7031 varnish and an overlay of Armstrong A2 epoxy.

The temperature dependence of the thermal conductivity is shown in Figure 1. The thermal conductivity decreases approximately monotonically with temperature yielding values of 4×10^{-3} W/cm K at 300 K to 6×10^{-4} W/cm K at 4·2 K. Ashworth and Rechowicz[2] found $2{\cdot}1 \times 10^{-3}$ W/cm K near 300 K for a thin film. In Figure 1 the thermal conductivities of other comparable noncrystalline materials such as fused quartz (SiO_2),[6,7,8] lucite (polymethylmethacrylate),[9] and teflon (polytetrafluoroethylene)[10] are also shown. Some uncertainty in these measurements is caused in the temperature range 300–150 K by thermal radiation losses from the sample heater. The magnitude of error due to thermal radiation at 300 K has been estimated by heating the walls of the sample chamber to a temperature roughly equal to that of the top of the sample, and observing the change in the apparent conductivity. The walls are normally run at the same temperature as the base of the sample. This procedure yielded a radiation correction factor of 20% at 300 K, which has already been applied to the data plotted in Figure 1. Thermal radiation effects below 150 K are negligible. Thus we conclude that the present results are accurate to ± 10% at 300 K and ± 5% at 4 K for the sample studied. In actual use, some variation in the thermal conductivity of a thin film of 7031 varnish might occur because of the retention of different amounts of unevaporated solvent, or different heat treatments. However, these variables will probably not change the thermal conductivity by more than 20–30%.

We conclude that the thermal conductivity of No. 7031 varnish is comparable to that of glass or other plastics commonly used at low temperatures. This property combined with its other characteristics[2,3] make it useful for thermally anchoring wires and cementing parts in cryogenic apparatus.

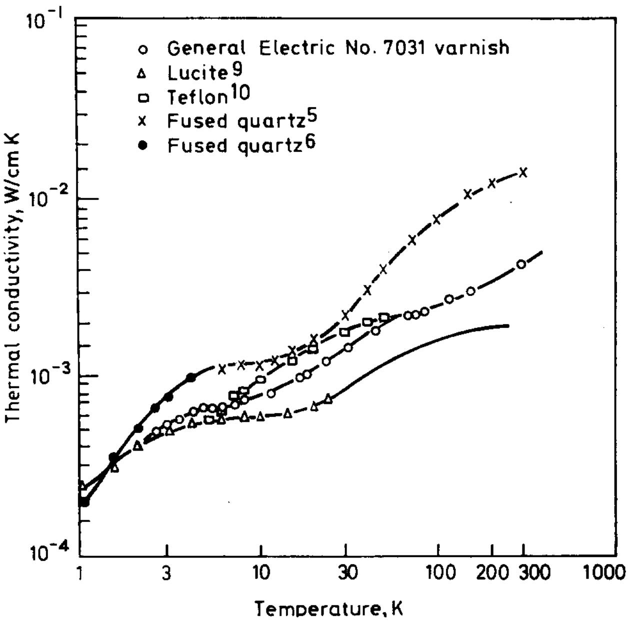

Figure 1. The thermal conductivity versus temperature for a solid sample of General Electric No. 7031 varnish compared to some other noncrystalline solids such as lucite, teflon, and fused quartz

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The specific heat of Apiezon N grease

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ANY ONE of a number of greases which are available commercially may be used to improve thermal contact in cryogenic systems. For high precision calorimetric measurements, it is advantageous to know the variation with temperature of the specific heat of the particular grease chosen, and it is essential that the details of any lack of consistency in the behaviour of the substance on thermal cycling should also be known. In this connexion, it has already been established[1] that the specific heat of Apiezon T grease exhibits a broad anomaly in the temperature range 205 K to 320 K, and within this range the specific heat of the grease is not reproducible to better than 2%. Because of this slight inconsistency in the behaviour of the T grease in the anomalous region, a determination of the specific heat–temperature relationship for Apiezon N grease has been undertaken in order to establish whether the N grease might be the more suitable for use at lower temperatures.

Measurements were made in a modified version of the cryostat described by Ashworth and Steeple,[2] using the continuous heating technique. The Apiezon N grease, which weighed 26·977 g, was contained in an open calorimeter of mass 12·6 g. The outer wall of the calori-

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Received 21 March 1969.

