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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  $\text{PbAl}_2\text{Si}_2\text{O}_8$ , were synthesized from melt as in a previous work and thermally treated at  $T = 1150^\circ\text{C}$  for 12 h and further annealed at  $T = 1000^\circ\text{C}$  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,  $\beta = 115.281(6)^\circ$ ,  $V = 1418.9(1)$  Å<sup>3</sup>; space group:  $I2/c$ ;  $Q_{\text{od}} = 0.7$ .

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 ( $\alpha_a > \alpha_c > \alpha_b$ ) 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<sup>3</sup> 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  $a$  ( $h+k = \text{even}$ ,  $l = \text{even}$ ) and  $b$ -type ( $h+k = \text{odd}$ ,  $l = \text{odd}$ ) reflections ( $I2/c$  space group). The appearance of  $c$  ( $h+k = \text{even}$ ,  $l = \text{odd}$ ) and  $d$ -type ( $h+k = \text{odd}$ ,  $l = \text{even}$ ) 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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