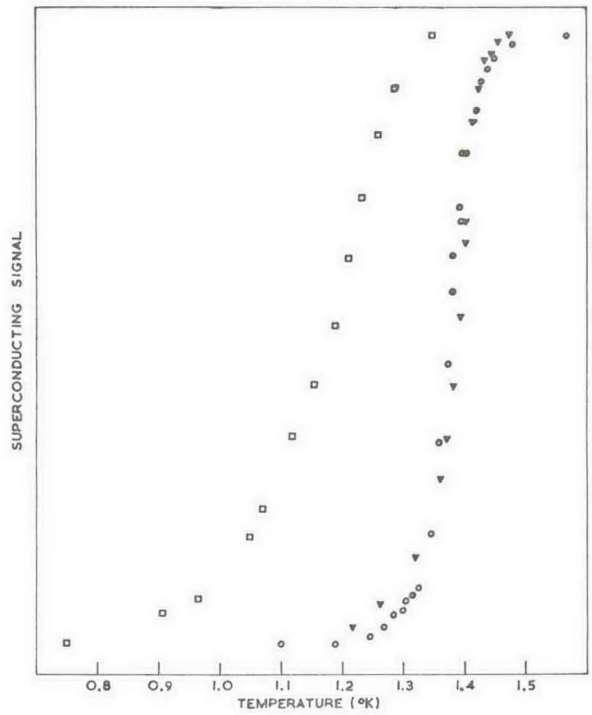

FIG. 1. Superconducting transitions for a U 0.6-at.% Mo alloy: large sample, ○ ($P=0$); small sample, □ ($P=0$), ▽ ($P=0.75$ kbar).

heat-capacity sample (a roughly cylindrical ingot 0.8 cm in diameter, 2.5 cm long) were sharper and at a higher temperature than those for the small sample (a half disk, 0.3 cm thick, 0.5 cm in diameter) cut from it for the pressure measurements. This is illustrated in Fig. 1 which shows zero-pressure transitions for the 0.6-at.% sample.

The present T_c values for the α-phase U–Mo alloys are in marked disagreement with the earlier values of Chandrasekhar and Hulm[13] who found that T_c first increased rapidly with the addition of Mo and then passed through a maximum at the composition corresponding to the $\alpha \rightarrow \gamma$ transition. We find that the T_c values from 0.3-at.% Mo fall with the addition of further Mo up to 4 at.% and then are almost independent of composition up to 7 at.%. This behavior is illustrated in Fig. 2.

(ii) *High Pressure*

Measurements of T_c were made up to a maximum pressure of 10 kbar, and the results are presented in Fig. 3. In addition, data for the variation of T_c over the same pressure range are shown for pure α-U. It is clearly seen that the addition of Mo rapidly destroys the initial sensitivity of T_c to pressure and with more than 3-at.% Mo the transition temperature is almost independent of pressure. For further comparison with the zero-pressure transitions, the 10-kbar values of T_c are also shown in Fig. 2.

[13] B. S. Chandresekhar and J. K. Hulm, J. Phys. Chem. Solids **7**, 259 (1958).

Heat-Capacity Measurements

(i) *Normal State*

Normal-state heat-capacity measurements[14] were made above T_c in zero magnetic field. In addition measurements for the 0.3- and 3-at.% alloys were taken in 8 kG. The data taken between 1.4 and 2.1°K have been least-squares fitted to the usual $\gamma T+bT^3$ relationship, and values for γ, b, and the related Θ_D are given in Table I. The uncertainties listed correspond to the standard deviations in the constants and do not reflect any possible systematic errors.

The heat capacity of the addenda was determined separately and can be represented as $0.1273T+0.0167T^3$ mJ mole^{-1} deg^{-1}. The addenda contribution to the linear term in the heat capacity was constant from run to run. Thus, even including systematic errors arising from the addenda correction, the uncertainty in the γ values is not likely to be much greater than ± 0.1 mJ mole^{-1} deg^{-2}. However, the T^3 contribution of the addenda to the heat capacity varied somewhat from run to run because of the slightly varying amounts of grease used to provide thermal contact between the sample and a pair of copper plates which provided the thermal link to the mechanical switch. Thus, the actual uncertainties in the Θ_D are probably considerably larger than the statistical values listed in Table I. Nevertheless, the internal consistency of most of these data plus data obtained on other alloy systems with this apparatus lead us to believe that the surprisingly low Θ_D values for the 0.3- and 0.6-at.% U-Mo alloys cannot be explained by inappropriate addenda corrections.

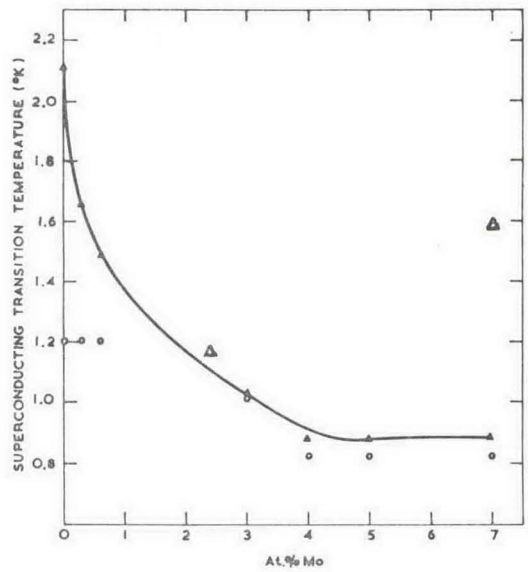

FIG. 2. Magnetically determined transition temperature at $P=0$ and 10 kbar as a function of Mo content: ○ ($P=0$), ▲ ($P=10$) kbar. △ data of Chandrasekhar and Hulm (Ref. 13).

