CHIME monazite ages of migmatites from the Aoyama area, Ryoke metamorphic belt, Japan

Tetsuo Kawakami[1]; Kazuhiro Suzuki[2]

[1] Kyoto Univ.; [2] Nagoya University Center for Chronological Research

In the Aoyama area, Ryoke metamorphic belt, Japan, pelitic-psammitic schists are dominant in the northern half, whereas migmatites are dominant in the south. Previous studies in this area dealt with segregation and extraction of melts during partial melting, constrained by the areal distribution of Tur and B (Kawakami 2001a, b), and proposed a non-hairpin-shaped clockwise P-T path (Kawakami, 2002). Lack of spot dating such as CHIME and SHRIMP correlated with rock microstructure has made it difficult to constrain the timing of above phenomena and the P-T-t evolution. Recently, Suzuki & Kato (in press) reported the Mnz grain that has a concentric euhedral chemical zoning with 100Ma core and 80Ma rim from the southern part of this area.

In this contribution, we report new CHIME Mnz ages from the Aoyama area. Samples used are as follows: (1) SAI99-1 from the low-T part of the Grt-Crd zone. This is the magmatic And and Tur-bearing leucosome that fills the boudin necks developed in the pelitic-psammitic rocks near the schist/migmatite transition (close to the Tur-out isograd). Because the penetrative foliation in this area is dragged into the boudin necks, we interpret that boudinage occurred at the final stage of the deformation that formed the foliation, and that the melt present around the boudin necks segregated into them and solidified. (2) Metatexite B002f-1 from the low-T part of the Grt-Crd zone. (3) Inhomogeneous diatexite S2 from the high-T part of the Grt-Crd zone.

In the Mnz grains from B002f-1 and S2, points with apparent ages of ˜100Ma and ˜80Ma are both found, and their distribution within grains is not systematic. In S2, peaks of apparent ages are observed at 101-105Ma and 81-85Ma, and the CHIME age (Suzuki & Adachi, 1991) determined for the points older than 95Ma is 108.5+/-11.8Ma. In B002f-1, the peak of apparent age is observed at 96-100Ma, and the CHIME age for the points older than 95Ma is 104.8+/-15.7Ma. The CHIME ages were determined for the points with (Ca+Si)/(Th+U+Pb+S) value between 0.95 and 1.05, and K_2O below 0.05wt%. No reliable age was obtained for the points with younger apparent ages both in S2 and B002f-1.

Sample SAI99-1 contains a Mnz that has a core with concentric euhedral chemical zoning. Mnz of this kind can be interpreted to have crystallized from a melt. Age mapping of this Mnz shows that the core records almost constant age. In SAI99-1, peak of apparent ages is observed at 76-85Ma, and the CHIME ages for the points older and younger than 90Ma are 101.5+/-12.4Ma and 81.3+/-2.9Ma, respectively.

Two Younger Ryoke granites intrude the metamorphic rocks of the Aoyama area. It is possible that the CHIME age of ˜80Ma records the polymetamorphism by these plutons. Mnz parts that give the age ˜80Ma would be due to the resetting of 100Ma Mnz or a new overgrowth at ˜80Ma. Especially in the former case, the rocks were possibly reheated over 650{o}ˆC. Because Mnz grains that record the 80Ma event are found widely throughout this area, thermal effect by the granitic intrusions could be significant and related to the development of coarser migmatites than the Yanai area.

The age of ˜80Ma is nearly the methodological limit of CHIME dating. However, assuming that the solidification age of SAI99-1 is ˜80Ma, following possibilities can be pointed out.

(a) The deformation that formed the penetrative foliation in the Aoyama area, accompanied by the E-W stretching, continued until ˜80Ma.

(b) Because the Tur-out isograds are the product of regional metamorphism (Kawakami, 2004), the observation that SAI99-1 solidified at ˜80Ma implies following cases. (i) B-bearing melt formed by the Tur breakdown at ˜100Ma cooled down slowly until the evolved melt segregated into the boudin necks and solidified at ˜80Ma. (ii) B-bearing melt segregated into the boudin necks has no relationship with the Tur-out isograd. In order to constrain the timescale more strictly, check by other methods as SHRIMP would be required.