

FIG. 2. The volume change on melting of He³ and He⁴ at low pressures. The large circles represent measurements made with the small, heavy-walled cell, while the small circles represent those made with the large, thin-walled cell.

dP_m/dT_m . Similar properties for He³ are given in Table II. Maximum errors are estimated to be 0.5 percent for ΔV_m , 0.1 percent for V_f , and 1 percent for ΔS_m . In Table III are presented the melting parameters for the solid-solid transition of He³. Results of the high-pressure, room-temperature gas-density determinations for He⁴ and He³ are given in Table IV.

As in the case of N₂ (15), the ΔV_m data were fitted to the equation

$$\Delta V_m = A - B \log_{10}(P_m + C) \quad (1)$$

by the method of least squares. For He³ two sets of constants were needed—one for the region below the triple point and the other for the region above. It was not possible to fit the He⁴ ΔV_m data to Eq. (1) over the full pressure range studied. However, for the purpose of interpolation, a fit was made from 175 to 3555 kg/cm². The constants in Eq. (1) for the various solids are presented in Table V. Listed also are the pressure range and rms deviation in ΔV_m .

The melting curve data at low pressure were fitted by the method of least squares to analytical expressions of the form,

$$P = A' + B'T + C'T^2 + D'T^3 + E'T^4. \quad (2)$$

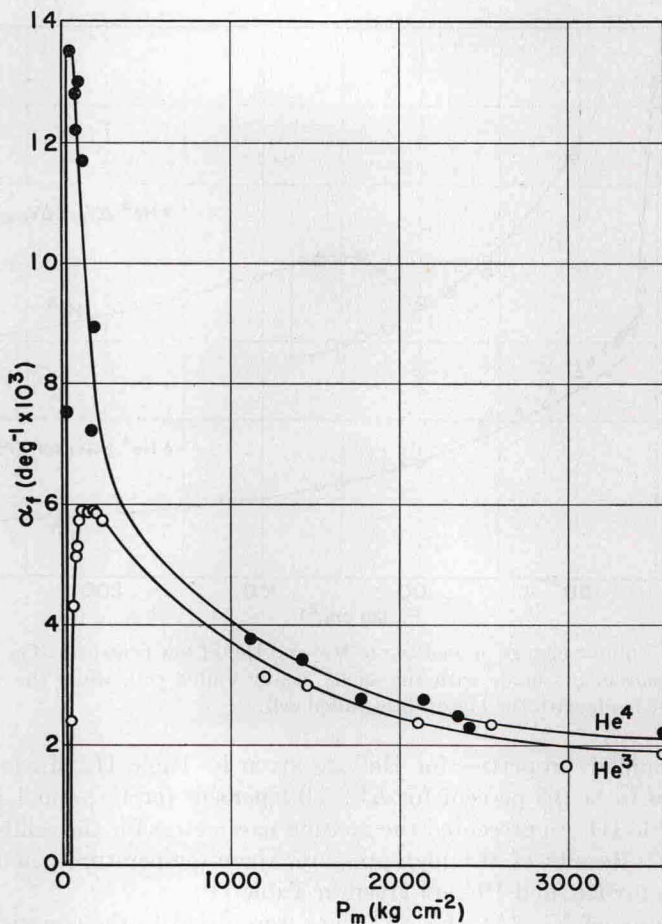


FIG. 3. The thermal expansion coefficient of fluid He³ and He⁴ along the melting curve.

For He⁴ a fit was made only above the λ -point; for He³ separate curves were fitted below and above the triple point. Fitted also to this equation were measurements of the solid-solid transition line in He³. Constants in Eq. (2) for the various transitions are given in Table VI along with the temperature range covered and the rms deviation in P . The melting curves at higher temperatures and pressures are well represented by the constants given earlier (1) for the Simon equation,

$$P_m = a + bT_m^c. \quad (3)$$

Data for the molar volume of fluid along the melting curve could be repre-