

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

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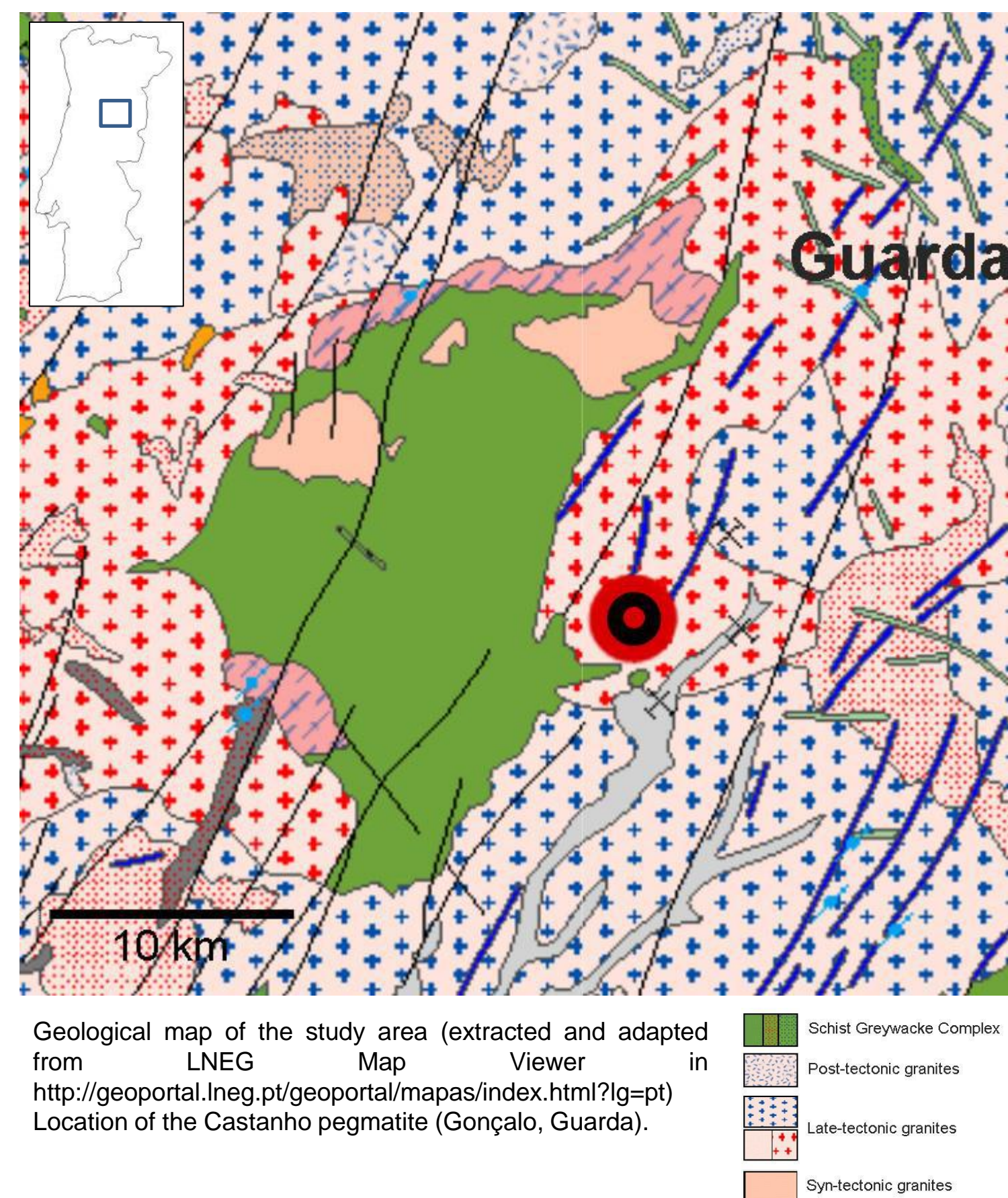
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## 1. OBJECTIVE

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-montebasite, petalite, topaz, apatite, beryl, cassiterite, columbo-tantalite and others.



