High-pressure Behavior of Feldspathoids: the Case of Analcite

G.Diego Gatta[a], F. Nestola[b], T. Boffa Ballaran, [a]*Department of Earth Sciences, University of Milan, Italy.* [b]*Bayerisches Geoinstitut, Bayreuth, Germany.* E-mail: diego.gatta@unimi.it

Feldspathoids are low silica minerals and, similar to zeolites, have large openings in the crystal structure. Elastic and structural behaviour of a natural cubic feldspatoid analcite ($NaAlSi_2O_6 \cdot H_2O$) was investigated up to 8.5 GPa by *in situ* single-crystal X-ray diffraction. A first-order phase transition was observed at P = 0.98±0.07GPa. Lattice parameters and reflection conditions show that the HP-polymorph has a $P\bar{1}$ Sp. Gr. Volume data of the low-P (cubic) and high-P (triclinic) polymorphs were fitted with a second- and third-order Birch-Murnaghan Equation of State [1], respectively. The refined elastic parameters are: V_0= 2571.2(4)Å^3, K_{T0}= 56(3) GPa and K'= 4 (fixed), for the cubic polymorph, V_0= 2613(10)Å^3, K_{T0}= 18(1) GPa and K'= 7.2(7), for the triclinic polymorph. The elastic behaviour of the HP-polymorph, calculated on the basis of the linearised bulk moduli, appears to be strongly anisotropic (K(a):K(b):K(c) = 2.07:1.36:1.00). Tetrahedral tilting produces the main deformation mechanism in response of the cubic→triclinic phase transition. The distortion of the secondary building units gives rise to a change of the 8- and 6-ring channels ellipticity. As a consequence, the extra-framework topological configuration changes: it appears in fact that the coordination number of part of the Na atoms becomes 7 ($2H_2O$ + 5 framework oxygens) instead of 6 ($2H_2O$ + 4 framework oxygens).

[1] Birch F., *Phys. Rev*., 1947, **71**, 809.

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