Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SMP46-01 会場:411 時間:4 月 28 日 12:00-12:15

Placing time constraints on a P-T-D evolution: insights from Lu-Hf garnet and U-Th-Pb monazite dating

Placing time constraints on a P-T-D evolution: insights from Lu-Hf garnet and U-Th-Pb monazite dating

SKRZYPEK, Etienne[1*] ; SZCZEPANSKI, Jacek[2] ; ANCZKIEWICZ, Robert[3] ; STIPSKA, Pavla[4] ; KRONER, Alfred[5]
SKRZYPEK, Etienne[1*] ; SZCZEPANSKI, Jacek[2] ; ANCZKIEWICZ, Robert[3] ; STIPSKA, Pavla[4] ; KRONER, Alfred[5]

[1]Kyoto University, [2]University of Wroclaw, [3]Polish Academy of Sciences, Krakow, [4]Universite de Strasbourg, [5]Universitat Mainz
[1]Kyoto University, [2]University of Wroclaw, [3]Polish Academy of Sciences, Krakow, [4]Universite de Strasbourg, [5]Universitat Mainz

The best approach for understanding the tectono-thermal evolution of a crustal level is through reconstructing its pressure-temperature-deformation-time (*P-T-D-t*) evolution. Whereas *P-T-D* paths can be inferred from crystallization-deformation relationships, placing absolute time constraints on such paths remains challenging, especially because a link between major element-bearing index minerals and trace element-bearing geochronometers needs to be established.

We present the example of medium-grade metasedimentary rocks (Orlica-Snieznik Dome, EuropeanVariscan Belt) for which results of Lu-Hf garnet and U-Th-Pb monazite dating are linked with prograde and retrograde stages of the *P-T-D* evolution, respectively. On the macroscopic scale, a succession of three metamorphic foliations is recognized: initial subhorizontal S1, intermediate subvertical S2, and late subhorizontal S3. A garnet±staurolite assemblage is ascribed to the S1 foliation, whereas the S2 fabric is associated with staurolite demise producing a garnet-biotite-sillimanite/andalusite assemblage. Post-S2 garnet and cordierite blastesis is followed by chlorite growth during and after the formation of the S3 foliation. Garnet porphyroblasts show a peculiar zoning pattern with a linear Mn-Ca decrease in the allanite-bearing core, an inner rim of alternating Ca-Y- and P-rich annuli, and a Ca-poor outer rim. Monazite is found as subhedral aggregates at garnet rim, and lone matrix grains close to partially resorbed garnet, staurolite or apatite. Textural observations and modelling of the garnet composition suggest that the inner rim with Ca-Y-rich annuli reflects the allanite-to-monazite transition which occurred close to the staurolite isograd. In this inner rim, a Lu oscillatory zoning pattern coincides with the zone of Ca-Y-rich annuli. Since the inner rim dominates the Lu budget of garnet, the associated Lu-Hf garnet-whole-rock isochron age of 344±3 Ma is ascribed to *P-T* conditions of the staurolite isograd, i.e. ∼5 kbar/575 ℃ in the S1 fabric. A subsequent temperature increase to peak conditions of ∼5 kbar/580-625 ℃ in the S2 fabric is indicated by the Ca-poor garnet outer rim that reflects staurolite breakdown. LA-ICP-MS monazite dating yields $^{208}Pb/^{232}Th$ ages defining a dominant group at 313±2 Ma and a secondary peak at 328±2 Ma. Based on monazite textures, these relatively young ages are ascribed to fluid influx during retrograde chloritization.

The short time span between prograde garnet growth (∼344 Ma) and existing Ar-Ar cooling ages on micas (∼335 Ma) points to a tectono-thermal event of about 10 Ma. Assumed high heating and cooling rates during this event are explained by the synchronous intrusion of granitoid sheets. Nevertheless, monazite ages indicate that a low-grade overprint occurred more than 20 Ma after peak conditions.

キーワード: P-T-D-t path, prograde garnet zoning, retrograde monazite
Keywords: P-T-D-t path, prograde garnet zoning, retrograde monazite