

RESEARCH FIELD:

Mineralogy

RESEARCH TOPIC:

Diffraction studies of thermoelasticity in minerals

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RESEARCH DESCRIPTION:

Thermoelastic properties of minerals vary significantly with composition. In the presence of solid solutions it is not straightforward to predict the behavior of intermediate compositions. In addition data in literature is sometimes contradictory and depends highly on the quality of the experimental setting. Thermal expansion coefficients and elastic constants are not yet determined with sufficient precision for the purposes of calculating precise formation pressures and temperature of equilibrium paragenesis in rocks. Moreover, many natural geomaterials (minerals) are inspiring sources of new technological materials and therefore it is important to know the way they behave to envisage their possible application.

Thermal expansion and elastic constant measurements are frequently determined using powder diffraction methods. However, these methods do not allow accurate determination of structural variations in order to understand the mechanisms ruling anisotropy, which is widely observed in many minerals. Non-ambient single crystal diffraction techniques have undergone a strong enhancement in the last years thus opening new possibilities. Higher levels of accuracy can still be reached.

LABORATORIES OF THE DST IN USE:

Laboratorio di diffrazione raggi X su cristallo singolo, Centro Interdipartimentale di Ricerca per lo Sviluppo della Cristallografia Diffattometrica (CRISDI), Laboratorio microscopia elettronica a scansione con microanalisi (SEM-EDS),

RESEARCH PRODUCTS:

- Alvaro, M., Angel, R.J., and Cámara, F. (2012) High-pressure behaviour of zoisite. *American Mineralogist*, 97, 1165-1176. DOI: 10.2138/am.2012.4014
- Lotti, P., Gatta G.D., Rotiroli, N., and Cámara, F. (2012) High-pressure study of a natural cancrinite. *American Mineralogist*, 97, 872-882. DOI: 10.2138/am.2012.4039
- Pandolfo F., Nestola F., Cámara F., and Domeneghetti M.C. (2012) New thermoelastic parameters of natural C2/c omphacite. *Physics and Chemistry of Minerals*, 39, 295-304. DOI: 10.1007/s00269-012-0484-1
- Pandolfo F., Nestola F., Cámara F., and Domeneghetti M.C. (2012) High-pressure behavior of P2/n omphacite. *American Mineralogist*, 97, 407-412. DOI: 10.2138/am.2012.3928
- Cámara, F., Gatta G.D., Meuvén M. and Pasqual D. (2012) Thermal expansion and high temperature structure evolution of zoisite by singlecrystal x-ray and neutron diffraction. *Physics and Chemistry of Minerals*, 39, 27-45. DOI: 10.1007/s00269-011-0457-9
- Alvaro, M., Cámara, F., Domeneghetti, M.C., Nestola, F. and Tazzoli, V. (2011) HT P2₁/c to C2/c phase transition and kinetics of Fe²⁺-Mg order-disorder of an Fe-poor pigeonite: implications for

cooling history of ureilites. *Contributions to Mineralogy and Petrology*, 162, 599-613. DOI 10.1007/s00410-011-0614-7

- Welch, M.D., Cámara, F., Oberti, R. (2011) Thermoelasticity and high-*T* behaviour of anthophyllite. *Physics and Chemistry of Minerals*, 38, 321–334. DOI 10.1007/s00269-010-0406-z
- Alvaro, M., Nestola, F., Cámara, F., Domeneghetti, M.C. and Tazzoli, V. (2011) High-pressure displacive phase transition of a natural Mg-rich pigeonite. *Physics and Chemistry of Minerals*, 38, 379-385. DOI 10.1007/s00269-010-0411-2
- Redhammer, G.J., Cámara, F., Alvaro, M., Nestola, F., Tippelt, G., Prinz, S., Simons, J., Roth, G., Amthauer, G. (2010) Thermal expansion and high temperature $P_{21/c} - C_{2/c}$ phase transition in clinopyroxene-type $\text{LiFeGe}_2\text{O}_6$ and comparison to $\text{NaFe}(\text{Si,Ge})_2\text{O}_6$. *Physics and Chemistry of Minerals*, 37, 685-704. DOI 10.1007/s00269-010-0368-1
- Tribaudino, M., Angel, R.J., Cámara, F., Nestola, F., Pasqual, D. Margiolaki, I. (2010) Thermal expansion of plagioclase feldspars. *Contributions to Mineralogy and Petrology*, 60, 899–908. DOI 10.1007/s00410-010-0513-3

REFERENTE GRUPPO

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