American Mineralogist, Volume 84, pages 856–860, 1999

High-pressure equation of state of magnesite: New data and a reappraisal

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ABSTRACT

The room-temperature static compression of magnesite ($MgCO_3$) has been measured by X-ray powder energy-dispersive diffraction in a diamond-anvil cell. Different pressure transmitting media and an internal pressure standard (gold) were used in order to differentiate the effects of stresses or pressure measurement errors in determining the isothermal bulk modulus K_0 and first pressure derivative K_0'. A third order Eulerian equation of state accounts well for the sets of data obtained in different configurations and yields a bulk modulus $K_0 = 115(1)$ GPa and an ambient unit-cell volume $V_0 = 278.9(1)$ Å^3 with a pressure derivative K_0' fixed to 4, consistent with recent measurements of Zhang et al. (1997) and Ross (1997). Measurements collected to 72 GPa allow us to have a reliable constraint on the first pressure derivative K_0'. The best fit to the data yields $K_0 = 108(2)$ GPa, $K_0' = 4.6(2)$, and an ambient unit-cell volume $V_0 = 279.1(1)$ Å^3. The first pressure derivative K_0' would be 4.5(1) with a bulk modulus fixed to the value of 110 GPa derived from the ultrasonic measurement of Christensen (1972).