Fluid inclusion studies in a granitic pegmatite from Central Portugal – preliminary results

encontro CIÊNCIA '21

MARCELA RODRIGUES*, ALEXANDRA GUEDES, IULIU BOBOS, FERNANDO NORONHA

DGAOT – Faculty of Sciences of the University of Porto and Institute of Earth Sciences (ICT), Rua do Campo Alegre 687, Porto, Portugal
*up201510120@edu.fc.up.pt

U.PORTO FACULDADE DE CIÊNCIAS UNIVERSIDADE DO PORTO Departamento de Geociências, Ambiente e Ordenamento do Território

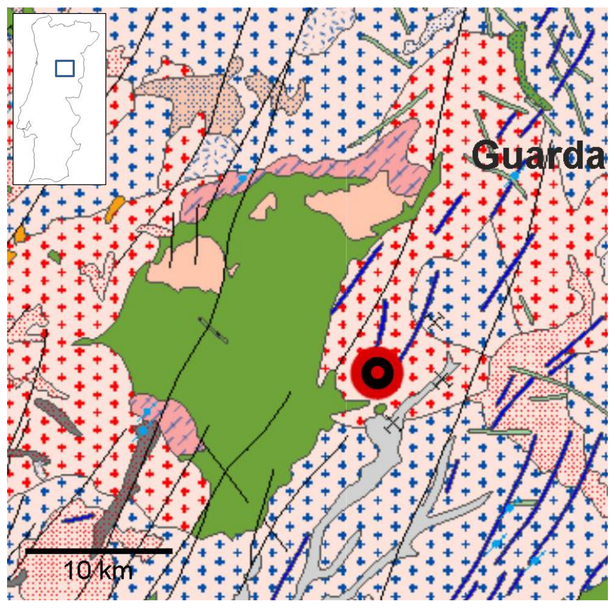
ICT Instituto de Ciências da Terra Institute of Earth Sciences

1. OBJECTIVE

This work aims to contribute to the study of the genesis of a pegmatite from the Central Portugal Pegmatite Field (CPPF) located in the Central Iberian Zone, based on fluid inclusion studies.

2. GEOLOGICAL SETTING

The studied topaz samples were collected in the Castanho pegmatite (Gonçalo, Guarda). In the Castanho area, several sub-horizontal aplite-pegmatites crosscut a Variscan, late-tectonic, coarse grain porphyritic biotite granite. According to Farinha-Ramos et al. (2006) and Farinha-Ramos (2007), the Li-sills in this area are banded, sometimes zoned, with quartz, albite, K-feldspar, muscovite and lepidolite as major minerals and several accessory minerals as zinnwaldite, amblygonite-montebrasite, petalite, topaz, apatite, beryl, cassiterite, columbo-tantalite and others.



Geological map of the study area (extracted and adapted from LNEG Map Viewer in http://geoportal.lneg.pt/geoportal/mapas/index.html?lg=pt) Location of the Castanho pegmatite (Gonçalo, Guarda).

3. METHODS

All the analyses were performed at the Institute of Earth Sciences-Porto Pole laboratories in the following order:

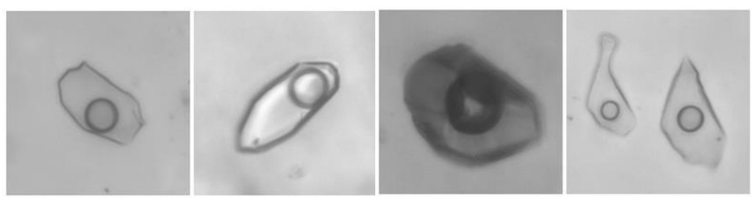
I. Petrographic study of fluid (FI) in doubly polished thick sections of topaz.

II. Microthermometry (cryometry) was conducted in a Chaixmeca stage on a Nikon microscope. The stage was calibrated with natural fluid inclusions and SynFlinc standards. Salinity was calculated using the equation of Bodnar (1993).

III. Raman analysis of the volatile species present in fluid inclusions and analysis of solid phases was performed using a Horiba Jobin-Yvon LabRam spectrometer (632.8 nm, He-Ne laser), equipped with an Olympus microscope (MPlan N 100x/0.90 objective, 1 µm spatial resolution), according to procedures and calibration described by Prieto et al. (2012). Solid phases were identified by comparison with the mineral host spectrum and using the online Raman spectra database RRUFF (http://rruff.info/).

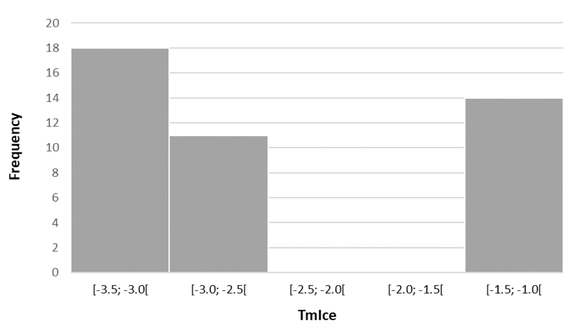
4. RESULTS

The FI in topaz are primary, randomly distributed, in groups or isolated, with regular and irregular shapes and sizes from 13 to 85 µm (66% between 20 and 40 µm). At room temperature, the FI are two-phase (or three-phase if a solid phase is present), having a degree of filling (Flw) from 0.75 to 0.95 (78% of the values between 0.85 and 0.95).

