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Sound velocities in KAlSi3O8-hollandite [liebermannite] vs. pressure

A polycrystalline specimen of liebermannite [$KAlSi_3O_8$-hollandite] was synthesized at 14.5 GPa and 1473K using glass starting material in a uniaxial split-sphere apparatus. The recovered specimen is pure tetragonal hollandite [SG: *I4/m*] with bulk density of within 98% of the measured X-ray value. The specimen was also characterized by Raman spectroscopy [?] and nuclear magnetic resonance spectroscopy. Sound velocities in this specimen were measured by ultrasonic interferometry to 13 GPa at room T in a uniaxial split-cylinder apparatus using Al_2O_3 as a pressure marker. Finite strain analysis of the ultrasonic data yielded K_{S0} = 145.0 (11) GPa, K_0' = 4.9(2), G_0 = 92.3(3) GPa, G_0' = 1.6(1) for the bulk and shear moduli and their pressure derivatives, corresponding to V_{P0} = 8.4(1) km/s, V_{S0} = 4.9(1) km/s for the sound wave velocities at room temperature. These elasticity data are compared to literature values obtained from static compression experiments and theoretical density functional calculations.