Metamorphic zonal mapping and the observation of zircon textures in the west of the Aoyama area, Ryoke metamorphic belt, SW Japan

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The result of metamorphic zonal mapping of metamorphic rocks derived from sandstone and mudstone (hereafter pelitic-psammitic metamorphic rocks) and the mode of occurrence of zircon in the western half of the Aoyama area (to the west of the Kachiji fault), Ryoke metamorphic belt, SW Japan is reported. The Aoyama area is located about 25 km west of Tsu city. Pelitic-psammitic schist is mainly distributed in the northwestern half of this area, whereas migmatites are mainly distributed in the southeastern half (Kawabe et al., 1996). Takahashi and Nishioka (1994) and Kawakami (2001) previously proposed the metamorphic zonal maps around this study area, but they were mainly on the eastern side of the Kachiji fault.

The pelitic-psammitic schist of this area is mainly composed of biotite, garnet, sillimanite, cordierite, K-feldspar, plagioclase, and quartz and accessory minerals are zircon, monazite, tourmaline, pyrrhotite, ilmenite, and graphite. Chlorite and muscovite are considered as secondary in origin. Field works and the thin section observation revealed that the assemblage garnet+cordierite+biotite+/-silimanite is widely distributed in the study area. Tourmaline is distributed only in the northwestern half of the study area and thus the 'tourmaline-out isograd' (Kawakami, 2001) can be defined. On the eastern side of the Kachiji fault, the metamorphic grade is considered to be higher in the south, so the same is expected in the western side of the fault. From the distribution of garnet+cordierite assemblage, however, we can only conclude that the metamorphic grade is almost isofacial.

It is well known that the introduction of Mn to garnets stabilizes this mineral at lower temperatures (Mahar et al., 1997). In order to check the effect of Mn, the garnet grains in the rocks with garnet+cordierite assemblage were analyzed by EPMA. As a result, the garnet from the north showed high Mn contents and that from the south showed lower Mn contents. From this, it is interpreted that because of Mn contained in garnet, the stability field of garnet expanded to stabilize the garnet+cordierite assemblage in the northern part of the study area.

Next, modes of occurrence of zircon contained in pelitic-psammitic metamorphic rocks (three migmatite samples and three schist samples) were observed under backscattered electron image. Coarse-grained zircon with diameter of more than 50um, middle-grained zircon with 20-30um diameter, and fine-grained zircon with diameter less than 10um were found. Zircon is commonly found around biotite grains and is rarely found in feldspathic parts. In migmatite samples, almost all the zircons are fine-grained and coarse-grained ones are rare. In pelitic-psammitic schists, almost all zircons are middle-grained. The core part of the coarse-grained zircons both in migmatites and schists often show euhedral oscillatory zoning. These zircon cores can be detrital in origin or formed during the crystallization of melt that was present in migmatites. To investigate the formation mechanism of zircon grains, U-Pb dating using the sensitive high resolution ion microprobe (SHRIMP) should be effective.

References

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