Compressibility of a new Al-bearing hydrous Mg-silicate (23 Å phase) under high pressure and high temperature

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Abstract

Previously we reported a new Al-bearing hydrous Mg-silicate named 23 Å phase ($Mg_{11}Al_2Si_4O_{16}(OH)_{12}$) with a hexagonal structure (Cai et al., in press), which could be a very important hydrous phase in an Al-bearing subducting slab. Here for the first time we determined the equation of state of this new 23 Å phase up to 10 GPa and 1073 K by energy-dispersive *in situ* X-ray diffraction. Fitting the *P-V* data to the room temperature Birch-Murnaghan equation of state yields: V_0 = 537.7(2) Å^3, K_0 = 112(1) GPa, K' = 4. The high temperature 3rd order Birch-Murnaghan equation of state was used to fit the *P-V-T* data, and yields: V_0 = 538.0(3) Å^3, K_0 = 109(1) GPa, $\partial K/\partial T$ = -0.012(5) GPa/K, a_0 = 3.0(4) × 10^{-5}/K., K' = 4. No or slight anisotropy was observed, and the compressibility is -2.54(2) 10^{-3}/GPa for a axis and -2.68(5) 10^{-3}/GPa for c axis. This new hydrous phase has a very similar compressibility comparing with phase A (105(4) GPa. Kuribayashi et al., 2003) and phase E (112 GPa, Bass et al., 1991), while lower density (2.761 g/cm^3) than that of phase A (2.96 g/cm^3) and phase E (2.88 g/cm^3) (Crichton and Ross, 2000), indicating that this new phase may be stable in the upper mantle condition.

References

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