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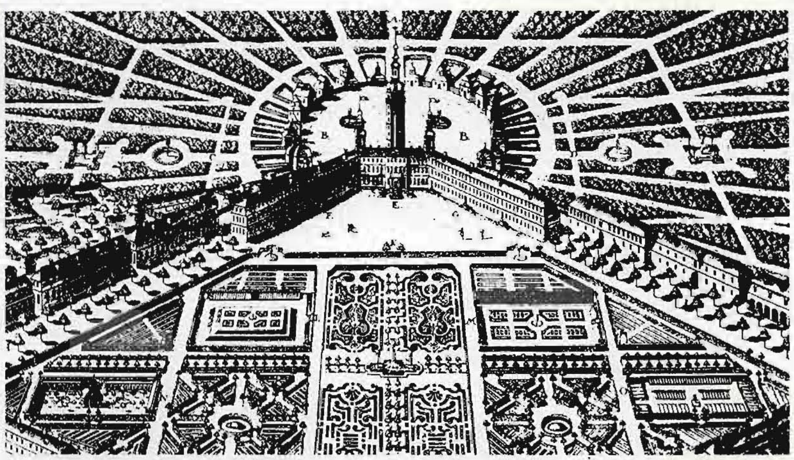

NORTH-HOLLAND

LT-17 (Contributed Papers)
U. Eckern, A. Schmid, W. Weber, H. Wühl (eds)

A COMPARISON OF SVP LIQUID He^3 SPECIFIC HEAT MEASUREMENTS*

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A comparison of specific heat measurements of liquid He^3 at SVP below 200 mK reveals two types of behavior. That where C/RT continues to increase with decreasing temperature below 100 mK and that which remains constant below that temperature. The latter yields the lower value of m*/m.

The specific heat of He^3 is of great importance since its limiting value yields the effective mass ratio m*/m of the substance. That in turn enters into the determination of the Landau parameters. Although it is now generally believed that the measurements of Greywall (1) yield the correct behavior of the specific heat, it is of interest to compare there measurements with others, some relatively recent as well as older ones because of the wide range of m*/m quoted. In this comparison, only those measurements of the specific heat were considered which had points below 100 mK since only below that temperature one would expect the limiting linear behavior to occur. Also, because of the number of measurements, the examination was confined to measurements at or near the saturated vapor pressure. The measurements examined are listed in the references (1-13). Of those, ten have been chosen for more detailed examination, the others being superseded by subsequent measurements or analysis, reporting only one point at SVP, or measurements being reported in such a way that not enough information was available for the determination of m*/m. Data published prior to 1980 were smoothed by averaging five points successively. Such an examination reveals that the specific heat measurements fall into two categories: one where C/RT becomes constant at temperatures below 80-100 mK, the other where C/RT is approximately linear in T and increases with decreasing temperature to below 20 mK. The former measurements yield an effective mass ratio m*/m of between 2 and 2.3 while the latter generally fall between 2.7 and 3.1.

Fig. 1 shows C/RT plotted against temperature for the first category with x Ref (5), + Ref (7), and the data below 20 mK of Ref (2) and (3).

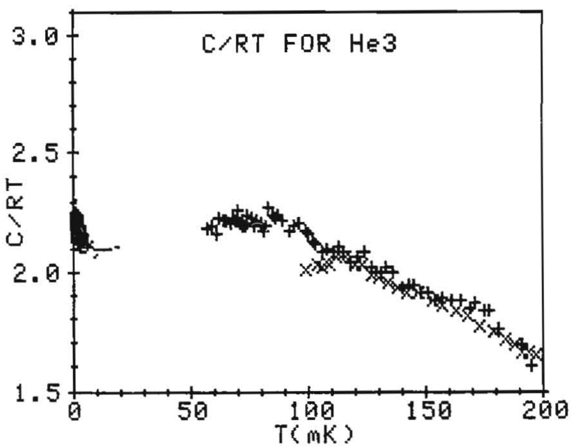

FIGURE 1
At SVP the value of C/RT for He^3 is equal to within a fraction of a percent to the ratio of m*/m.

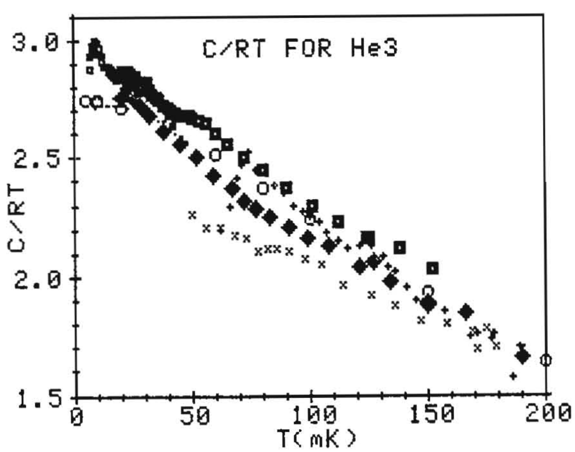

FIGURE 2

* Supported in part by NSF Grant No. DMR 8113456.

Fig. 2 shows C/RT for the second category. Open squares and dots are Ref (1), x Ref (8), + Ref (10), ■ Ref (12), ■ Ref (13), and ◆ Ref (9). Here Ref (8) yields an m*/m value of 2.4 but still displays a monotonic increase with lower temperature.

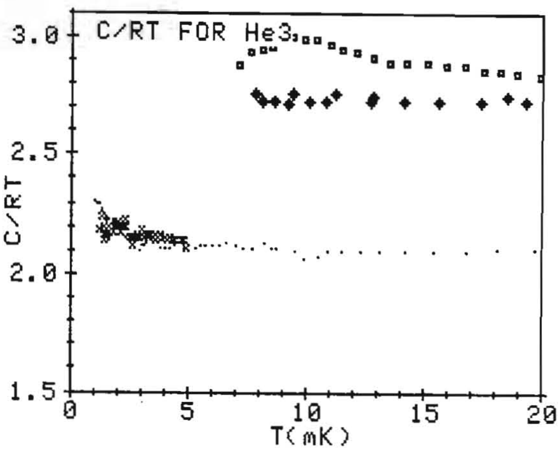

FIGURE 3

Fig. 3 shows the low temperature data of ■ Ref (12), ◆ Ref (1), ● Ref (2), and + Ref (3).

An examination of the experimental techniques reveals that except for the measurement of Greywall (1) which might need a separate category, the measurements which fell into the second category yielding the higher value of m*/m had helium in intimate contact with Cerous Magnesium Nitrate powder, while in the others the helium was in contact with a metal. This is also true in the measurement of Ref (4) which gives $m^*/m \simeq 3$.

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