## 3. METHODS

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

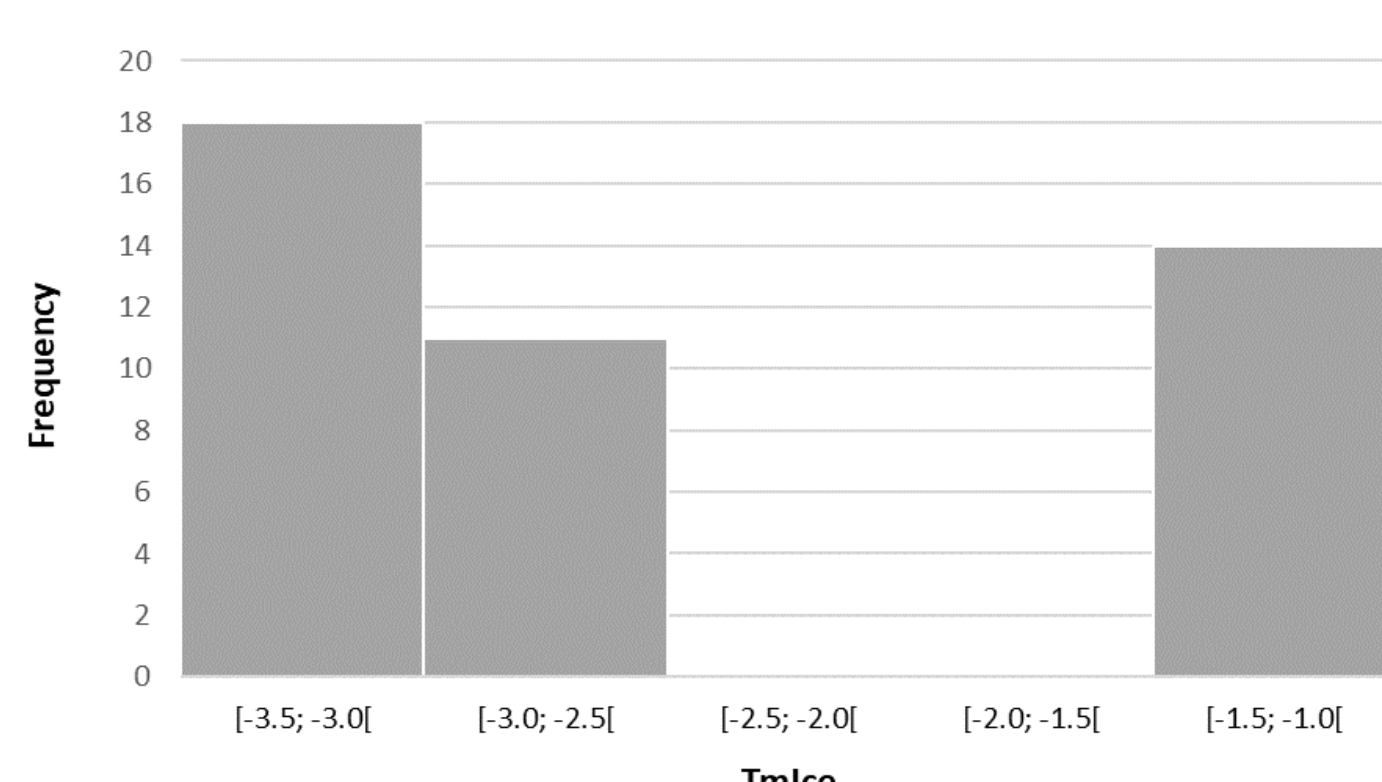
- Petrographic** study of fluid (FI) in doubly polished thick sections of topaz.
- Microthermometry** (cryometry) was conducted in a Chaixmecca stage on a Nikon microscope. The stage was calibrated with natural fluid inclusions and SynFlinc standards. Salinity was calculated using the equation of Bodnar (1993).
- 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  $\mu$ m 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