[14] A preliminary report on these measurements was given by J. E. Gordon and T. Soller at the 22nd Annual Calorimetry Conference, Thousand Oaks, Calif., 1967 (unpublished).

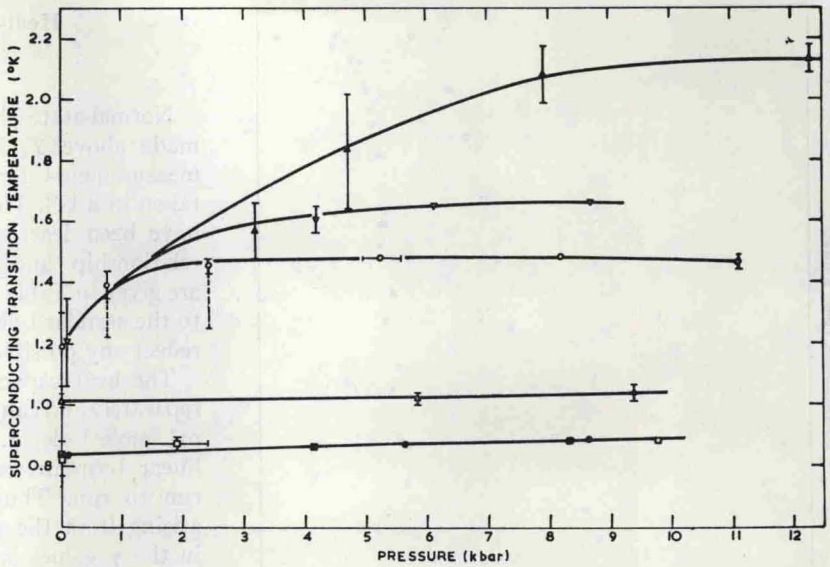

FIG. 3. Magnetically determined transition temperature as a function of pressure: Mo content in at.%, ▲0, ▽0.3, ○0.6, △3, □4, ●5, ■7.

A plot of the dependence of γ on Mo concentration is presented in Fig. 4. Initially, γ increases rapidly with the addition of Mo, but there is a rapid change in slope at $\sim$0.5 at.%, followed by an approximately linear variation described by $d\gamma/dc=0.17$ mJ mole^{-1} deg^{-2} at.%$^{-1}$. The measurements made in a magnetic field for the 0.3- and 3-at.% samples indicate that the normal-state heat capacity is slightly field-dependent. This field dependence, while small, appears to be real, but its significance is not clear. Plots of the zero-field and 8-kG data for the 0.3-at.% samples are given in Fig. 5.

(*ii*) *Superconducting State*

Well-defined heat-capacity jumps typical of the type observed at the transition to the superconducting state were observed for the 7- and 5-at.% samples (Fig. 6). Jumps observed for the lower-concentration alloys were much broader and more ill-defined, and in the case of both 3-at.% samples the temperature limitations of the cryostat prevented measurements at sufficiently low temperatures for observation of a maximum. In order to determine whether these broader transitions (particularly that of the 3-at.% alloy) were associated with a transition to the superconducting state, measurements were made on the 0.3- and 3-at.% samples in a field of 8 kG. For both alloys this field was sufficient to destroy the transition down to the lowest temperature available (see Fig. 5).

Estimates of the fraction of the sample which has become superconducting at various temperatures below

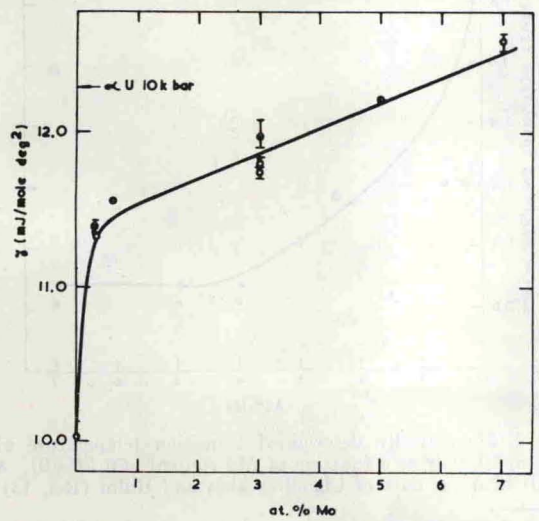

FIG. 4. Coefficient of electronic specific heat γ as a function of Mo content.

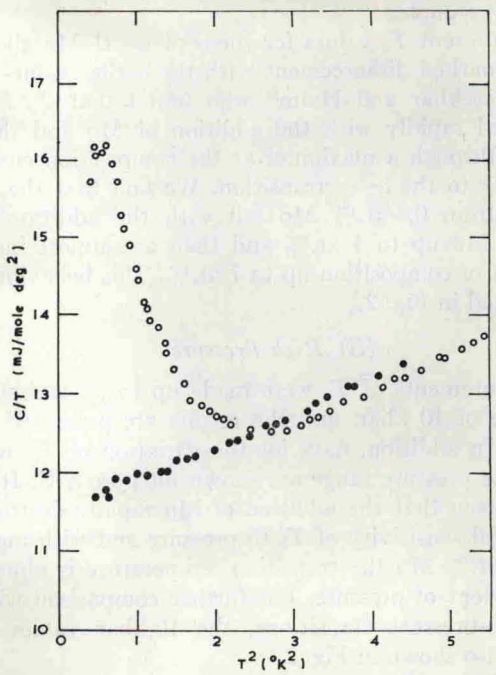

FIG. 5. Heat-capacity data for the 0.3-at.% Mo alloy taken in zero field and 8 kG: ○ ($H=0$), ● ($H=8$) kG.