

中部地方の御荷鉾帯の蛇紋岩及びロジン岩 Serpentinite and Rodingite from Mikabu belt, Central Japan

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Introduction

Serpentinites are valuable evidence of hydrothermal activity in deep earth. They are often made by hydrothermal alteration of peridotite, the main component of the mantle, at relatively low temperatures. They form in specific conditions, such as subduction zone and mid-atlantic ridges. They capture and release various elements during formation, playing an important role in the geochemical cycles and biological activity (Fruh-Green, 2004).

Rodingites are greatly affected by fluid of serpentinization. Rodingites are Ca-rich, Si-poor rocks often seen at serpentinite outcrops, composed by diopside clinocllore and various Ca-Al silicates. It is thought to form by hydrothermal alteration by the fluid, who experienced serpentinization (e.g. Coleman, 1967; O' Hanley et al., 1992). The mineral assemblage seems to be affected by the composition of the fluid, showing various combinations within the same locality, though the system is not totally understood (Kobayashi and Shoji, 1988; Li et al., 2007).

Methods

In this study the formation process of serpentinite and rodingite was investigated by the observation of the samples from ultramafic body in the Mikabu green rocks, central Japan. The samples were collected from Nakauri and Yoshikawa in Aichi prefecture, and Shiokawa peridotite body in Nagano prefecture (Makimoto, 1978; Uesugi and Arai, 1999). In this presentation, the samples from Shiokawa peridotite were mainly handled. The constituent minerals were determined by X-ray diffraction pattern, and texture observation and quantitative chemical analysis was carried out by scanning electron microscope.

Results and Discussion

The main contents were dunite and serpentine with various degree of serpentinization. The serpentinized part often included clinopyroxene, showing that wehrlite altered to serpentinite while dunite remained fresh. Rodingite was seen as dikes of few meters or of few centimeters in size, accompanied by dunite or serpentinite. The consistent minerals were diopside, clinocllore, vesuvianite, and andradite.

In serpentinite, an Al-rich area of serpentine, which seem to take shape of the primary mineral, was often seen. In one sample, pumpellyite-(Al) and grossular was seen in the center of this texture, formed by the saussurization of plagioclase. A needle like clinopyroxene, Ca-poor than the primary clinopyroxene, was seen around this structure, and the following formation sequence is proposed. First, the plagioclase undergoes saussuritization and turns into fine grained minerals such as pumpellyite-(Al), grossular. Then those minerals become Al-rich serpentine and releases Ca, forming clinopyroxene of needle like shape, replacing the surrounding olivine and evolving around the primary clinopyroxene with sharp contacts. Needle like clinopyroxenes were seen where the degree of serpentinization is high, indicating that this reaction caused by plagioclase accelerates serpentinization.

In rodingite, a primary clinopyroxene, showing the same features as those in serpentinite, was replaced by vesuvianite, andradite, clinopyroxene. The estimated order of formation is diopside, vesuvianite, andradite, Fe-rich andradite, and clinocllore were present in all stages. The mineral of the host rock is thought to be clinopyroxene and saussurized plagioclase. Therefore, the rodingite veins should have formed in the gabbrotic part of the peridotite, which means the source and receiver of rodingitization coexists inside a single rock type.

As mentioned above, rodingite coexists with dunite in this locality, which is quite unique, since most reported rodingites accompanies completely serpentinized serpentinite. Rodingite of this occurrence lack the source of the serpentinized fluid, so the transportation is essential for formation. Since the rodingites show the same features irrelevant to the degree of serpentinization of the surrounding rock, the same fluid was thought to be supplied from the surrounding serpentinites.

Keywords: serpentinite, rodingite, dunite, needle like clinopyroxene, serpentine, clinocllore