

Pressure-temperature (P-T) path of the high-grade rocks of the Takahama metamorphic rocks, western Kyushu, SW Japan

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The Takahama metamorphic rocks, occurring in western Kyushu, consist of high-grade rocks, which belong to the high-pressure granulite facies, and underlying crystalline schists of the epidote-glaucophane schists subfacies. The former comprises mainly basic rocks and minor siliceous and calcareous rocks, and was mostly mylonitized. A scarcely mylonitized garnet-clinopyroxene amphibolite shows equigranular texture and was metamorphosed at 770°C and 1.1 GPa (Ikeda et al., 2005). Weakly mylonitized metabasite containing corundum and kyanite represents reaction microstructure. We described the reaction texture in the rock to estimate the P-T path of the high-grade rocks.

The rock contains mainly corundum, kyanite, hornblende, chlorite, clinozoisite and margarite. Corundum and kyanite are surrounded by reaction rim composed of the fine-grained aggregates of margarite. The chemical composition of margarite is almost pure $\text{Ca}_2\text{Al}_4(\text{Si}_4\text{Al}_4)\text{O}_{20}(\text{OH})_4$ and $\text{Fe}^{3+}/(\text{Al}+\text{Fe}^{3+})$ of clinozoisite is 0.13-0.14. The reaction that produced these microstructures in this rock may be described as below, assuming existence of aqueous fluid,

corundum + kyanite + clinozoisite + aqueous fluid = margarite.

This reaction is univariant in the CaO-Al₂O₃-SiO₂-H₂O system. The reaction curve is located between two invariant points at 530°C, 1.3 GPa and 660°C, 0.8 GPa in the P-T diagram based on experimental studies. The P-T condition of the reaction and that of the garnet-clinopyroxene amphibolite indicate that the P-T path of the high-grade rocks is isobaric cooling at lower part of crust.