Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SMP43-P11 Room:Convention Hall Time:May 24 16:15-17:30

Compositional zoning and inclusions of garnet in Sanbagawa metapelites from the Asemigawa area, central Shikoku

Tomoki Taguchi[1*], Masaki Enami[2]

[1]Graduate School of Environmental studies, Nagoya University, [2]Center for Chronological Research, Nagoya University

Chemical zoning and inclusions in garnets record valuable information for estimating the pressure-temperature (P-T) history of metamorphic rocks. Metamorphic garnet grains in Sanbagawa metapelites usually record a bell-shaped profile of Mn (normal zoning), suggesting that they were formed by nucleation and continuous growth with increasing temperature during the Sanbagawa metamorphism (Sakai et al., 1985). In contrast, garnet grains in metapelites around eclogite bodies in the Besshi area usually have composite zoning, showing discontinuous growth between the grain's core and mantle boundary, and are reported as resorption-overgrowth zoning by Takasu (1986). In the Asemigawa area, some rare garnet grains in metapelites show reverse zoning (Itaya, 1978) and sector zoning (Inui, 2010) in addition to the normal zoning.

We re-examined the metamorphic P-T history of the metapelites in the Asemigawa area, based on the zoning of garnets, composition and parageneses of garnet inclusions, and residual pressure recorded by quartz grains inclusions in garnets. Thirty-four samples were collected from different metamorphic zones of the garnet (Grt), lower albite-biotite (Ab-Bt), oligoclase-biotite (Ol-Bt), and upper albite-biotite zones along the Asemigawa region from south to north.

Most garnet grains show normal zoning. However, garnet grains from the lower Ab-Bt zone have composite zoning. The composite zoning of garnet is defined by the discontinuous variation in Mn content at the core-mantle boundary. The two types of zoned garnet grains have different inclusion assemblages, as follows: (1) Normal zoning: Qtz (quartz), Ttn (titanite), and micro multi-phase inclusions of Pg (paragonite) + Phg (phengite); and (2) Composite zoning comprising (a) Core: Rt (rutile), Ttn, Cz (clinozoisite), Gln (glaucophane), and (b) Rim: Qtz and Ttn.

Quartz inclusions in the garnets in samples from the Grt, Ol-Bt, and upper Ab-Bt zones preserve a residual pressure compatible to that of the epidote-amphibolite facies. In contrast, the samples from the lower Ab-Bt zone record higher residual pressure than those from the other zones.

These results suggest that the metapelites in the lower Ab-Bt zone were likely recrystallized under relatively higher-pressure metamorphic conditions than others in the Asemigawa area.

Keywords: garnet, compositional zoning, residual pressure, quartz-Raman barometer, Sanbagawa metamorphic belt