

Temperature Derivatives of Elastic moduli of Modified Spinel, Beta Phase, and Composition of the C Layer

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Modified spinel was synthesized at high pressure and temperature. Its composition is $(\text{Mg}_{0.91}\text{Fe}_{0.09})_2\text{SiO}_4$, and density is 3.6081 Mg/m^3 . Resonant frequencies and their temperature dependence of a small sphere specimen were measured for eight modes. Bulk moduli and their temperature derivatives are $K_S = 165.698$, $K_T = 164.452$ in GPa, and $K_S^* = -0.0160$, $K_T^* = -0.0222$ in GPa/K. Rigidity modulus and its T-derivative is 105.661 GPa and -0.0124 GPa/K , respectively.

Slopes of velocities are $v_p^* = -4.0$ and $v_s^* = -2.4$ in 10^{-4} km/sK . Anharmonic parameters, such as Gruneisen $\text{prmt} = 1.22$, $\Delta S = 4.64$, and $\Delta T = 6.48$. Mineral constitution in the upper mantle is discussed.