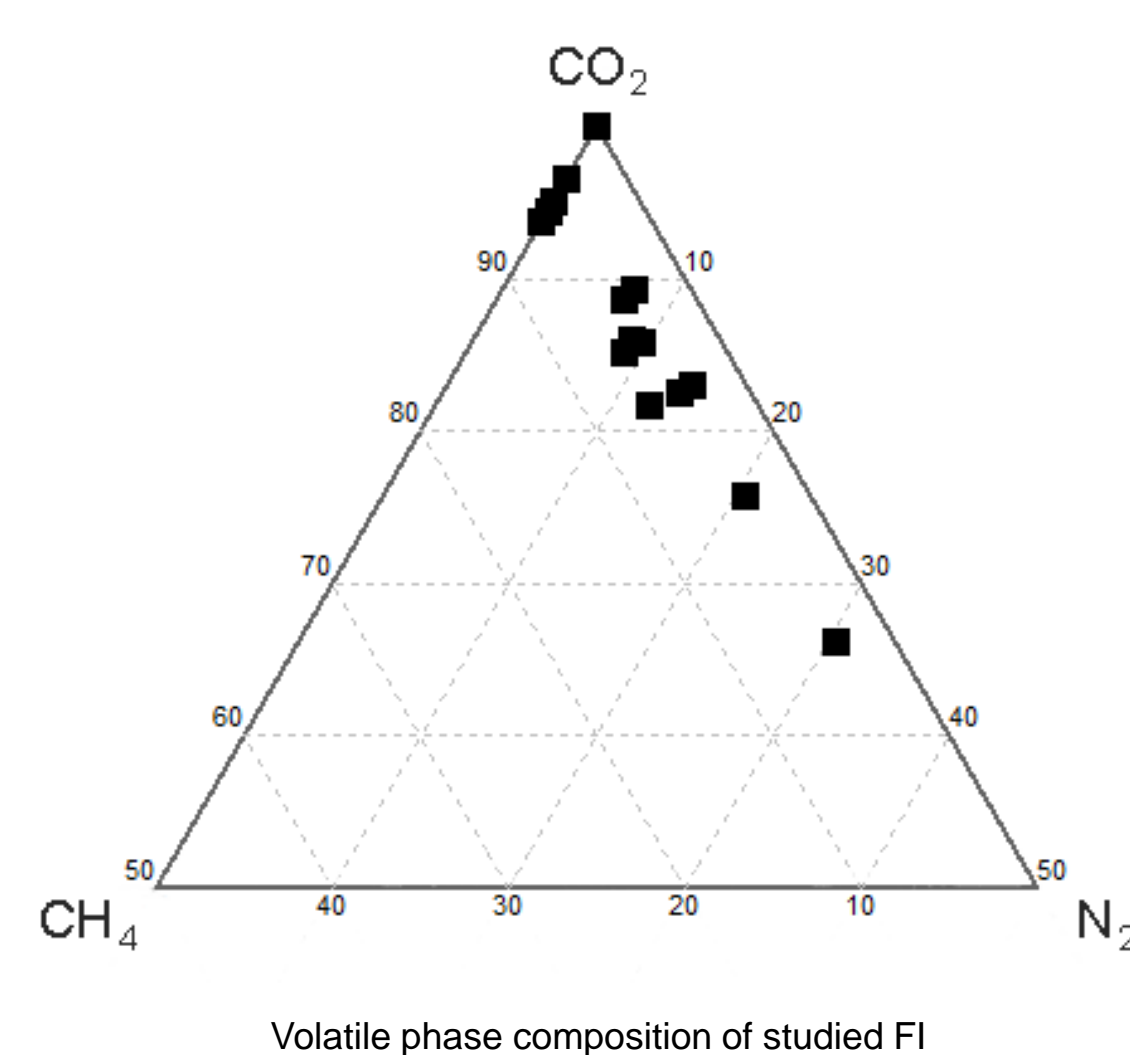
The FI in topaz are primary, randomly distributed, in groups or isolated, with regular and irregular shapes and sizes from 13 to 85  $\mu$ m (66% between 20 and 40  $\mu$ m). At room temperature, the FI are two-phase (or three-phase if a solid phase is present), having a degree of filling (FIw) from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



