

$$\exp \left\{ \frac{2}{(-r)^{1/2}} \left[\tan^{-1} \frac{K_0'}{(-r)^{1/2}} - \tan^{-1} \frac{CP + K_0'}{(-r)^{1/2}} \right] \right\} \quad (11b)$$

respectively. We note from the figure that both equations predict similar values of compression over a considerable pressure range. For negative values of C , equation 11 exhibits an inflection point, corresponding to the maximum value of K at the positive pressure $P = -K_0'/C$, and at another finite positive pressure

$$P = - \left[\frac{K_0' + (r)^{1/2}}{C} \right]$$

the bulk modulus and volume are both zero. In addition, for positive values of C , equations 11, 10a, and 11b tend to the limits

$$\left[\frac{K_0' - (r)^{1/2}}{K_0' + (r)^{1/2}} \right]^{1/(r)^{1/2}}, \exp \left[- \frac{2}{K_0'} \right],$$

and

$$a_1 = a^2 C + 2a(K_0' - m) \quad (A2)$$

$$\exp \left[\frac{2}{(-r)^{1/2}} \tan^{-1} \frac{K_0'}{(-r)^{1/2}} - \frac{\pi}{(-r)^{1/2}} \right]$$

respectively, as $P \rightarrow \infty$. Nevertheless, these equations usually predict reasonable behavior beyond the range of experimental data. The behavior predicted by this quadratic approximation to the bulk modulus has been discussed also by *Macdonald* [1969] in a recent review paper on equations of state.

APPENDIX A. SOME OTHER POSSIBILITIES

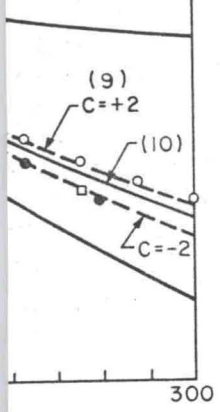
There are many expressions that may be suitable for representing the bulk modulus as a function of pressure. To put equation 2 in a more general setting, we write

$$\frac{d(K/K_0)}{dP} = m + \frac{a_1}{P + a} + \frac{a_2}{(P + a)^2} \quad (A1)$$

When one solves for a_1 and a_2 in terms of K_0' , C , m , and a , the results are

COMPRESSION
BY BRIDGMAN, 1964
AND WALSH, 1958

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a quadratic approximation to the bulk modulus given by

$$K = 1 + K_0'P + \frac{1}{2}CP^2$$

the volume formula predicted by the quadratic approximation is obtained in a manner similar to that given in Appendix B. The result is that is

$$\int \frac{dP}{\frac{1}{2}CP^2 + K_0'P + 1} = \frac{K_0' + (r)^{1/2} [K_0' - (r)^{1/2}]^{1/2}}{K_0' - (r)^{1/2} [K_0' + (r)^{1/2}]^{1/2}} \ln \left| \frac{2(K_0' - (r)^{1/2}) + CP + K_0'}{2(K_0' - (r)^{1/2}) + CP + K_0'} \right|$$

For $(K_0')^2 - 2C > 0$. For $r = 0$, the same equation becomes

$$\ln \left(\frac{2}{CP + K_0'} - \frac{2}{K_0'} \right) \quad (1)$$

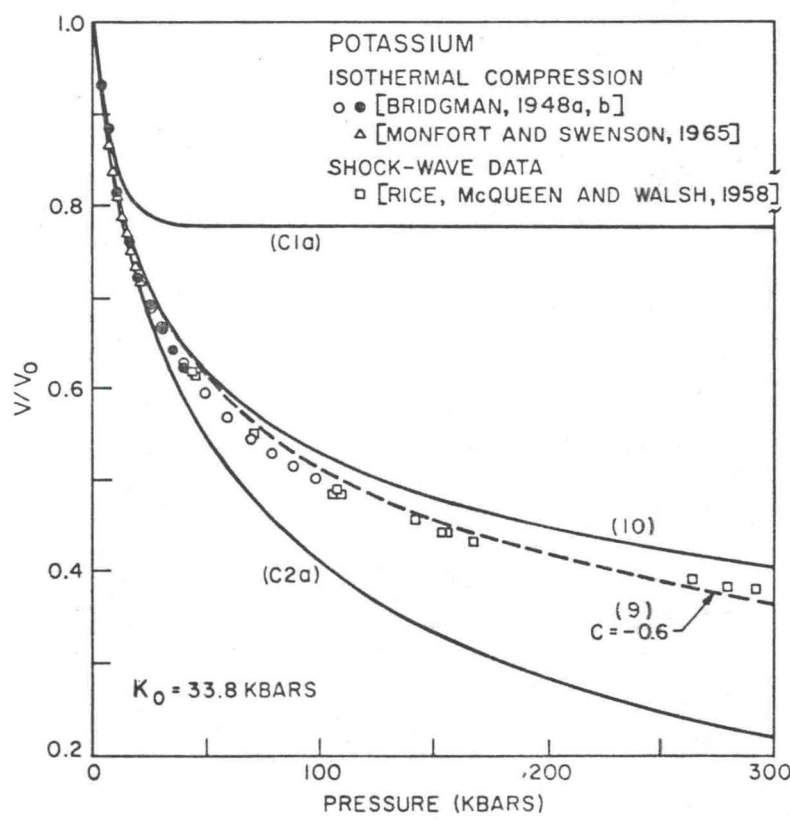


Fig. 5.