



## **Thermobarometry and electron microprobe dating of monazites of the Winnebach migmatite (Ötztal-Stubai-Kristallin, Austria): clues to the P-T-t history of a complex pre-Variscan metamorphic basement unit of the Eastern Alps**

Thöny Werner (1), Tropper Peter (1), Krenn Erwin (2), Finger Friedrich (2), Kaindl Reinhard (1)

(1)Faculty of Geo- and Atmospheric Sciences, Institute of Mineralogy and Petrography, University of Innsbruck, Innrain 52, A-6020 Innsbruck, Austria, (2) Division of Mineralogy and Material Sciences, University of Salzburg, Hellbrunnerstraße 34, A-5020 Salzburg, Austria

The pre-Variscan event in the Ötztal-Stubai Crystalline Complex (ÖSCB) is manifested in localized migmatite occurrences in the central ÖSCB (Winnebach migmatite) and the western ÖSCB (Verpeil migmatite, Nauderer Gaisloch). The Winnebach migmatite is a „Schollen“-migmatite which is characterized by a high degree of migmatization of ca. 20 vol.%. The mineral assemblage is complex and contains: garnet(1),  $\text{Alm}_{76}\text{Prp}_9\text{Grs}_4\text{Sps}_{11}$ , garnet(2),  $\text{Alm}_{62}\text{Prp}_5\text{Grs}_{24}\text{Sps}_9$  + Kyanite (two generations, based on micro-Raman data) + plagioclase(1),  $\text{An}_{17}\text{Ab}_{83}$ , plagioclase(2),  $\text{An}_5\text{Ab}_{95}$  + K-feldspar + biotite + muscovite + chloritoid. Due to the complex metamorphic history of these rocks, mineral assemblages, which can unambiguously be attributed to a certain metamorphic event, only occur locally. The pre-Variscan mineral assemblage is comprised of relict muscovite and biotite grains, which show textural evidence of melting textures, and pinitic pseudomorphs after cordierite. The dominant Variscan mineral assemblage contains garnet(1) + plagioclase(1) + kyanite(1) + biotite + muscovite + quartz. Staurolite has not been found in the course of this investigation, but was described from this locality. The Eo-Alpine mineral assemblage consists of garnet(2) + plagioclase(2) + kyanite(2) + biotite + muscovite + quartz. The P-T conditions of the pre-Variscan metamorphic evolution were estimated with limiting equilibria and the calculation of a pseudosection with PERPLEX (Connolly, 2005, written

comm.). The observed reaction  $ms + kfs + qtz + H_2O = L$  requires at least 650°C and 0.4 GPa (Spear et al., 1999). The assemblage biotite + plagioclase + K-feldspar + muscovite + quartz + melt requires P-T conditions of 650-670°C and 0.4-0.5 GPa. These conditions fit very well with the data by Hoinkes et al. (1972) who obtained 685°C and >0.4 GPa. Thermobarometric calculations with the assemblage garnet(1) + plagioclase(1) + biotite + kyanite(1) yield P-T conditions of about 530-540°C and 0.5-0.6 GPa and are thought to represent the Variscan event. Garnet(2) + plagioclase(2) + kyanite(2) + chloritoid only occur in small microdomains and are thought to represent the youngest Eo-Alpine event. The calculations with the Eo-Alpine assemblage yield P-T conditions of 485°C and 0.9 GPa, which agree well with Eo-Alpine P-T estimates from the Austroalpine nappes west of the Tauern Window. For the partial anatexis zircon-single-grain dating resulted in ages of 490 Ma (Klötzli-Chowanetz et al., 2001). In contrast, for the subsequent metamorphic events (Variscan, Eo-Alpine) no detailed ages have been obtained so far. Therefore electron microprobe dating of monazites from the Winnebach migmatite will hopefully provide a better understanding of the timing of the complex metamorphic evolution of this Austroalpine basement unit west of the Tauern Window. Currently, monazites from microdomains, which are thought to represent Variscan mineral growth and microdomains representing Eo-Alpine high pressure mineral growth are dated. The grains often appear complex with coronas of epidote and apatite. Within some samples xenotime also was analyzed, which will also provide additional informations about T during monazite growth.

#### References

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