

Contrasting low and high speed exhumation and metasomatic banding in the Sambagawa metamorphic belt

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The author studied spherical transformation of quartz in albite porphyroblasts in the Sambagawa metamorphic belt in central Shikoku at 1979 and he concluded that the process is controlled simply by boundary diffusion of oxygen of albite and quartz for reducing the interfacial free energy (1). The critical spherical size of quartz inclusion in albite is then estimated by diffusion coefficient and annealing time by their 0.25 power index. Thus the critical spherical size is the potential annealing time under the given temperature.

The author thus, measured the systematic change of the critical sizes of quartz inclusions in albite of metamorphic rocks along the Asemigawa route of central Shikoku, and obtained the general trend of the increasing size by metamorphic temperature. On the other hand, the critical sizes of the highest temperature zone suddenly change the very smaller values than those of the other grade rocks, suggesting the highest grade zone rocks exhumed very rapid rather than surrounding lower grade rocks.

This enigma has not been possibly answered by any model of metamorphic exhumation. However, recent studies of high grade metamorphic terranes revealed that there are abundant dendritic grains of aplitic minerals in so-called felsitic inclusions or nanograin inclusions in metamorphic garnet (2) (3). Therefore, it is inferred that there are a few blocks or sheets of higher grade metamorphic rocks rapidly intruded into the surrounding metamorphic belt.

The mechanism of these contrasting two exhumation at the same belt is modeled by the viscous drag to friction drag exhumation governed by fluid concentration along on the fluid concentrated faulted narrow zones. Such fluid filled damage zones are evidenced by the large scale abundant metasomatic bands in the boundary zones as described in this paper.

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