



Fig. 15 Pressure-volume relations in diamond cell

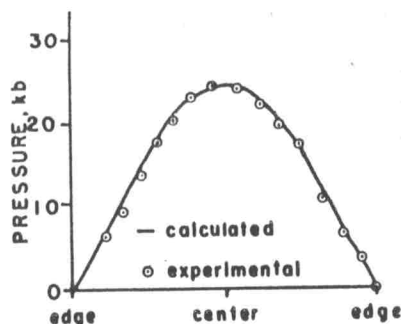


Fig. 16 Calculated pressure gradient - TlBr, 12 kbar.

$$V = f(P, T, h, r) = \pi r^2 h$$

At constant temperature and pressure

$$\left(\frac{dV}{dP}\right)_{P, T, r} = \pi r^2 \left(\frac{dh}{dP}\right)_r$$

However, this is the same volume change which would occur at a given applied pressure in an identical system of constant  $h$  and variable  $r$ , Fig. 26(b), i.e.

$$\left(\frac{dV}{dP}\right)_{P, T, h} = 2\pi r h_0 \left(\frac{dr}{dP}\right)$$

This volume change can be related to  $\beta$  and give a relations for  $dP/dr$ , the pressure gradient. Combining the definition of  $\beta$ , equation (1) and the foregoing expression, we get

$$-(1/V_0) 2\pi r h_0 \left(\frac{dr}{dP}\right) = \beta$$

Multiplying both sides by  $V_0/\Delta V_a$ , where  $\Delta V_a = \pi h_0 (r_0^2 - r_a^2)$ , we get

$$-(2r/r_0^2 - r_a^2) dr = (\beta dP) (V_0/\Delta V_a)$$

Integrating between  $r_0$  and  $r$  corresponding to  $P=0$  kbar at the edge to  $P = P$  at  $r$ , we get

$$-\int_{r_0}^r (2r/r_0^2 - r_a^2) dr = V_0/\Delta V_a \int_0^P \beta dP$$

or

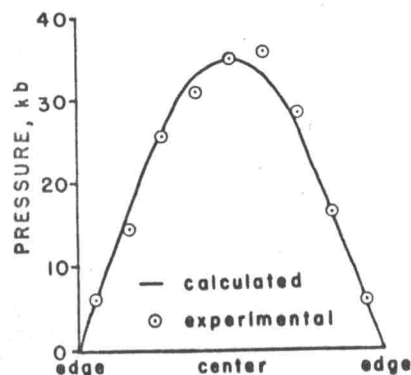


Fig. 17 Calculated pressure gradient - NaCl, 20 kbar

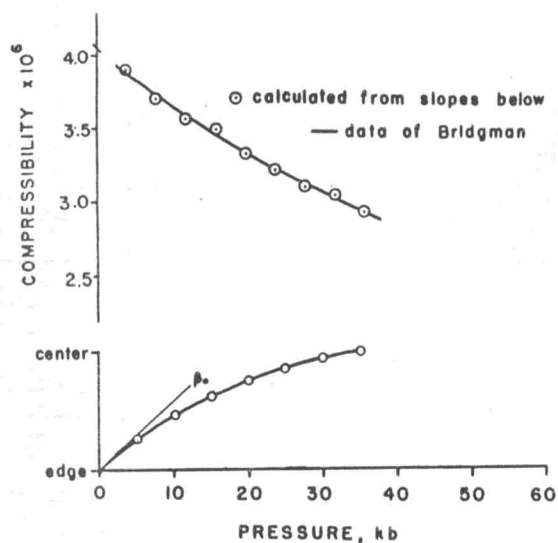


Fig. 18 Compressibility calculation - NaCl

$$\frac{1 - r^2}{1 - r_a^2} = \frac{(aP - bP^2)V_0}{V_a} = \frac{aP - bP^2}{aP_a - bP_a^2} \quad (2)$$

Similarly, the pressure,  $P$ , and  $r$  may be compared to  $P_m$ , the maximum pressure at the center of the cell by means of a similar derivation to get relation (3).

$$\frac{1 - r^2}{1 - r_m^2} = \frac{(aP - bP^2)V_0}{\Delta V_m} = \frac{aP - bP^2}{aP_m - bP_m^2} \quad (3)$$

Now it is necessary to introduce another relation to evaluate the constant  $r_a$ ; viz.

$$\bar{P} = \frac{\sum_1 A_1 P_1}{\sum_1 A_1}$$