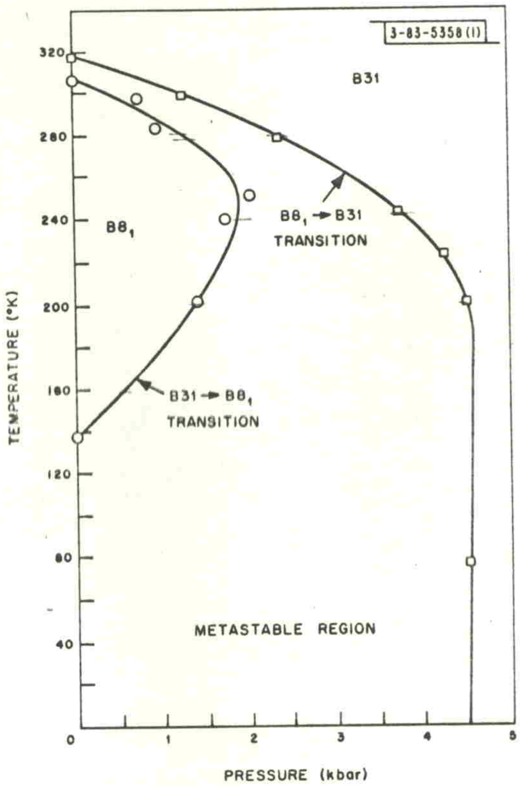

Fig. III-2. Hysteresis of B8$_1$ ⇄ B31 transition in MnAs.

implies a $d\mu/dV > 0$ in a critical molar volume range $V_t - \Delta V < V < V_t$, where V_t is the molar volume at T_t and $\Delta V/V \approx 0.025$.

(2) A first-order B8$_1$ ⇄ B31 transition at T_c occurs only if the molar volume at T_c falls within the critical range. Further, the fact that the low-temperature phase is hexagonal, with a discontinuous expansion of the basal planes on cooling through T_c, demonstrates that there is a large, positive exchange striction in the basal planes if $V > V_t - \Delta V$ at T_c. This exchange striction has essentially disappeared where $V < V_t - \Delta V$.

Bean and Rodbell[12] have shown that a first-order transition can occur at T_c if

$$T_c = T_o\,[1 + \beta(V - V_o)/V_o] \quad ,$$

both the coefficient β and the compressibility are large, and there is a large ΔV at T_c due to exchange striction. Since T_c is proportional to $W\mu^{*2}$, where W is the Weiss molecular field and $\mu^{*2} \approx 4S(S+1)\,\mu_B^2$, it follows that

$$\beta = \left(\frac{1}{W}\frac{dW}{dV} + \frac{2}{\mu^*}\frac{d\mu^*}{dV}\right) \quad .$$

Bean and Rodbell assumed $d\mu^*/dV = 0$, and therefore required a large $dW/dV > 0$. However, analysis of available data gives $dW/dV < 0$ and

$$6 < \beta < 22 \quad \text{for} \quad 3 \geqslant (\mu_8^*/\mu_{31}^*)^2 \geqslant 2$$