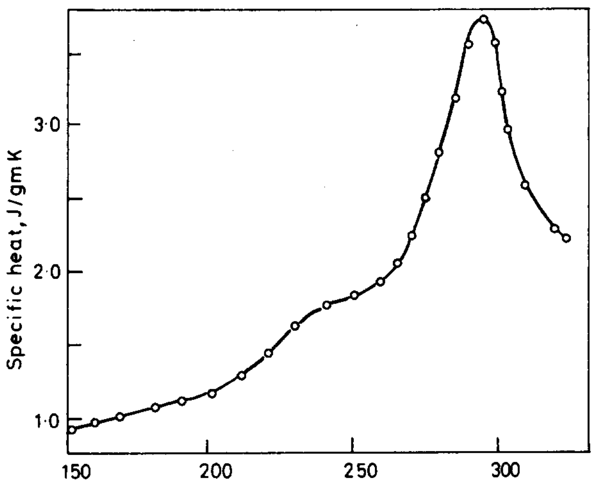

Figure 1. The anomalous behaviour, with temperature, of the specific heat of Apiezon N grease

TABLE 1. THE SPECIFIC HEAT, C_p, OF APIEZON N GREASE

T, K	C_p, J/gK	T, K	C_p, J/gK
80	0·543	210	1·26
90	0·599	220	1·44
100	0·654	230	1·64
110	0·707	240	1·76
120	0·759	250	1·86
130	0·810	260	1·96
140	0·860	270	2·27
150	0·910	280	2·84
160	0·961	290	3·57
170	1·011	296	3·76
180	1·063	300	3·59
190	1·117	310	2·62
200	1·177	320	2·32
		324	2·25

meter and the thermometer well were formed electrolytically, and the heaters were uniformly wound on four fins of copper foil which were evenly distributed inside the calorimeter.

Readings were made and the results computed as described by Ashworth and Steeple.[2] The heating rate was approximately 10 K/h and the resulting values of specific heat at selected temperatures are given in Table 1. From the table it is evident that from 80 K to 200 K the specific heat of Apiezon N grease increases approximately linearly with temperature; the temperature range from 200 K to above 324 K, however, embraces a broad anomalous region which includes a 'foothill' extending from 200 K to 260 K, and a high peak which has a maximum value at 296 K (see Figure 1). The anomalous values of the specific heat are reproducible to within 1% in the range 200 K to 260 K, but within the range 260 K to 324 K the reproducibility is about 5%.

When the values of the specific heat of Apiezon N grease are compared with those of Apiezon T grease,[1] it can be seen that between 80 K and 220 K there is little to choose between the two substances; however, in the temperature range 220 K to 260 K the results for Apiezon N grease are the more reproducible, whereas above 260 K the opposite is true. The similar behaviour of the two greases over the lower range of temperatures is not surprising, since the Apiezon T grease differs from the Apiezon N grease only in that the former contains an aluminium soap, in addition to the hydrocarbon content, whereas the latter does not. What is puzzling is the nature of the vastly different anomalous regions of the two greases.

One of us (JGB) is indebted to the Science Research Council for the award of a studentship, and another (TA) to Messrs Turner and Newall for the award of a research fellowship.

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Vessels for liquified gases, formed from PSB foam polystyrene

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It is sometimes difficult to use glass dewars in the laboratory because of their fragility. Also, making vessels of large dimensions or complicated shape with given glass blanks can lead to difficulties. In many cases this situation can be avoided by using foam polystyrene insulation. Polystyrene is normally used in the form of relatively thin sheets from which the required article is cut out in pieces and stuck together. However, the widespread domestic production of suspended unextruded PSB foam polystyrene now offers another method. PSB is in the form of beads, that is, granules between 0·5 and 2·5 mm diameter, containing the frothing agent (a pore former). Articles of the required shape can be prepared directly in the laboratory by forming PSB beads in a mould. Mechanical operations and gluing of the foam are dispensed with and the article is obtained whole, with smooth uninterrupted surfaces. In view of these properties, and the good insulating characteristics, PSB seems to us a suitable material for making, in the laboratory, vessels of large dimensions and complicated shape

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