# Serpentine minerals from Irikura, Oita Prefecture, 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 zones and mid-atlantic ridges. Forming species differ, reflecting the environment at serpentization, and show characteristic pseudomorph structures (e.g. Wicks and Whittaker, 1977).

Serpentinite is mostly composed of serpentine group minerals, which are formed by Si-rich tetrahedral sheet and Mg-rich octahedral sheet in one to one layer sequence. Between these sheets, interlayer stress are caused by the difference of their lattice dimensions. Serpentine group minerals can be classified into three species, lizardite, chrysotile, and antigorite, according to their crystal structures taken to compensate the dimensional misfits. Each species have several polytypes, and also there is a fibrous serpentine called polygonal serpentine whose classification is still under debate (e.g. Baronnet and Devouard, 2005). Despite their characteristic role in geology, the mineralogical analysis of serpentine group minerals is often imperfect, due to their difficulty in observation.

The ultramafic rock body in the Asaji metamorphic rocks is mainly composed of pyroxenites and serpentinites. The chemical trends of spinel in serpentinite show similarity to the Kurasegawa belt, suggesting similar tectonic setting for the formation of those ultramafic rocks (Sonoda and Takagi, 2004). In this study we report the property of serpentine group minerals and associating minerals, contained in serpentinite from Irakura, Oita prefecture, Japan.

## Methods

In this study, the samples from ultramafic body in the Asaji metamorphic rocks, in Irikura, Oita prefecture, Japan were observed. The samples were collected from several points in a huge outcrop, with different appearance within one sampling point. 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

In the studied locality, the out crop was mainly composed of serpentinite, including rodingite and albitite bodies of a few meters in size. The investigated samples were all completely serpentinized. The sepentinites can be roughly divided in to three types from macroscopic feature and constituent minerals.

The first type is the blocky black serpentinite surrounding the rodingite and albitite bodies. They are either pure antigorite or lizardite with magnetite. They are mainly composed of reed type texture and fine grained fibers and grains filling the interspace. This type can be estimated to be formed by recrystallization.

The second type is spathic dark greenish serpentinite. It makes up the major part of the outcrop. They are antigorite or lizardite, with clinochrysotile and various carbonates. Magnesite, dolomite, and brucite were dominant and a small amount of hydrotalcite was observed. Carbonates exceed serpentine group minerals in some samples. Fractured aggregate of reed type texture make up most of the area, and fine grained fibers and grains fill the interspace.

The third type is splintery yellowish green serpentine which form aggregates in some points, and often occurs as veins in the type two serpentinite. They can be indexed clinochrysotile and / or

 

orthochrysotile by XRD, and further TEM observation is essential to determine whether it is polygonal serpentine or not. In the aggregate form, it accompanies greenish fibours of low crystalline antigorite.
The chemical compositions of serpentine were near the endmember, slightly differing in Si component. The textures of serpentinites of Irikura suggest strong deformation and recrystallization after the first serpentinization.

Keywords: serpentine, serpentinite, Irikura, Asaji metamorphic rocks

 