European Current Research on Fluid Inclusions (ECROFI-XXI)
Montanuniversität Leoben, Austria, 9–11 August, 2011. Abstracts, p. 162

Postmagmatic evolution of the Caeiras-Pegmatite – a new occurrence and its potential for high-tech-metals in the Borborema Pegmatite Province, NE-Brazil

Piribauer, Christoph J.*, Sindern, Sven*,Mashev, Dobromir*, Meyer, F. Michael*, Hellmann, André*, Havenith, Vanessa J.*, Bakker, Ronald J.**, Lima, R. F. S.***, Petta. R. A.*** and Campos, T. F. C.***

*Institute of Mineralogy and Economic Geology, RWTH Aachen University, Wüllnerstrasse 2, 52056 Aachen, Germany
** Resource Mineralogy, Department of Applied Geoscience and Geophysics, University of Leoben, 8700 Leoben, Austria
*** Departamento de Geologia, Universidade Federal do Rio Grande do Norte, Rio Grande do Norte, Brazil

The Caeiras-Pegmatite is one of numerous pegmatite occurrences in the Borborema Pegmatite Province in NE-Brazil. It is exposed in three quarries and exploited by an artisanal operation since 2007. The effect of mineral alteration and redistribution is of interest for the assessment of the economic potential of the rare metal Caeiras-Pegmatite.

The heterogeneous pegmatite consists of a core of quartz, enveloped by meter-sized perthitic feldspars. Within the wall zone texturally different units can be distinguished, generally dominated by quartz and feldspar. In addition to quartz and feldspar from the core zone, other minerals such as tantalite, beryl, and tourmaline are extracted in minor amounts from both the intermediate zone and the wall zone. Tantalite mineralization is a salient feature of the general pegmatite zonation pattern known in the province. Ratios of K/Rb vary between 91 and 294 in K-feldspar. Caesium ranges from values < 2 ppm in the presence of ceramic-type feldspar in the central areas, up to 60 ppm in association with rare metal occurrences in the wall zones.

Potassium-rich alkali-feldspar crystals have the composition $Ab_{22.7\text{-}30.7}Or_{69.0\text{-}77.0}An_{0.3}$. Their perthitic exsolution texture is characterised by the occurrence of different Or-rich domains showing either fine or coarse irregular microcline. Ab-rich domains are either fine coherent lamellae or irregular elongated to patchy areas. Compositional data of these domains indicate a first exsolution event at approximately 550 °C, followed by a second at 400 to 300 °C. Irregular and partly patchy perthitic exsolutions reveal the presence of a fluid phase at the lower temperature stage, as is indicated by secondary low-salinity aqueous inclusions. The post-magmatic hydrothermal fluid overprint resulted in the alteration of primary magmatic phases and in the formation of secondary minerals. The alteration of tantalite and the ubiquitous distribution of secondary U-minerals is attributed to the late fluid overprint.

Primary, secondary, and pseudosecondary fluid inclusions within quartz contain up to three different phases: liquid, vapour, and sometimes solid as accidentally trapped crystals. These aqueous solutions show salinities up to 21 mass% NaCl eqv.; homogenisation occurs into the liquid phase at temperatures between 140 and 270 °C.

Raman spectroscopy identified CO_2 and N_2 as gaseous phases in fluid inclusions and LA-ICP-MS analyses of fluid inclusions in wall zone quartz revealed the presence of Li, in addition to Na and K. This particular fluid composition is a good indication of the rare metal potential of the wall zones.

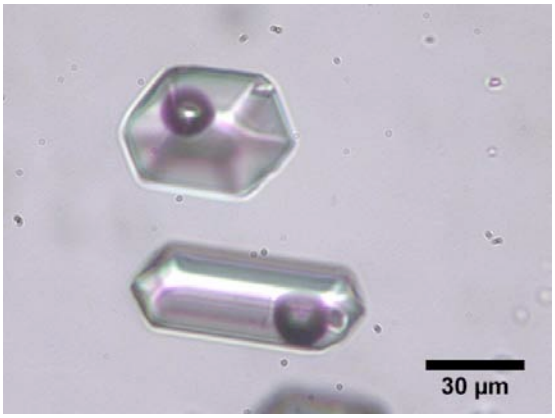

Fig. 1. High saline aqueous fluid inclusions with accidentally trapped crystals.

Cerny (1992) defines the P-T conditions of LCT-type pegmatites between 2 and 4 kbar and 500 – 650 °C. The metamorphic conditions within the Borborema province are between 3.5 – 5 kbar and 560 – 600 °C (Beurlen et al., 2001). Feldspar analyses show minimal formation temperatures above 550 °C.

None of the calculated isochors plot within the P-T range (3.5 – 4 kbar and 600 – 650 °C, which has been defined in the literature. The trapping temperatures at the given pressures correlate partly with the temperatures of the second event exsolution event within the feldspars.

REFERENCES

Cerny, P. (1992) *Geosc. Canada* 18, 49-67
Beurlen, H., Da Silva, M. R. R., De Castro, C. (2001) *Chem. Geol*., 173: 107-123.