

**New P-T-t constraints on the metamorphic evolution of the garnet-chlorite schists from the Roßrugg (Zillertal core, Tauern Window, Tyrol): home of the Zillertal jewellery garnets**

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The mineral garnet has been an important raw material for jewellery since Early Medieval times and it is therefore of great interest to the archaeological sciences. In the alpine region, garnet, especially the variety almandine ( $\text{Fe}_3\text{Al}_2\text{Si}_3\text{O}_{12}$ ), is still used today as traditional costume jewellery. Garnet mining started in the Eastern Alps around the middle of the 18th century in the Ziller Valley (Zillertal), or more precisely the area of the Roßrugg in the Zemmgrund, which served as a major source of garnet raw materials. These garnets from the Ziller Valley and furthermore from the Ahrn Valley (South Tyrol), Radenthein (Carinthia) and the Czech Republic are subject of the project “Garnet from the Ziller Valley – Cultural heritage of an East Alpine semiprecious stone industry as reflected in interdisciplinary research”, which is funded by the Austrian Academy of Sciences (ÖAW). Geologically garnet-chlorite schists (garnet + chlorite + muscovite + biotite + plagioclase + quartz + rutile + apatite) at the Roßrugg occur along shear zones inside the Zillertal core (Tauern window) which formed during the Alpine orogeny. Besides the detailed geochemical characterization (e.g., EPMA, micro-XRF and determination of trace element zoning with LA-ICP-MS) of 21 different garnet localities throughout the Ziller Valley, geochronological investigations of garnets from two Roßrugg samples (6E and 3W) are carried out. Due to the paucity of robust age data concerning garnet formation in the Tauern Window, a first attempt using Lu-Hf dating of garnet was undertaken and yielded an age of  $32.35 \pm 0.22$  Ma. This age fits into the time span between the formation of the Venediger Duplex and the “Tauernkristallisation”. In addition to age dating, thermodynamic modelling using pseudosections and averagePT calculations was done. AveragePT conditions using the program THERMOCALC 3.50 resulted in 550–560 °C and 0.8–0.82 GPa. Pseudosection modelling was done using THERIAK-DOMINO and two databases (tcd55c2d and td-ds62-mp50-03). Depending on the database used, the outcome resulted in different mineral assemblages. However, the observed assemblage is in agreement with the results using the most recent td-ds62-mp50-03 database. Calculation of garnet isopleths using the program Perplex yielded garnet growth with decreasing pressures (ca. 0.9 GPa in the core and 0.8 GPa in the rim) and increasing temperatures (560 °C in the core and 590 °C in the rim). The obtained garnet ages agree with the existing age data of the Alpine metamorphic event and indicate that the time span between Alpine eclogite formation and subsequent “Tauernkristallisation” is rather short.