Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07141, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07141
EGU General Assembly 2008

Multi-stage garnet from the Plankogel unit, Eastern Alps: new constraints from Sm-Nd isotope, trace element and P-T data

M. Thöni (1), Ch. Miller (2)

(1) Center for Earth Sciences, Althanstrasse 14, A-1090 Wien, Austria (martin.thoeni@univie.ac.at)

(2) Institute of Mineralogy and Petrography, Innrain 52, A-6020 Innsbruck, Austria

(christine.miller@uibk.ac.at)

Multi-stage garnet from the Plankogel unit, Eastern Alps: new constraints from Sm-Nd isotope, trace element and P-T data

M. Thöni (1) and Ch. Miller (2)

(1) Center for Earth Sciences, Althanstrasse 14, A-1090 Wien, Austria (martin.thoeni@univie.ac.at)

(2) Institute of Mineralogy and Petrography, Innrain 52, A-6020 Innsbruck, Austria

(christine.miller@uibk.ac.at)

The “Plankogel unit” in the Saualpe-Koralpe region, Eastern Alps, represents the hangingwall part of the Cretaceous high-P metamorphic, Austroalpine “Koralpe–Wölz nappe system” (*sensu* Schmid et al., 2004). It consists of amphibolites with MORB-type and intra-plate alkali-basaltic composition, associated serpentinites, Mn-rich quartzites, and marbles, floating in a matrix of Al-rich garnet-mica-schist. It has been interpreted as a dismembered tectonic mélange of Early Palaeozoic age (Neubauer et al., 1989).

Kyanite-staurolite-garnet-mica schists from different localities of the Plankogel unit

record clear evidence of a poly-metamorphic evolution. Textural observations indicate two stages of garnet growth, interpreted as (i) relics of an early, pre-Alpine metamorphic event and (ii) newly-grown garnet of Alpine age.

The age of the first crystallisation event is constrained by internal Sm-Nd mineral dating of up to cm-sized almandine-rich garnet cores from mica schist, using both inclusion-rich fractions and H_2SO_4/HCl-leached garnet residues. Garnet core domains from three far-distant localities (Plankogel, NW Saualpe; Laaken, SE Koralpe; Friesach, E Gurktal Alps) gave tightly concordant multi-fraction Sm-Nd regression ages of 270.6±3.4 Ma, 271.0±4.0 Ma, and 270.3±3.8 Ma, respectively, at uniformly negative εNd(t) values of -8.7±0.4. Hence, the first prograde metamorphism in the Plankogel unit is clearly post-Variscan. Kyanite inclusions in the inner and sillimanite in the outer core part, in conjunction with decreasing grossular and increasing pyrope contents indicate variable pressure conditions during Permian garnet core growth. Numerical modelling of mineral assemblages in pressure-temperature pseudosections suggests that the first-generation, Permian garnet started to crystallize at about 0.46 GPa and 540 ˚C, whereas the second garnet generation documents distinctly higher pressures of 1.0 GPa and 600 ˚C, related to tectono-metamorphic reworking during Cretaceous continental subduction.

The data constrain regional prograde metamorphism in metapelites of the Austroalpine unit, at low or moderate pressure conditions, during the middle Permian. This low-P tectonothermal event is explained by crustal-scale extensional processes and heat input form the mantle, geodynamically induced by the ongoing Paleotethys subduction in the course of separation of Europe and Africa-related Adria.

Neubauer, F., Frisch, W., Schmerold, R., Schlöser, H., Metamorphosed and dismembered ophiolite suites in the basement units of the Eastern Alps. *Tectonophysics*, 164, 49-62, 1989.

Schmid, S.M., Fügenschuh, B., Kissling, E., Schuster, R., Tectonic map and overall architecture of the Alpine orogen. *Eclogae Geologicae Helvetiae*, 97, 93-117, 2004.