

**SYNCHROTRON INFRARED SPECTROSCOPY
OF SYNTHETIC $P2_1/m$ AMPHIBOLES AT HIGH PRESSURE**

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The Na(NaMg)Mg₅Si₈O₂₂(OH)₂ amphibole represents a key double-chain silicate to model the $P2_1/m - C2/m$ phase-transition in A-site filled amphiboles (IEZZI et al., 2004). It has $P2_1/m$ symmetry at room- T , and reverses to the usual $C2/m$ space-group of monoclinic amphiboles at ~ 257 °C (CAMARA et al., 2003). Della Ventura et al. (this volume) found that the aggregate B-site dimension has a strong influence on the transition temperature (T_c) based on high temperature infrared (HTIR) studies of the OH stretching vibrations. We report here an IR study of the same samples studied by Della Ventura et al. (this volume) at high pressure up to 30 GPa using synchrotron radiation.

The experiments were carried out at U2A beamline on the VUV ring of the National Synchrotron Light Source, Brookhaven National Laboratory. The fine amphibole powder was loaded into a symmetric diamond anvil cell (DAC) together with some ruby chips as pressure gauge. High-pressure IR absorption spectra of the synthetic amphiboles were collected using a Bruker IFS 66v/S vacuum Fourier transform interferometer, Bruker IRscope II microscope equipped with a HgCdTe type-A detector.

The spectrum of the Na end-member shows three bands: (A) at 3740 cm⁻¹, (B) at 3715 cm⁻¹ and (C) at 3667 cm⁻¹, respectively (IEZZI et al., 2004). The higher-frequency bands are assigned to two non equivalent H atoms interacting with ^ANa; this pattern is typical of an amphibole with a P -lattice. The ^BLi-bearing amphiboles show in addition a fourth, minor band at 3690 cm⁻¹. The bulk intensity of the A and B bands is > 95%, suggesting that the analysed amphiboles have virtually full A-sites. With increasing P , we observe two main modifications of the spectra: 1) all bands linearly shift toward higher frequency. At 20.8 GPa, the peak centroid of the main (A) band is > 3800 cm⁻¹ 2) the A and B bands merge into a single, broad absorption, and the P value at which the A-B doublet disappear is a function of the B-site occupancy. For the ^BNa end-member the A and B bands merge at around 18 GPa; for sample 406, with nominal B-site composition (Na_{0.2}Li_{0.8}Mg₁), the A and B bands merge around 13 GPa. These results show that the Na(NaMg)Mg₅Si₈O₂₂(OH)₂ amphibole undergoes a $P2_1/m - C2/m$ phase transition at high P , and that the transition pressure, P_c , is a function of the aggregate dimension of the B-site, in a fashion similar to that observed by Della Ventura et al. (this volume) for increasing T . However, while for decreasing $\langle \text{B}_T \rangle$ (increasing ^BLi in solid-solution) Della Ventura et al. observe an increase in the T_c , the results presented here show that the reverse is true for P_c , in a fashion similar to what occurs in clinopyroxenes.

References

- CAMARA, F., OBERTI, R., IEZZI, G. & DELLA VENTURA, G. (2003): Phys. Chem. Minerals, **30**: 570-581.
IEZZI, G., DELLA VENTURA, G., CAMARA, F., OBERTI, R. & HOLTZ, F. (2004): Am. Mineral., **89**: 640-646.