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6P5. Compressibility and high-pressure behaviour of lead feldspar

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High-pressure *in situ* X-ray diffraction was performed on synthetic lead feldspar. The crystals, with composition $PbAl_2Si_2O_8$, were synthesized from melt as in a previous work and thermally treated at T = 1150°C for 12 h and further annealed at T = 1000°C for 70 h [1]. A single crystal of lead feldspar was preliminary characterized by using a Gemini R Ultra X-ray diffractometer (CrisDi, University of Torino). At room condition the unit-cell parameters are a = 8.3936(4), b = 13.0498(7), c = 14.3258(8) Å, β =115.281(6)°, V = 1418.9(1) Å^3; space group: $I2/c$; Q_{od} = 0.7.

The sample was loaded in an ETH-type diamond anvil cell (DAC) and the unit-cell parameters were measured in the P range 0.0001 - 8.4 GPa at room T, using a Siemens P4 diffractometer and SINGLE software [2]. The evolution with pressure of the unit-cell parameters and volume shows a strong discontinuity between 7.7 and 8.2 GPa indicating a first order-phase transition. In the P range 0.0001 - 7.7 GPa the trend shown by the axial compressibility ($_a$ > $_c$ > $_b$) is similar to that observed in the previous HP powder diffraction study, performed on lead feldspar using high-brilliance synchrotron radiation up to 7.1 GPa [3].

In the P range 0.0001 - 4.3 GPa at room T, the P-V data of the $I2/c$ lead feldspar were fitted with a 2nd-order Birch-Murnaghan EoS, using EosFit7c software [4]. The parameters obtained are: V_0 = 1422.2(1) Å^3 and K_{T0} = 76.4(9) GPa. At P > 4.27 GPa, the volume values deflect from the BM2 curve and show a volume softening, precursor of the reported HP phase transition. Also in strontium feldspar a volume softening was recently observed above 4.2 GPa [5].

Another crystal of lead feldspar of the same synthesis was loaded in the DAC to investigate the structural changes with increasing pressure. Single-crystal diffraction intensities were collected with Gemini diffractometer at P=0.0001, 2.4, 3.1, 5.4, 6.0, 7.2, 8.4, 9.7 GPa. The measurements up to 7.2 GPa showed only a (h+k = even, l = even) and b-type (h+k = odd, l = odd) reflections ($I2/c$ space group). The appearance of c (h+k = even, l = odd) and d-type (h+k = odd, l = even) reflections at P = 8.4, the analysis of the systematic absence and the structural refinements indicate that the HP first-order transformation is an $I2/c$ - $P2_1/c$ phase transition.

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