Thermal equation of state of omphacite

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ABSTRACT

In-situ synchrotron X-ray diffraction experiments were conducted using the MAX-III multi-anvil press of KEK on an omphacite ($Di_{63}Jd_{37}$), for which $Di = Ca(Mg,Fe)Si_2O_6$ and $Jd = NaAlSi_2O_6$. Pressure-volume-temperature data were collected at up to 10 GPa and 1000 K. A fit to the high-temperature Birch-Murnaghan equation of state yielded an isothermal bulk modulus $K_{T0} = 126(1)$ GPa, an assumed pressure derivative of the bulk modulus $K_T' = 4.0$, a temperature derivative of the bulk modulus $(\partial K_T/\partial T)_P = -0.015(4)$ GPa/K, and a volumetric thermal expansivity $\alpha = 2.2(1) \times 10^{-5}$ K^{-1}, when the equation of state of NaCl by Brown (1999) is adopted for the pressure scale. The derived K_{T0} value is consistent with the linear interpolations from K_{T0} values for diopside and jadeite in the literature.