THE DEMANTOID GARNETS OF THE GREEN DRAGON MINE (TUBUSSI, ERONGO REGION, NAMIBIA)

KOLLER, F.[1]*, NIEDERMAYR, G.[2], PINTÉR, Zs.[3] & SZABÓ, Cs.[3]
[1] Department of Lithospheric Research, University of Vienna, Altanstraße 14, A-1090 Vienna, Austria
[2] Natural History Museum of Vienna, Burgring 7, A-1010 Vienna, Austria
[3] Lithosphere Fluid Research Lab, Department of Petrology and Geochemistry, Eötvös Loránd University, Pázmány Péter sétány 1/C, H-1117 Budapest, Hungary
* E-mail: friedrich.koller@univie.ac.at

Demantoid garnets are known from the forelands of the Erongo Mountains in Namibia since mid of 1990's, but it is worth to note that also a Sn-bearing andradite has been reported approximately 70 years earlier from farm Davib Ost 61. The demantoid garnets of the Green Dragon Mine near Tubussis are bound to a neoproterozoic metasedimentary sequence consisting of schists, amphibolites, calc-silicate rocks and marbles part of the Damara Orogen. In Cretaceous time this sequence was intruded by granitic rocks of the Erongo Complex (MILLER, 2008). The granitic dikes are exposed also in the Green Dragon Mine and it is not unlikely to assume that these granitic rocks might at least in part have given rise to a contact metamorphism of the marbles resulting in the formation of calc-silicate rocks and even andradite garnet, too. Therefore, demantoid garnets can be found in the marbles, as well as in the calc-silicate rocks along the contact to the granitic veins and plugs.

In the calc-silicate rocks a zone with up to 1–2 cm large green garnet crystals in a calcite matrix together with quartz and minor silicates is common. These green garnets are close to an andradite end-member composition with low Ti, Cr, Mn and Mg content. The rim of these garnet shows a complex zoning with anisotropic zone formed by increasing grossular component (up 40 mol%) and Ti contents up to 1.6 wt% TiO_2. Few crystals show a wider variation with a complex zoning ranging from pure andradite to almost pure grossular. Diopside (X_{Mg} = 0.92–0.95), wollastonite, quartz, calcite and sphalerite were found as inclusions. Sometimes they also form vein type pockets with perfect crystals of high gem quality and perfect shape, they occur together with quartz and prehnite. In the marble and massive calc-silicate rock a more brownish garnet with an almost pure grossular end-member is common.

Several generations of fluid inclusions can be recognized in the garnet. All fluid inclusion generations have secondary origin as the fluids are trapped along healed fractures. Based on the shapes, three different "age" generations can be distinguished. The oldest generation fluid inclusions could be seen in 30–60 micrometer sizes. They always contain a vapour bubble, a liquid phase and several solid phases. The "middle" generation fluid inclusions have 20–70 micrometer size; they show irregular ratty shape with a vapour and a liquid phase, rarely also solid phase. The "youngest" generation fluid inclusions occur in small size (10–50 micrometer). They are always characterized by dark color, and two fluid phases as vapour and liquid.

Microthermometric measurements were carried out in the "oldest" generation fluid inclusions. The liquid phase could be H_2O–$CaCl_2$ system (first melting point is around -45°C). The other (two) fluid inclusion generations show the same microthermometric nature and results as the older generation one, therefore they can be the same salty H_2O system. The last melting point of the fluid inclusions suggests low salinity: 6–8% in $CaCl_2$–H_2O system (in Na-equivalent salinity: 10–13%, after ROEDDER, 1984). Raman spectroscopy, used at room temperature, indicates the presence of CH_4 in vapour phase.

References

MILLER, R.M.G. (2008): The geology of Namibia. Geological Survey of Namibia, Windhoek.
ROEDDER, E. (1984): Fluid inclusions. Reviews in Mineralogy, 12: 1–646.