

# EQUATION OF STATE

The equation of state used by Bridgman to represent compression data is

$$-\frac{\Delta V}{V_0} = a_v P - b_v P^2 \quad (8)$$

where coefficients  $a_v$  and  $b_v$  are functions of temperature only. Successive differentiation of equation (8) yields  $a_v$  and  $b_v$  as functions of the isothermal bulk modulus and its pressure derivative:

$$a_v = \frac{1}{B_T} \quad (9)$$

and

$$b_v = \frac{1}{2B_T^2} \left( \frac{dB_T}{dP} + 1 \right) \quad (10)$$

where all quantities are evaluated at zero pressure. Using equations (9) and (10), the ultrasonic experiments give the following coefficients for tantalum:

$$a_v = 0.526 (10^{-3} \text{ kbar}^{-1})$$

and

$$b_v = 0.581 (10^{-6} \text{ kbar}^{-2}).$$

The zero pressure compressibility,  $a_v$ , like the elastic constants published by Featherston and Neighbours<sup>(2)</sup>, is known within 1 per cent while  $b_v$  is about 5.2 per cent uncertain as determined by propagation of maximum errors.

The ultrasonic equation of state is compared in Fig. 2 with the 1949, 30 kbar, relative compression data of Bridgman<sup>(15)</sup>. This plot