

RESEARCH FIELD:

Mineralogy.

RESEARCH TOPIC:

Pressure and Temperature induced Structural Modifications and Phase Transitions in Feldspars.

PARTICIPANTS:

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RESEARCH DESCRIPTION:

The Research is focused on experimental studies of phase transitions, structural changes and order/disorder phenomena in feldspars as a function of T and P. These studies define the relationship among state of Al,Si order, HT and HP structural modifications and compressional behavior in feldspars. HP investigations are performed by means of single-crystal X-ray diffraction techniques (Gemini R Ultra Diffractometer, CrisDi and Siemens P4 Diffractometer, DST). The purpose of the investigations is to define the stability fields of the different phases and to investigate the ordering processes observed in feldspars by means of *in situ* HP and HT studies. The crystal structures are investigated directly at HP, in the range between 0 and 10 GPa, using diamond-anvil cell (DAC).

The investigation is carried out on Ca, Ba, Sr and Pb-feldspars, which are of particular interest to both mineralogical and ceramic studies. These studies allow to investigate the pressure induced phase transitions occurring in alkaline-earth feldspars and in Pb-feldspar. Compressional studies on feldspars at HP and HT can provide more accurate equation of state data for petrological applications. The results should allow a more accurate experimental definition of the changes induced by variations in pressure and will enable to characterize the structural evolution and thermodynamic behavior of feldspars.

LABORATORIES OF THE DST IN USE:

Lab. Single-Crystal X-ray Diffraction

Lab. Hydrothermal Synthesis and High Pressure.

RESEARCH PRODUCTS:

- Benna P., Bruno E. (2003) Single-crystal *in situ* high-temperature structural investigation of the I1-I2/c phase transition in Ca_{0.2}Sr_{0.8}Al₂Si₂O₈ feldspar. *American Mineralogist* 88, 1532-1541
- Nestola F., Boffa Ballaran T., Benna P., Tribaudino M., Bruno E. (2004) High-pressure phase transitions in Ca_{0.2}Sr_{0.8}Al₂Si₂O₈ feldspar. *American Mineralogist* 89, 1474-1479
- Benna P., Bruno E. (2006) Long range Al,Si equilibrium configuration in strontium feldspar treated at high temperatures. *Mineralogical Magazine* 70, 65-71
- Benna P., Nestola F., Boffa Ballaran T., Balic-Žunic T., Fahl Lundegaard L., Bruno E. (2007) The high-pressure structural configurations of Ca_{0.2}Sr_{0.8}Al₂Si₂O₈ feldspar: the I1-I2/c and I2/c - P2(1)/c phase transitions. *American Mineralogist* 92, 1190-1199

- Nestola F., Curetti N., Benna P., Ivaldi G., Angel R. J., Bruno E. (2008) Compressibility and high-pressure behaviour of Ab₆₃Or₂₇An₁₀ anorthoclase. *Canadian Mineralogist* 46, 1443-1454
- Curetti N., Sochalski-Kolbus L., Angel R. J., Benna P., Nestola F., Bruno E. (2011) High-pressure structural evolution and equation of state of analbite. *American Mineralogist*, 96, 383-392.

Reference: P. Benna.