

GARNET ISOPLETH GEOTHERMOBAROMETRY: A METHOD TO OBTAIN P-T ESTIMATES FOR THE PERMIAN METAMORPHIC EVENT IN THE WÖLZ TAUERN, EASTERN ALPS

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During Permo-Triassic times parts of the Austroalpine units were exposed to extensional tectonics, magmatism, and experienced high temperature/low pressure (HT/LP) metamorphism. Due to the intense Alpine overprint metamorphic patterns and parageneses of pre-Alpine/post-Variscan ages were almost completely obliterated.

Garnet cores of polyphase garnets of the Wölz Complex, which belongs to the Austroalpine Basement and is located in the Wölz Tauern, are considered to be relics of the Permian metamorphic event. They can easily be distinguished from garnet rims according to their chemical composition, mineral inclusions and their inclusion fabric. While the timing and metamorphic conditions of the Eo-Alpine event are well known, age and P-T determinations for the garnet cores are rare. In many cases quartz, ilmenite, and rutile are the only inclusions in the garnet cores and conventional thermobarometric methods can not be used to determine the P-T conditions of garnet core growth.

We used garnet isopleth geothermobarometry to estimate the P-T conditions for the initial stages of garnet growth. Hereby we assume that the most primitive garnet grew in equilibrium with the matrix. In such case, the bulk rock composition may be taken as the composition of the thermodynamic system, and the corresponding P-T pseudosection is a valid representation of equilibrium phase relations. We used the intersection of the isopleths that represent the observed garnet core composition to derive the P-T conditions of incipient garnet growth.

Analyses of the garnet cores of the Wölz Unit yield about $540 \pm 15^\circ\text{C}$ and 4 ± 0.5 kbar. This is compatible with the presumed HT/LP conditions of the Permian event and provides an indirect indication of the age of incipient garnet growth. Selected one-phase Eo-Alpine garnets of the Wölz Unit yield P-T conditions for the garnet core growth of about $535 \pm 10^\circ\text{C}$ and 6.75 ± 0.5 kbar.

Garnet cores of polyphase garnets from the Rappold Complex, which is also located in the Wölz Tauern, were investigated, too. They yield temperatures and pressures of about $535 \pm 20^\circ\text{C}$ and 5.5 ± 0.5 kbar. This fits well with the Barrowian type P-T path of the Variscan orogeny.