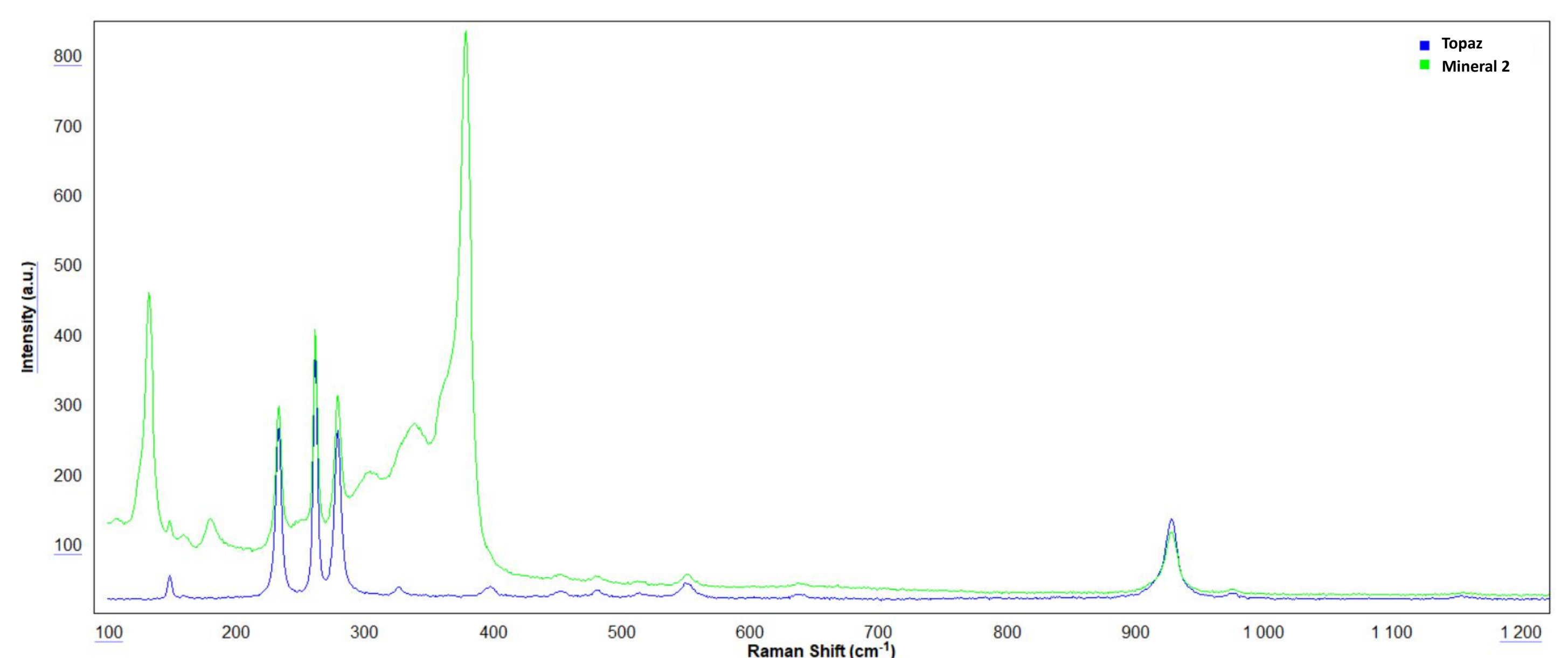
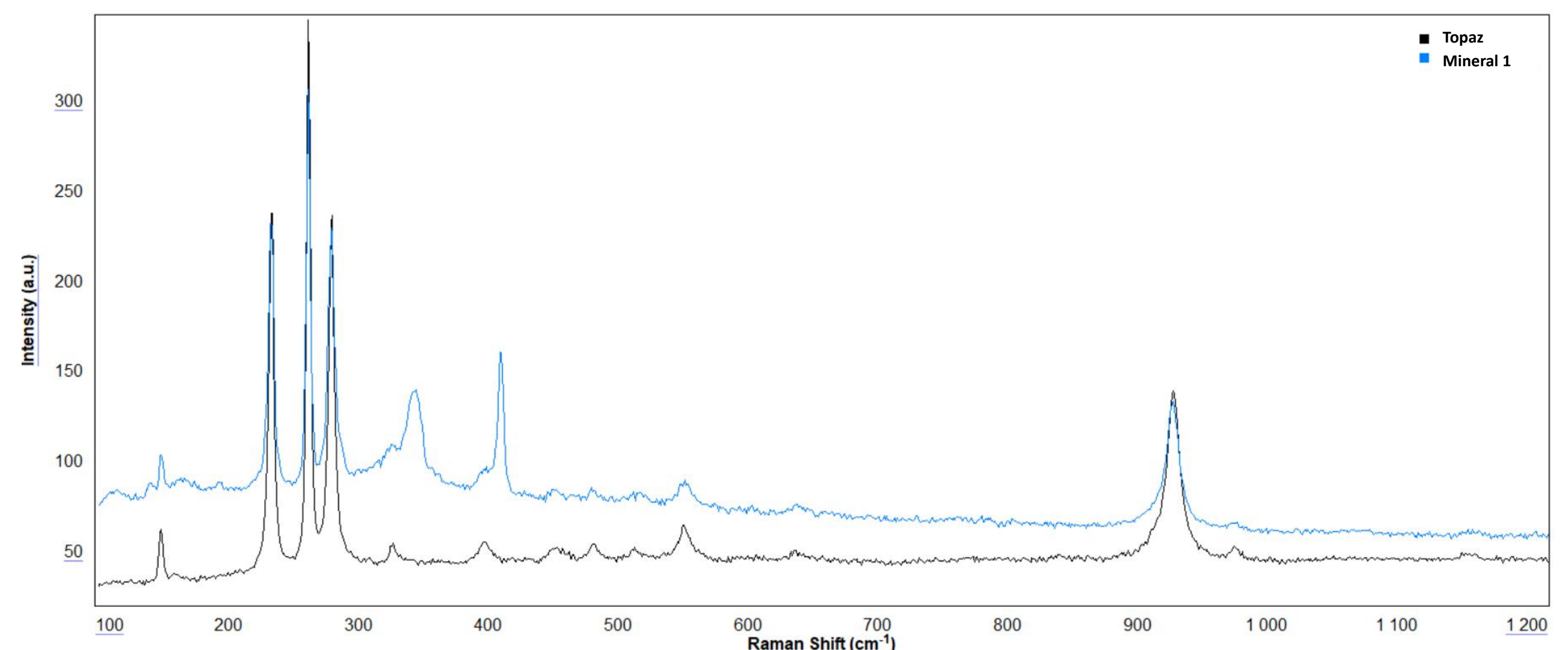
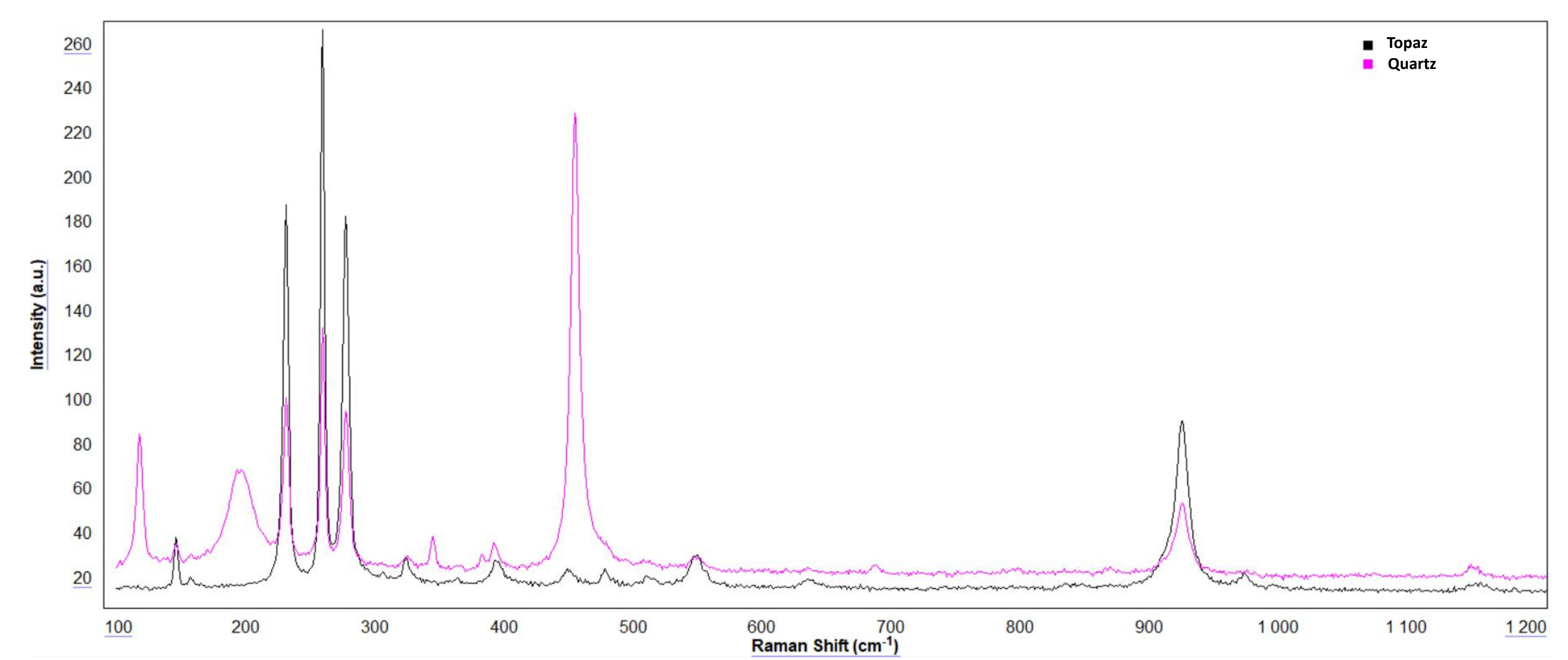
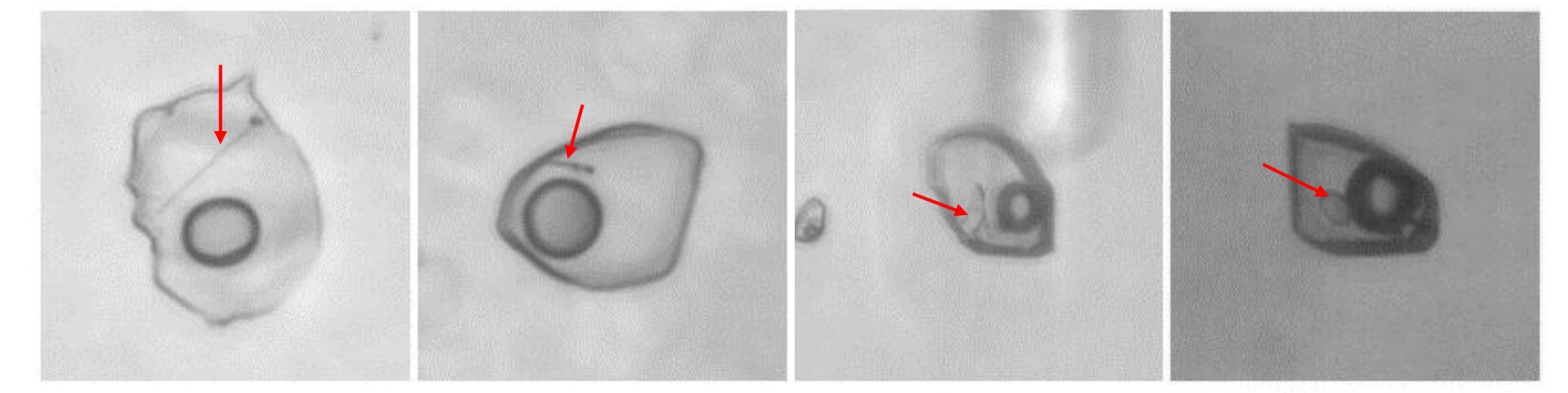
The microthermometry provided values for the final melting temperature of ice (TmIce) between -3.3 and -1.0  $^{\circ}$ C, corresponding to salinities between 1.74 and 5.41 wt.% NaCl. Bulk density between 0.86 and 0.91  $\text{g}/\text{cm}^3$ . Raman microspectrometry allowed to identify  $\text{CO}_2$ ,  $\text{CH}_4$  and  $\text{N}_2$  in the volatile phase of some FI. The volatile phase is dominated by  $\text{CO}_2$  (66.21-100 mol%) with low amounts of  $\text{CH}_4$  (0-6.25 mol%) and  $\text{N}_2$  (0-30.41 mol%).



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



The solid phases present in the fluid inclusions are often opaque with needle-like habit and translucent with irregular shapes or hexagonal habit. Raman analysis of these solid phases allowed the identification of quartz and two distinct phases which, due to the peak positions in the spectrum, seem to correspond to sulphides.



## 5. CONCLUSIONS

In the topaz from Castanho pegmatite, fluid inclusions trapped aqueous fluids with low salinity and some  $\text{CO}_2$ ,  $\text{CH}_4$  and  $\text{N}_2$ , during a late hydrothermal stage. The solid phases present in these fluid inclusions are quartz and apparently two distinct sulphides.



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### References:

- Bodnar, R. J., 1993. Revised equation and table for determining the freezing point depression of  $\text{H}_2\text{O}$ -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., Leningrad: 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