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LOW-TEMPERATURE SPECIFIC HEAT OF APIEZON-N GREASE

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ABSTRACT

Data are presented for the specific heat of Apiezon-N Grease between 0.4 and 20 K.

Apiezon-N grease[1] has been used in this laboratory and in several others to establish thermal contact to samples used in heat capacity measurements. It has proven satisfactory for attaching both solid samples and powders to calorimeters. We have measured the specific heat of this grease between 0.4 and 20 K to provide the data necessary for correcting the measured heat capacity for that of the grease.

We expect an overall accuracy of approximately 1% in the total measured heat capacity but the accuracy of the values reported for the grease is further limited, particularly at low temperatures, by the heat capacity of the calorimeter. The specific heat of the grease was 5% of the total heat capacity at 0.4 K, 10% at 1 K, and 50% or more at 4 K and above. The results are shown in Figs. 1 and 2 which emphasize the data above 1.5 K and below 1.5 K, respectively. There is a minimum in C/T^3 near 0.8 K but the accuracy of the measurements at lower temperatures does not permit a precise characterization of the deviations from a T^3 temperature dependence. The results are presented as a smoothed table of values of C/T^3 in Table I and as a power-series expansion that fits the data between 1 and 20 K to ±1% in Table II.

A specific heat of $0.0325T^3$ mJ/g-K has been reported[2] near 1 K, and other measurements[3] extend from 80K to 325 K. Between 1 and 20 K our data for the specific heat of Apiezon-N grease are approximately 10% lower in magnitude than, but similar in temperature dependence to those[4] for Apiezon-T grease. The temperature dependences [3,4] of the specific heats of the two greases are also very similar between 80 and 220 K.

Work done under the auspices of the U. S. Atomic Energy Commission.

REFERENCES

1. Supplied by Apiezon Products Ltd., 8 York Road, London, England, and sold in the U.S.A. by James G. Biddle Co., Plymouth Meeting, PA 19462.

2. Scheffer, J., private communication quoted by Wielinga, R. F., Thesis, Leiden University, 1968.

3. Bunting, J. G., Ashworth, T., and Steeple, H., Cryogenics 9, (1969) 385.

4. Westrum, E. F., Jr., Chow, Chien, Osborne, D. W., and Flotow, H. E., Cryogenics 7, (1967) 43.

Table I. The specific heat of Apiezon-N grease.

T(K)	C/T^3 (mJ/g-K^4)	T(K)	C/T^3 (mJ/g-K^4)
0.4	0.0812	8.0	0.02805
0.7	0.0306	9.0	0.02620
1.0	0.02630	10.0	0.02431
1.5	0.02661	11.0	0.02244
2.0	0.02741	12.0	0.02071
2.5	0.02870	13.0	0.01917
3.0	0.03010	14.0	0.01780
3.5	0.03112	15.0	0.01652
4.0	0.03182	16.0	0.01538
4.5	0.03200	17.0	0.01436
5.0	0.03198	18.0	0.01340
6.0	0.03142	19.0	0.01250
7.0	0.02990	20.0	0.01169

Table II. Power series representation of the heat capacity of Apiezon-N grease, $C = \Sigma A_n T^n$ with C in mJ/g-K and T in K, valid to ±1% between 1 and 20 K.

n	A_n
3	2.80019×10^{-2}
4	-4.87887×10^{-3}
5	3.81416×10^{-3}
6	-9.072917×10^{-4}
7	9.76703×10^{-5}
8	-5.23844×10^{-6}
9	1.21072×10^{-7}
11	-3.12038×10^{-11}

FIGURE CAPTIONS

Fig. 1. The specific heat of Apiezon-N grease above 1 K.

Fig. 2. The specific heat of Apiezon-N grease below 1.4 K.

