



Chromium in garnet as tracer of the metamorphic evolution of an eclogite-facies garnet pyroxenite from the Pohorje Mountains, Slovenian Eastern Alps

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Controversy remains concerning (1) the ultrahigh-pressure (UHP) or high-pressure (HP) nature of metamorphic rocks at the southeastern flank of the Pohorje Mountains (Mts.) and (2) corresponding different geotectonic scenarios such as deep subduction of a coherent continental slab or fragments of the continental crust. For example, eclogites from this area were reported to have experienced peak pressure-temperature (P-T) conditions of 30-37 kbar and 710-940 °C (Janák et al., 2004; Vrabec et al., 2012) or 18-25 kbar and 630-750 °C (Sassi et al., 2004; Miller et al., 2005). Therefore, we studied an eclogite body (actually a garnet pyroxenite) from the southeastern Pohorje Mts. using mainly the electron microprobe for mineral analytics and the computer program PERPLE_X for thermodynamic modelling in order to decipher the P-T evolution of this rock. Millimetre-sized garnet shows a peculiar zonation. The virtually Cr-free and unzoned core (Grt1) contains c. 16 mol% almandine, 18.5 mol% grossular (+andradite), 65 mol% pyrope, and 0.5 mol% spessartine components (Alm16Grs18.5Pyr65Sps0.5). The average composition of the slightly zoned mantle (+rim) (Grt2) is Alm16Grs20Pyr63.5Sps0.5 with 0.22 wt% Cr₂O₃. X-ray maps (K α Cr-radiation) of garnet show a sharp boundary between Grt1 and Grt2 and demonstrate that the shape of Grt1 is irregular. Cr-free amphibole, (clino)zoisite, kyanite, staurolite, and rutile are enclosed in garnet. Inclusions in Grt2 are also Cr-bearing amphibole and (clino)zoisite. The matrix consists of garnet and Cr-bearing amphibole, clinopyroxene (around 17 mol% jadeite+acmite), and (clino)zoisite as well as some Cr-free kyanite.

After thermodynamic modelling, we interpret the studied rock as follows: An olivine- and hornblende-bearing gabbro with some chromite experienced a first metamorphism at about 22 kbar and 730 °C. The rock was subsequently exhumed and cooled leading to significant corrosion of garnet. A second metamorphism, which was recognized thanks to the different and mappable Cr contents in garnet, led to considerable growth of Grt2 and other Cr-bearing minerals at the expense of chromite at P-T conditions around 23.5 kbar and 710 °C. These conditions are compatible with those derived by Sassi et al. (2004) and Miller et al. (2005) and support the view that no UHP eclogite exists in the Pohorje Mts. The two metamorphic events could be related to Cretaceous and Palaeogene HP events which were recently reported by Li et al. (2021) from the Pohorje Mts.

Janák et al., 2004. *Tectonics* 23, TC5014.

Li et al., 2021. *Journal of Metamorphic Geology* 39, 695-726.

Miller et al., 2005. *Contributions to Mineralogy and Petrology* 150, 70-84.

Sassi et al., 2004. *Lithos* 78, 235-261.

Vrabec et al., 2012. *Lithos* 144, 40-55.