Progressive metamorphism of the Sanbagawa belt revisited: Calculated P-T pseudosection for pelitic schists in the NKMnFMASH system

Kazumasa Aoki[1]; Soichi Omori[2]; Shigenori Maruyama[1]

[1] Earth and Planetary Sci., Tokyo Institute of Technology; [2] Res. Centr. Evolving Earth and Planets, Tokyo Tech.

The Sanbagawa belt in SW Japan belongs to the high-P transitional type (Miyashiro, 1961). In this belt, four mineral zones of chlorite, garnet, albite-biotite and oligoclase-biotite, with a progressive increase metamorphic temperature, have been established based on mineral assemblages and chemistry of diagnostic minerals in pelitic schists (e.g. Higashino, 1975; Enami, 1983). Recently, it is clear that the highest-grade parts in the intermediate structural levels is suffered strongly affected by overprinting with extensive hydration during exhumation from over ca. 50 km depths to mid crustal levels (e.g. Ota et al., 2004; Aoki et al., 2008). Those recent researches suggest that the present minerals in the Sanbagawa metamorphic rocks reflect lower-P-T recrystallization that occurred during exhumation.

In order to clarify the progressive mineral parageneses of the Sanbagawa pelitic schists, we calculated P-T equilibrium phase diagram (P-T pseudosection) in the Na_2O-K_2O-MnO-FeO-MgO-Al_2O_3-SiO_2-H_2O model system with the software THERIAK-DOMINO ver. 15.05.08 (De Capitani, 1994). Calculated P-T equilibrium phase diagram for the average bulk rock composition of pelitic schists in central Shikoku clarifies that the peak minerals of the highest-grade zone, which is the oligoclase-biotite zone, were paragonite, glaucophane, garnet and phengite, and the present mineral assemblages were formed by retrograde metamorphism during exhumation. Moreover, integration of these results with previous petrological and thermodynamic studies for the Sanbagawa metamorphic rocks suggests that progressive P-T curve of the Sanbagawa metamorphic rocks was a convex downward with anti-clockwise direction and the Sanbagawa pelitic schists were divide into five zones; chlorite zone, paragonite zone, garnet zone, glaucophane zone and omphacite (jadeite) zone, with a progressive increase of metamorphic pressure and temperature. Hence, judging from the above, division of metamorphic facies series of the Sanbagawa belt is not high-P transitional type but jadeite-glaucophane type.