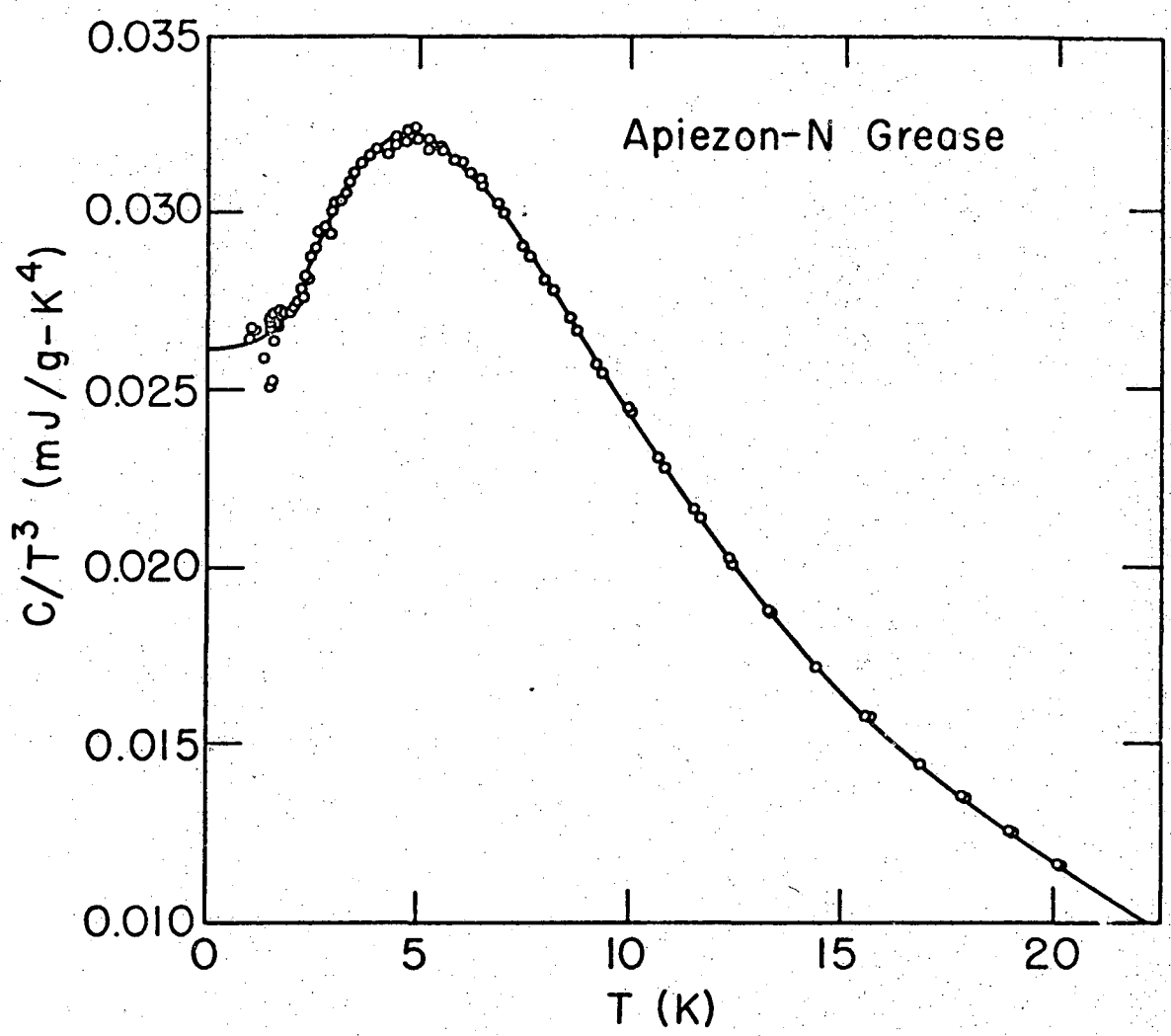

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Fig. 1

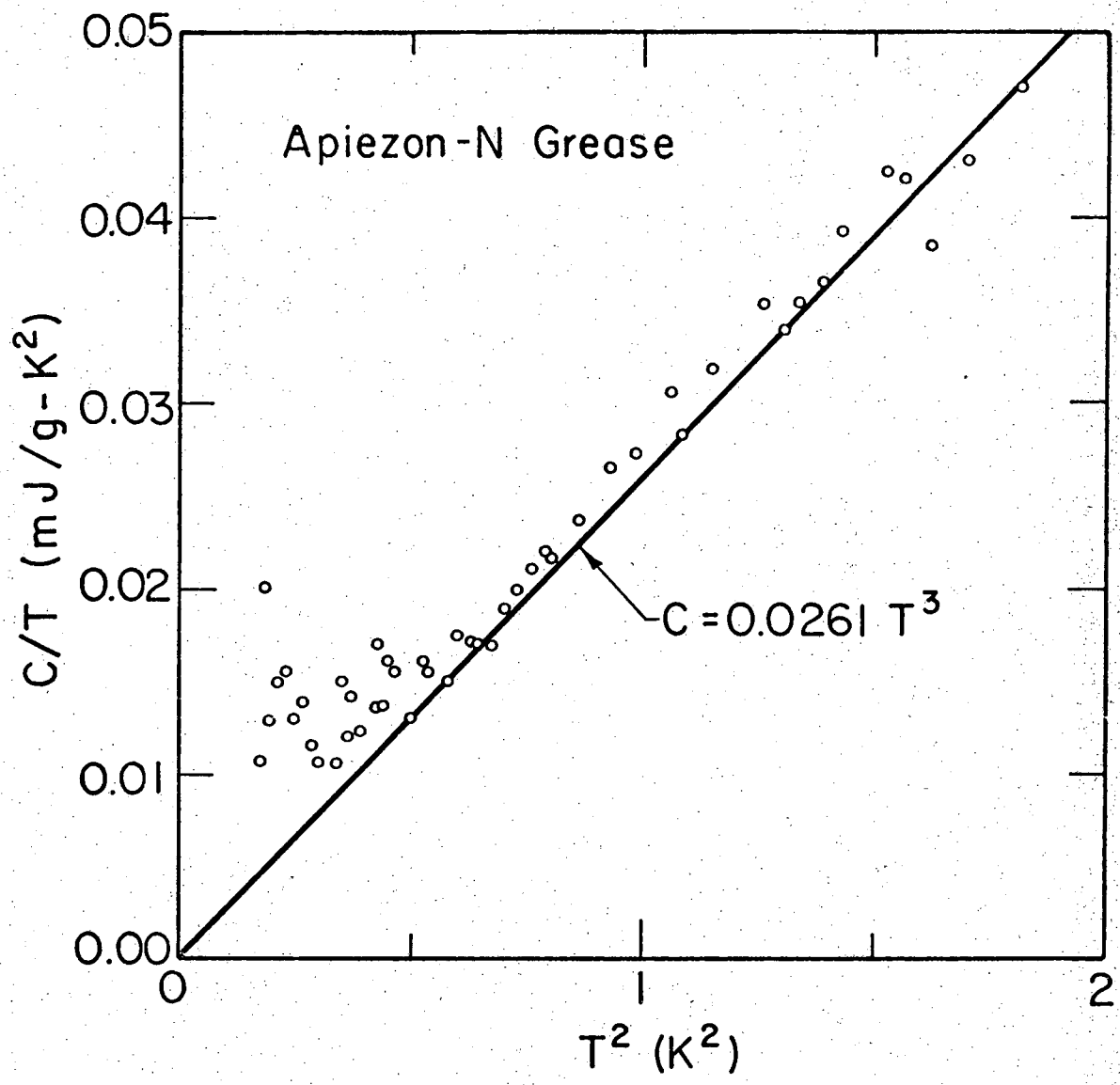

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Fig. 2

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