

London has directed attention to the fact that an ideal Bose-Einstein gas shows a transition point, which lies at 3.15° K. for a gas of a density and a molecular weight of liquid helium. Moreover, below this transition point the gas allows also a division of the molecules in those condensed in the lowest energy state, and others having a kinetic energy.

However, it can scarcely be expected that the velocity distribution of the moving particles in liquid helium can be identified with that of an ideal Bose-Einstein gas, so that it is not surprising that the specific heat of such an ideal gas¹ does not agree with that of liquid helium. The specific heat should increase $T^{3/2}$, whereas experiments show an increase with, at least, T^3 .⁵

This difficulty can be eliminated by the assumption of an 'excitation-energy', which must be added to a condensed particle before it can participate in the velocity distribution of the moving ones. The specific heat increases then exponentially at low temperatures. In this way a better representation of the anomaly in the specific heat is obtained.

The existence of such an 'excitation-energy' can be explained on similar lines as the disorder energy in Fröhlich's theory of liquid helium⁴. On the other hand, it may also be derived from the gas model, as a consequence of the theory of a non-ideal Bose-Einstein gas below its transition temperature.

Here the excitation energy is due to the effect of exchange, which gives rise to a different interaction when molecules are in the same and when they are in different states. This effect leads to important corrections in the specific heat below the transition temperature, as then many particles will occupy the same, namely, the 'condensed' state.

A more detailed discussion will be published in *Physica*.

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¹ Allen, J. F., and Jones, H., *NATURE*, **141**, 243 (1938).

² Michels, A., Bijl, A., and de Boer, J., *Physica*, **5**, 121 (1938).

³ Tisza, L., *NATURE*, **141**, 913 (1938).

⁴ London, F., *NATURE*, **141**, 643 (1938).

⁵ Keesom, W. H., and Keesom, A. P., *Physica*, **2**, 557 (1935).

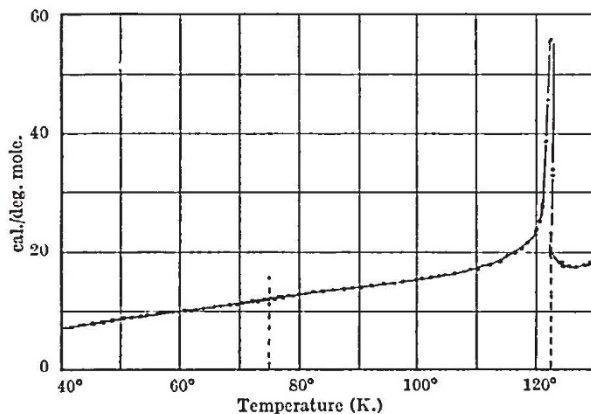
⁶ Fröhlich, H., *Physica*, **4**, 639 (1937).

Specific Heat of a Substance showing Spontaneous Electric Polarization

VARIOUS authors¹ have investigated the specific heat of Rochelle salt, the best-known example of substances showing spontaneous electric polarization, but the results obtained so far have been somewhat contradictory. In some of the experiments a small anomaly at the Curie point (the upper limit of the Rochelle electric temperature region) was observed. Very little is, however, known about any thermal effects at the lower limit of the Rochelle-electric region. This temperature has sometimes been called the 'lower Curie point', and it has been suggested² that it should be marked by an anomaly in the specific heat.

We have now determined the specific heat of potassium dihydrogen phosphate which shows Rochelle electricity in the temperature region between 75° and 122° K.³ The result of this investigation is given in the accompanying graph. It is evident from our

measurements that there is no trace of any anomaly at the 'lower Curie point'. This means probably that the apparent disappearance of spontaneous electric polarization towards lower temperatures is due to a 'freezing-in' of the dipoles; that is, their inability to orientate themselves below a certain temperature owing to lack of thermal motion in the lattice. It seems, therefore, misleading to describe this temperature as a 'lower Curie point'.



A strong anomaly was observed at the Curie point (122° K.). Owing to the very gradual rise of the specific heat at the onset of this anomaly, an accurate evaluation of its energy content seems difficult. While these experiments were in progress, measurements of the specific heat at the Curie point were reported by Bantle and Scherrer⁴ and Stephenson and Hooley⁵. Whereas our values in this temperature region agree well with the results of the latter authors, they differ considerably from those of Bantle and Scherrer. These authors observe the anomaly at 114° K. and give much higher values for the specific heat.

A full report of our experiments will be published elsewhere.

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Kobeko and Nelidow, *Sovj. Phys.*, **1**, 382 (1932). Rusterholz, *Helv. phys. Acta*, **8**, 39 (1935). Wilson, *Phys. Rev.*, **54**, 1103 (1938). Hicks and Hooley, *J. Amer. Chem. Soc.*, **61**, 2994 (1938).

¹ Staub, *Naturwiss.*, **43**, 723 (1935).

² Busch, *Helv. phys. Acta*, **11**, 269 (1938).

³ Bantle and Scherrer, *NATURE*, **142**, 930 (1939).

⁴ Stephenson and Hooley, *Phys. Rev.*, **53**, 121 (1939).

A Particular Mode of Fission of the Uranium Nucleus

As has been reported by one of us¹, uranium fission products can be collected by the recoil method many hours after the end of the irradiation of uranium by slow neutrons. This phenomenon can be explained in the simplest way by the assumption that one or more of the fission products are radioactive gases, of more or less long life and coming somewhere in the middle of the β -transmutation chain. To test this assumption we have performed the following experiments.

About 20 gm. of sodium pyrouanate placed in a glass tube between two cotton-wool plugs was irradiated by slow neutrons from a radio-thorium