High-pressure Single-crystal Study of Chlorite

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Chlorite is a major constituent of hydrated oceanic crust, and may represents an important water carrier in subducting slabs. In this context, its stability under high pressure has relevant implications on rheology and melting behaviour of mantle rocks.

The structural effects of pressure on a natural chlorite from Val Malenco (Italy) [clinochlor, polytype II*b*-4, S.G. *C*-1, pseudomonoclinic metric, composition $(Mg_{7.82}Al_{3.36}Fe^{2+}_{0.52}Fe^{3+}_{0.30})(Si_{7.70}Al_{0.30})\ O_{20}(OH)_{16}$] have been studied by X-ray diffraction on single-crystal mounted in a DAC. Pressure was calibrated through the EoS of α-quartz.

Structural refinements were performed at 0, 0.8, 1.8, 2.7, 3.5, 4.4, 5.1 GPa with intensity data collected on a CCD Xcalibur diffractometer (Oxford Instr.) equipped with monochromatized MoKα. Lattice parameters were measured with the point-detector mounted on the same instrument.

The compressibility data of chlorite (bulk modulus K= 83(1) GPa, K'= 4) are in fair agreement with data based on powder neutron [1] and synchrotron diffraction methods [2,3]. Axial moduli are 102(2), 97(3) and 63(1) GPa respectively for *a*,*b* and *c* axes. The main structural deformations affect the interlayer region where the hydrogen bonds are relevant to the structural properties of the phase. The OH-O distances decrease of about 4% in the 0-5 GPa range. Work is in progress and further details will be presented at the conference site.

[1] Welch M.D., Marshall W.G., *Am. Mineral*., 2001, 1380. [2] Pawley A.R., Clark S.M., Chinnery N.J., *Am. Mineral*., 2002,1172. [3] Welch M.D, Crichton W.A., *Eur. J. Min*., 2002, 561.

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