stishovite) which has a mean density at zero pressure $\bar{\rho}_0$ of 4.08 g/cm^3. This value of $\bar{\rho}_0$ compares very well with 4.10 (±0.05) g/cm^3, the density value obtained by extrapolation of trajectory (4) to the zero-pressure point by the use of the Birch equation of state. Thus, the usefulness of the proposed scheme for identification of phases and their densities at high pressures is readily observed.

In summary, then, the author concludes the following: a) the analytical scheme proposed in this paper involving eqs. (3) and (5) is useful for constructing equations of state of solid phases that cannot be determined experimentally given the present state of technology, and b) one now should be able to model in the laboratory the elasticity and constitution of the earth's interior by incorporating the information on experimental petrology, high-pressure compression data and geophysical field observations in this approximation scheme. In a subsequent series of communications, the results of such an attempt shall be reported.

The author is grateful to Francis Birch who gave encouragement to look further into the equations of state of high-pressure solid phases. The idea presented here is simple, but it works as illustrated, and it is the only one of its kind proposed in the geophysical literature. This study was supported by the National Science Foundation.

* The Hugoniot curve is found from the pressure-volume-energy (PVE) surface specified by the input through the constraint equation

$$E_2 - E_1 = \tfrac{1}{2}(p_1 + p_2)(V_1 - V_2)$$

which is the energy-jump condition for a shock transition from State 1 to State 2. In the case of a phase transition, the Gibbs free energy is found by integrating the equation of state of each phase and the additional constraint that "the Gibbs free energy must be equal" is imposed in the mixed-phase region. The slope of the equilibrium Hugoniot curve in the mixed-phase region depends on the entropy difference and volume difference between phases. For any reasonable value of these parameters, the slope of the equilibrium Hugoniot curve in the mixed-phase region is much smaller than the slope of the actual shock-wave data points. Therefore, the transition does not go to completion in the shock experiments and in this intermediate region consisting of mixed phases no conclusion on density of the high-pressure phase can be drawn.

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$$\frac{dS_{ij}}{dX} = \frac{1}{\Delta_0}[A_{ij} - S_{ij0}\Delta]$$

and this equation is dimensionally inconsistent. The correct equation should have been

$$\frac{d\hat{S}}{dX} = -\hat{S}\frac{dC}{dX}\hat{S}.$$

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