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LETTER

Single-crystal elastic properties of dense hydrous magnesium silicate phase A

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ABSTRACT

The single-crystal elastic properties of phase A have been investigated by Brillouin spectroscopy at ambient conditions. The Voigt-Reuss-Hill average for the adiabatic bulk and shear moduli are K_S = 106(1) GPa and μ = 61(1) GPa, respectively. The present acoustic measurements resolve discrepancies between the bulk moduli obtained in earlier compression studies. The axial compressibility of the hexagonal ($P6_3$) structure is highly anisotropic with the *c*-axis, which is perpendicular to the distorted close-packed layers, approximately 21% stiffer than the *a*-axis, in agreement with previous compression studies. The hydration of forsterite to phase A decreases the bulk and shear moduli by about 18 and 21%, respectively, while both compressional V_P and shear V_S wave velocities decrease by about 7%. These results suggest that water could be identified seismologically if phase A is present in abundance in cold subducted slabs.

Keywords: Single-crystal elasticity, phase A, Brillouin spectroscopy, water in subduction zones