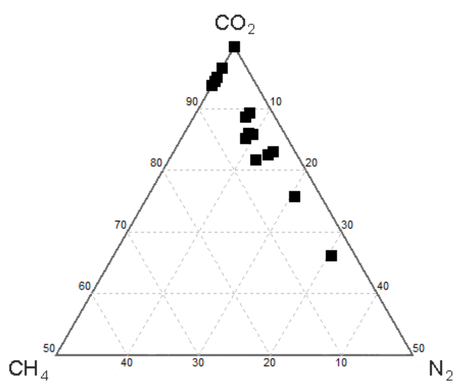


Examples of studied fluid inclusions.

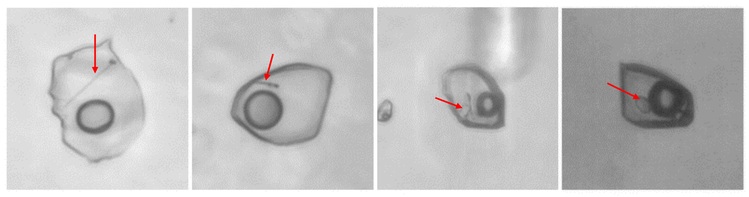
The microthermometry provided values for the final melting temperature of ice (TmIce) between -3.3 and -1.0 °C, corresponding to salinities between 1.74 and 5.41 wt.% NaCl. Bulk density between 0.86 and 0.91 g/cm^3.
Raman microspectrometry allowed to identify CO_2, CH_4 and N_2 in the volatile phase of some FI. The volatile phase is dominated by CO_2 (66.21-100 mol%) with low amounts of CH_4 (0-6.25 mol%) and N_2 (0-30.41 mol%).



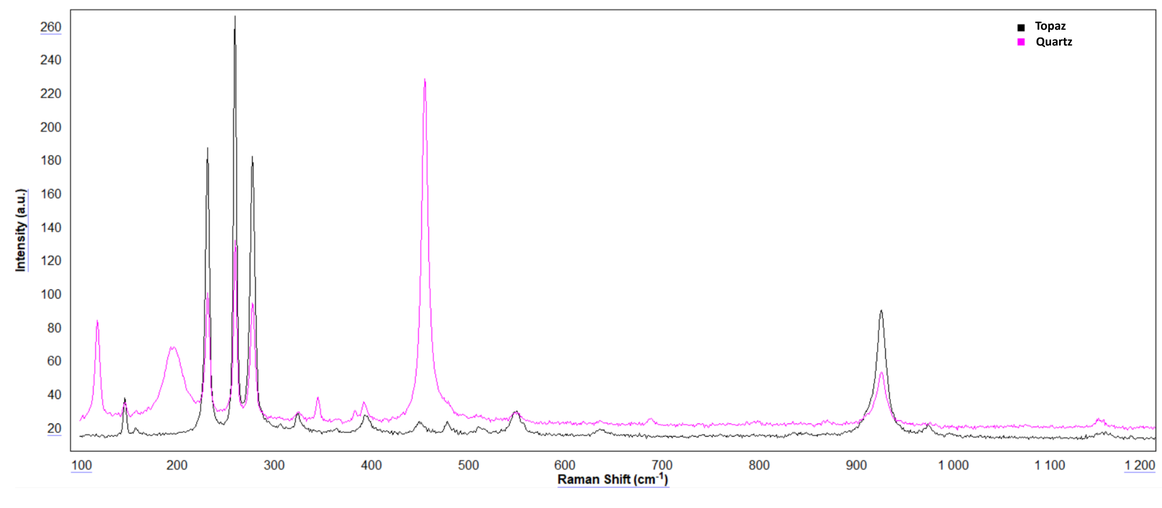
Distribution of TmIce in the studied FI. Nº obs.: 43.

