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SMP43-P14 Room:Convention Hall Time:May 24 18:15-19:30

Radiolarian fossils and crystal growth of metamorphic minerals in low-grade metamorphic rocks

ONO, Akira[1*]

[1]None

Radiolarian fossils are commonly found in weakly metamorphosed slates and siliceous rocks of the Atogura Nappe and Chichibu Complex on the basis of the observation by using a loupe. Pelitic schists and Kashio mylonites from the Ryoke belt of the Takato-Hase region were also examined to elucidate the existence of radiolarian fossils. The results were reported before [1]. In the present article, radiolarian fossils in thin sections are described in relation to metamorphic grade and crystal growth of minerals.

Radiolarian fossils of a siliceous slate of the Atogura Nappe

A siliceous slate in a chert block exposed in the Yatsu, Yorii town was studied. Figure A shows radiolarian fossils observed under an optical microscope. Many white ring structures are filled with fine colored minerals. Ring structures become indistinct when concentrations of internal colored minerals are low. The concentrations of colored minerals, chlorite and opaque minerals are often low in the central parts of the ring structures. In this case a broad dark ring structure of fine-grained colored minerals is formed. White and dark ring structures are considered as traces of radiolarians fossils. Similar textures are recognized in metamorphic rocks formed under fairly high temperatures. An example is shown in Figure B which is a muscovite-biotite schist exposed in Takato town, Ina city, Nagano Prefecture.

Metamorphic grade and radiolarian fossil

The Ryoke metamorphic belt of the Takato-Shiojiri area is divided into three zones; chlorite-biotite zone, biotite zone and sillimanite zone. Metamorphic temperature increases in this order. Radiolarian fossils were confirmed under an optical microscope in the chlorite-biotite zone, but it was unable to recognize radiolarian fossils in the biotite and sillimanite zones. Recently, however, many small white rings (Figure B) were recognized by using a loupe and usb microscope for biotite schists near the sillimanite isograd. The ring structures are traces of radiolarian fossils which are preserved in spite of the existence of large biotite, muscovite, plagioclase and quartz. The preservation of the ring structures is mainly due to the existence of very small carbonaceous materials within the ring structures (Figure C). The small grain sizes of the carbonaceous materials suggest the slow rates of crystal growth and transportation of carbonaceous materials under relatively low metamorphic temperatures. Carbonaceous materials of pelitic Ryoke gneisses, however, considerably grow up in the sillimanite zone of the Takato area. Therefore it is almost impossible to recognize relics of radiolarian fossils in the sillimanite zone.

Mineral growth and radiolarian fossil

A large metamorphic tectonic block is distributed in the northern part of the Kiroko greenstone melange of the Atogura Nappe. Psammitic metamorphic rocks are common in the tectonic block. Many small ring structures of approximately 40-100μm in diameter are recognized by using a loupe for a siliceous psammitic rock. The siliceous rock is mainly composed of quartz and small amounts of fine brown minerals which are not identified yet. Quartz crystals larger than 100μm are common. The fine brown minerals are distributed forming circular structures and broad dark ring structures within quartz crystals according to the observation by using an optical microscope. Fine brown minerals were included in quartz crystals during the crystal growth of quartz crystals. Shapes of radiolarian fossils were partly preserved in spite of high-temperature metamorphism.

[1] A. Ono, 2012, Abs. Geol. Soc. Japan, Meeting, R4-P-24, p.228.

Keywords: Radiolarian fossil, Metamorphic temperature, Recrystallization

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A Siliceous slate B and C Biotite-muscovite schist