

method could be used to very one version, could be changed the other hand, in order to had to undergo plastic deformation experiments such as the effect of temperature or on polycrystalline work on galvanomagnetic effects many times greater (1964).

KEROSENE

method and Itskevich (1963) and (15 kb) is first generated by a technique where the oil-kerosene is solidified by cooling and then cooled to helium temperature.

TECHNIQUES

low-pressure techniques used at present may well come into greater use as the technique is extended. Some of the techniques A and D are limited to room temperature to low-pressure techniques (up to 100 atmospheres) (see, for example, Swenson, 1963).

METHODS

generated in fluid helium at a pressure corresponding to the solidification pressure when allowed to solidify around the specimen. This process can either be done by Dugdale and Hulbert, or the method was introduced by

Swenson and his collaborators and is a great improvement on the constant volume technique (Hinrichs and Swenson, 1961; Schirber and Swenson, 1961, 1962). It is an improvement in several ways: first the retained pressure at the lowest temperature (after cooling the solidified helium to say 1° K) is appreciably higher than in the constant volume method where about one quarter is lost, largely because of the contraction on freezing. Secondly the fluid pressure obtained

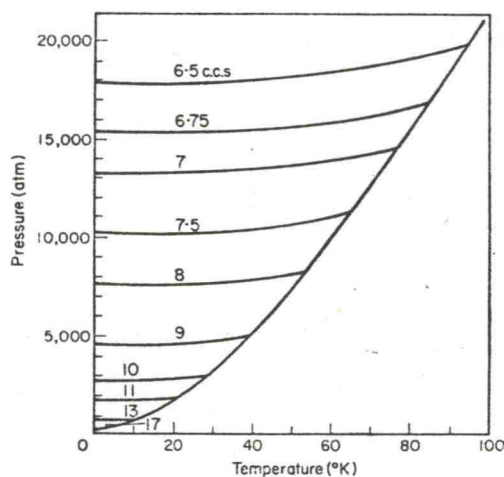


FIG. 1. Melting curve and lines of constant volume in solid ^4He : the numbers indicate molar volumes. (From Dugdale, 1958.)

is known more accurately since the correction derived from the equation of state of helium is smaller (Dugdale, 1958); see Fig. 1. And thirdly, the non-hydrostatic stresses imposed on the specimen can be made extremely small. In the solidification process at constant pressure the solid helium can grow from the fluid around the specimen from the bottom; if this is done slowly there should be no shear stresses on the specimen. Thereafter if the apparatus is cooled at constant volume, non-hydrostatic stresses will arise only because of the difference in thermal expansion or contraction of the specimen and the solid helium. At low temperatures thermal expansion or contraction is small so that there will be no appreciable relative movement of solid helium and specimen provided the initial temperature is not too high. Consequently the pressure remains essentially hydrostatic.

When we come to consider the work on Fermi surfaces we shall have occasion to compare directly the results of some of these techniques.