E. HIGH-PRESSURE STUDY OF MnAs

The effect of pressure in reducing the transition temperature T_c for the first-order $B8_1 \rightarrow B31$ transformation in MnAs has been reported previously.[10] It was found that above a critical pressure of 4.5 kbar the B31 phase was stable at all temperatures. It was also observed that the phase transformation was marked by an increasing degree of hysteresis as the temperature was decreased.

The pressure-temperature hysteresis curve for the reverse $B31 \rightarrow B8_1$ transformation has now been determined. The results are shown in Fig. III-2, together with those reported earlier for the $B8_1 \rightarrow B31$ transition. For temperatures down to 200°K, the hysteresis data were obtained by observing the discontinuity in resistivity due to the reverse transformation which occurred as the pressure was reduced at constant temperature. The point at atmospheric pressure and 138°K was obtained by magnetic susceptibility measurements. In this case, a specimen was converted to the B31 phase by applying 5 kbar and then cooled to 77°K. The pressure was released, the specimen was transferred without warming up to the cold stage (at 4.2°K) of a vibrating-coil magnetometer, and the magnetization was monitored as the sample was allowed to warm up to room temperature. Initially the susceptibility was small and decreased with increasing temperature, but at 138°K the magnetization increased abruptly by a factor of more than 50 to the value characteristic of the $B8_1$ phase.

The results shown in Fig. III-2, together with those obtained in an earlier study[11] of $MnAs_{1-x}P_x$, establish the following:

(1) There is a $d\mu/dV > 0$ in the temperature interval $T_t - \Delta T < T < T_t$, where $T_t = 130°C$ is the temperature of the second-order $B31 \rightleftarrows B8_1$ transformation, $\Delta T \approx 125°C$ and μ is a manganese atomic moment. Since the thermal expansion coefficient is $\sim 2 \times 10^{-4}°C^{-1}$, this