Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

SMP46-05 Room:304 Time:May 25 10:00-10:15

Monazite age of pelitic gneiss in the Lhenice shear zone (southern Bohemian Massif) and its significance

KOBAYASHI, Tomoyuki[1*], Simon L. Harley[2], HIROI, Yoshikuni[1], HIRAJIMA, Takao[3]

[1]Department of Earth Sciences, Faculty of Science, Chiba University, [2]Department of Geology and Geophysics, University of Edinburgh, [3]Department of Geology and Mineralogy, Graduate School of Science, Kyoto University

Recently, multiple equilibrium stages were identified from Grt-rich gneiss at Kti? in the Lhenice shear zone, located along the western margin of the Blansky les massif (Kobayashi et al., 2011). The characteristic matrix mineral assemblage of the Grt-rich gneiss is Crd+Sil+Bt+Grt+/-Spl with Qtz+Kfs+Pl. The coarse-grained Grts are commonly composed of dusty core and clear rim. The dusty core is defined by the alignment of fluid (CO_2-N_2) and micro-sized solid inclusions (Qtz, Kfs, Pl, Rt, Ap, Mnz and Zrn) of which outline are hexagonal in shape. Some coarse-grained ($>$ 3 mm) Grts show chemical heterogeneity both in major and minor elements; Grs-content is homogeneous and high (Xgrs = 0.27) in an apparent core of the grain and continuously decreases towards the rim (Xgrs = 0.02). However, Prp-content shows an inverse pattern against Grs-content, i.e., Prp content is low and constant (Xprp = 0.03) in the core and gradually increases towards the rim (up to Xprp = 0.28). The outline of Grs and Prp content contours show symmetrical hexagonal shapes. Phosphorous (P)-content is almost below the detection limit of EPMA in the apparent core but it is high at the margin of the grain with local development of P-poor outermost rim. The outline of P-poor core shows a hexagonal shape, similar to that of Grs and Prp content contours. The geothermobarometory, based on the mode of occurrence of constituent minerals and the zoning pattern of Grt, depicts following developing history of the host rock, such as, a prograde stage defined by the assemblage of P-poor Grt core (Grs=27) + Pl (An_{11-15}) under 1.5-2.3 GPa at 700-900 ^oC (Stage 1), a subsequent Grt-rim forming stage represented by P-rich Grt (Grs5) + Pl (An_{12-19}) + Ky/Sil at 730-830 ^oC and 1.0-1.3 GPa (Stage 2), and a following decompression stage by the outermost rim of Grt (Grs_2) + Sil + Crd +/- Spl at 740-850 ^oC and 0.6-0.8 GPa (Stage 3) (Kobayashi et al., 2011).

To evaluate age of multiple equilibrium stages, chemical Th-U-Pb isochron method (CHIME) Mnz age dating was carried out for Grt-rich gneiss. Mnzs which included in core of Grt show bimodal grain size; coarse-grained (1 mm in diameter) and fine-grained (10 micrometer in diameter). Mnzs which included in rim of Grt have fine-middle grained size (10 micrometer to 0.5 mm in diameter). Mnzs in matrix have middle-coarse grained size (0.5 mm to 3 mm in diameter). Most of middle-coarse grained Mnzs show a chemical zoning; relatively low Th constant in the core and high Th constant in the rim. The Mnz grains which included in the core of Grt give an age of 336+/-11 Ma. The Mnz grains which included in the rim of Grt give an age of 335.4+/-7.2 Ma. The Mnz grains in matrix give 334.9+/-3.9 Ma. These results suggest that the studied rock experienced very fast exhumation from stage 1 to stage 3. Furthermore, felsic volcanic rock-like inclusions (FVRLI) are found from the core and rim of coarse-grained Grt. The FVRLI mainly consists of micro to cryptocrystalline aggregate of Qtz, Pl and Kfs. The FVRLI show spherulitic, granophyric, and porphyritic textures in addition to quartz dendrites. These features of the inclusions are similar to those of ”nanogranites” which are FVRLIs enclosed within Grt in high- to ultrahigh-temperature pelitic migmatites and/or granulites as reported by Cesare et al. (2009) and Hiroi et al. (2011). Cesare et al. (2009) concluded that nanogranites are the crystallized anatectic melts which were trapped by peritectic minerals growing during partial melting. The FVRLI in this study may suggest that partial melts formed during early high-pressure metamorphism stage (stage 1) and trapped by garnet have undergone nonequilibrium crystallization under specific conditions of continuous rapid cooling. The possible corresponding geotectonic process may be ”vertical extrusion and horizontal channel flow” (e.g. Schulmann et al., 2008) proposed for the Himalayan-Tibetan and Variscan (Bohemian Massif) orogeny.

Keywords: Bohemian Massif, Monazite age, Grt-rich gneiss, Partial melting, Felsic volcanic rock-like inclusions (FVRLI), Rapid cooling