + calcite + magnetite. Actinolite are oriented parallel to the schistosity. The matrix also contains porphyroclasts of epidote and brown hornblende. The tectonic blocks in this serpentinite melange include the metavolcanic rocks (pillow lava, pillow breccia, hyaloclastite and volcanic breccia), amphibolite, mylonite, cataclasite, albitite, metagabbro and serpentinite. Metavolcanic rocks generally occur as large blocks, which are 1 to 10m in size. The pillow lava is hardly deformed and round pillow laves are seen with epidote -rich layers inbetween. The mineral assemblages is omphacite + chlorite + muscovite + epidote + albite + titanomagnetite. The pillow breccia, shows a transition from pillow lava, and calcite filling the original vesicles is observed. The mineral assemblages is winchite + chlorite + epidote + albite + calcite + titanomagnetite. In the angular rock fragments show jig-saw puzzled structures indicating brecciation owing to rapid quench in the water. The mineral assemblage is winchite + barrosite + chlorite + epidote + muscovite + albite + titanomagnetite. In contrast to the hyaloclastite, the volcanic breccia consists of various round blocks in the matrix. The mineral assemblages is winchite - barrosite + actinolite + chlorite + epidote + albite + titanomagnetite. The amphibolite occurs as blocks of 1 to 2 m in size. The mineral assemblages is winchite - barrosite + actinolite - tremolite + chlorite + epidote + muscovite + albite + titanomagnetite. The mylonite occurs as blocks of less than 1 m in size. It shows strong foliation, and banded structures. Fine grained aggregates of albite and epidote occurs in the mylonite, including porphyroclasts of amphibole. The mineral assemblages is actinolite + tschermakite + chlorite + epidote + albite + titanomagnetite. The tschermakite contains 10.40wt% of Al_2O_3 , suggesting high temperature origin. The cataclasite occurs as blocks of less than 1 m in size, consisting of rock fragments with various orientations. The mineral assemblages is actinolite + winchite - barrosite + chlorite + epidote + albite + titanomagnetite. The metagabbro is accompanied by a reaction zone of chlorite. The mineral assemblages is barrosite + magnesioriebeckite + chlorite + epidote + muscovite + albite + titanomagnetite. Amphiboles are mostly barrosite, but rarely magnesioriebeckite. The albitite occurs as blocks of 10cm in size. The mineral assemblages is actinolite + epidote + chlorite + albite + titanomagnetite. The serpentinite melange has undergone epidote blueschist facies metamorphism, as suggested by the occurrence of omphacite, winchite - barrosite and magnesio-riebeckite. Some peculiar rocks rich in calcite and hematite occur as blocks in the serpentinite melange. The mineral assemblages is cpx + epidote + mica + amphibole + chromite + albite + chlorite + calcite + hematite. Cpx, epidote, mica and amphibole occur in cracks or peripheries of chromite grains. All minerals contain Cr except albite and calcite. Cpx contains up to 6.82wt% of Cr_2O_3 and no compositional zoning is observed from the core to the rim. Chemical zoning owing to diffusion of Cr is not observed in these Cr-bearing minerals, therefore the reaction halos surrounding chromite grains do not represent diffusion-controlled process.

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