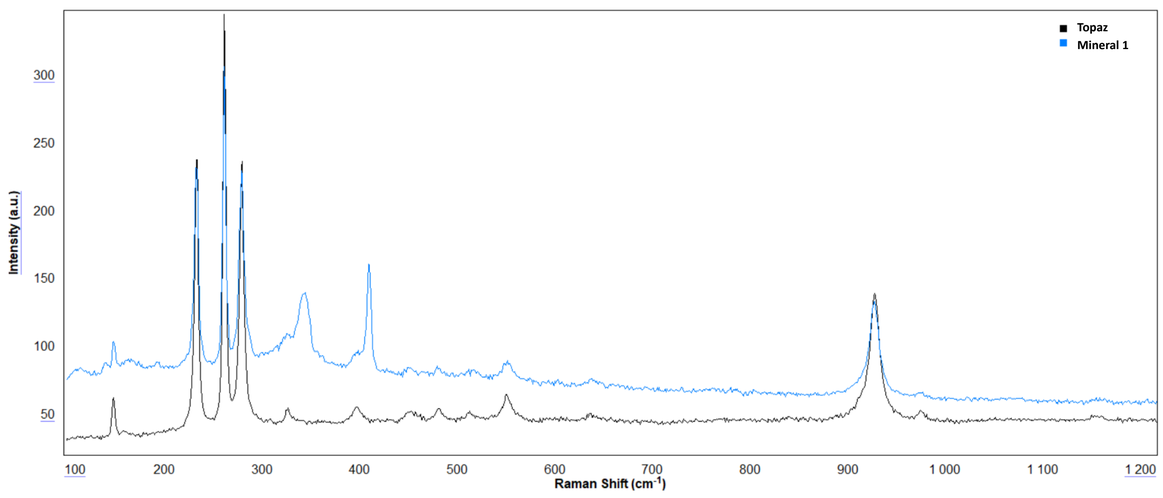


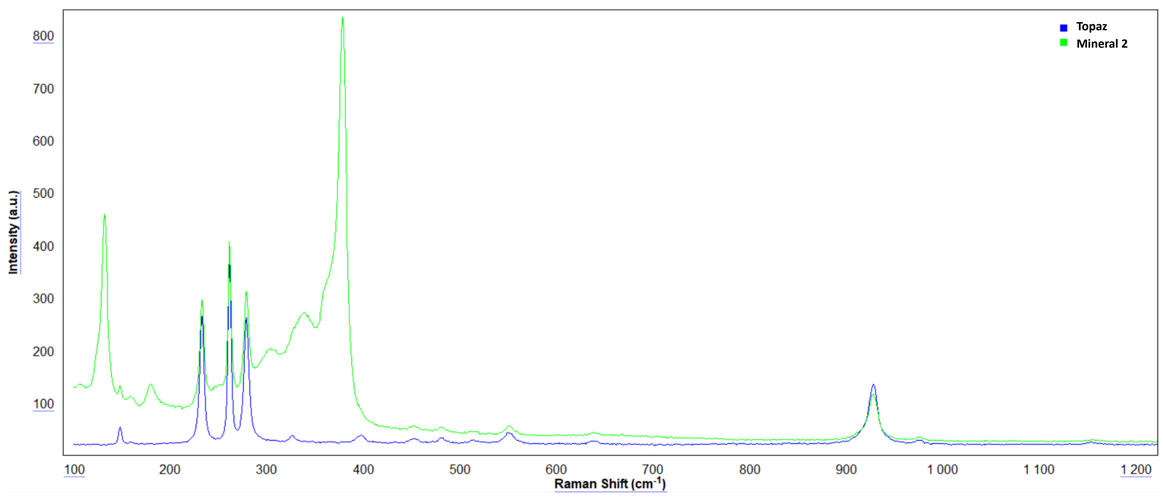
Volatile phase composition of studied FI



Examples of fluid inclusions with solid phases (red arrow) analysed by Raman microspectroscopy.







5. CONCLUSIONS

In the topaz from Castanho pegmatite, fluid inclusions trapped aqueous fluids with low salinity and some CO_2, CH_4 and N_2, during a late hydrothermal stage. The solid phases present in these fluid inclusions are quartz and apparently two distinct sulphides.

Acknowledgements:

The authors acknowledge the funding by COMPETE 2020 through the ICT project (UIDB/04683/2020) with the reference POCI-01-0145-FEDER-007690. The author Marcela Rodrigues benefits from a PhD grant financed by the Fundação para a Ciência e Tecnologia (FCT) (Ref: SFRH/BD/138332/2018).

References:

Bodnar, R. J., 1993. Revised equation and table for determining the freezing point depression of H2O−NaCl solutions. Geochim. Cosmochim. Acta, 57: 683–684
Farinha-Ramos, J. M., 2007. Locality No.5, Seixo-Amarelo – Gonçalo rare element aplite-pegmatite field. In: A. Lima & E. Roda-Robles (Eds). Granitic Pegmatites: the state of the art. Field Trip Guidebook, FCUP (Portugal), 72-86
Farinha-Ramos, J. M., Bravo Silva, P., Neiva, A. M. R., Gomes, E. P., 2006. Evolução Geoquímica de Pegmatitos LCT da Região centro de Portugal no sentido de enriquecimento de lepidolite. VII Congresso Nacional de Geologia, Estremoz (Portugal), 1193-1198
Fersman, A. E., 1931. Les pegmatites: leur importance scientifique et pratique. Acad. Sc. U.R.S.S., Lenningrad: French translation. Louvain, 1951
Prieto, A. C., Guedes, A., Dória, A., Noronha, F. & Jiménez, J., 2012. Quantitative determination of gaseous phase compositions in fluid inclusions by Raman microspectrometry. Spectroscopy Letters, 45, 156-160