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LETTER

High-pressure $I2/c$-$P2_1/c$ phase transformation in $SrAl_2Si_2O_8$ feldspar

FRANCESCO PANDOLFO,[1] TIZIANA BOFFA BALLARAN,[2] FABRIZIO NESTOLA,[3,*] MONIKA KOCH MÜLLER,[4] MARIA MROSKO,[4] AND EMILIANO BRUNO[5]

[1]Dipartimento di Scienze della Terra, Università di Pavia, Via Ferrata 1, I-27100 Pavia, Italy
[2]Bayerisches Geoinstitut, Universität Bayreuth, Universitätstrasse 37, D-95440 Bayreuth, Germany
[3]Dipartimento di Geoscienze, Università di Padova, Via Giotto 1, I-35137 Padova, Italy
[4]Helmholtz-Zentrum Potsdam, Deutsches GeoForschungsZentrum–GFZ, Germany
[5]Dipartimento di Scienze Mineralogiche e Petrologiche, Università di Torino, Via Valperga Caluso 35, I-35127 Torino, Italy

ABSTRACT

In situ, high-pressure single-crystal X-ray diffraction experiments were performed on a feldspar with composition $SrAl_2Si_2O_8$ (space group $I2/c$). The measurements were performed at 19 different pressures up to 7.9 GPa. The unit-cell parameters and the unit-cell volume show a strong discontinuity at 6.6 GPa indicating a first-order phase transition. The systematic absences clearly show that the transition occurs from $I2/c$ to $P2_1/c$ space group symmetry, as for the transition recently reported for a feldspar with composition $Sr_{0.8}Ca_{0.2}Al_2Si_2O_8$.

Our results suggest that the $P2_1/c$ phase is softer than the $I2/c$ one. Moreover, within the $I2/c$ symmetry two pressure–volume trends are evident due to a volume softening above 4.2 GPa. The softening did not allow fitting the data to a single equation of state, and only the data up to 3.67 were fitted with a third-order Birch-Murnaghan equation of state.

Based on our and previous experimental results we propose a possible composition-pressure stability field for the Sr-rich side along the $CaAl_2Si_2O_8$-$SrAl_2Si_2O_8$ join.

Keywords: $SrAl_2Si_2O_8$ feldspar, high pressure, single crystal, phase transition