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Crystalline Anisotropy of the Intermediate State

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WE have undertaken experiments on the investigation of the moments of forces which act through the agency of a magnetic field on a monocrystalline sphere of lead of high purity (99.998%), placed in the intermediate state. The specimen was mounted on a torsion suspension so that the [010] axis could be vertical and was placed (at a temperature of 3.65 °K) in a magnetic field whose direction could be changed in the horizontal plane. In addition, we superimposed a small (1-2 oersteds) magnetic field, which changed its sign with a period of 30 sec. Under these conditions we could observe the moments, which evidently have a reversible equilibrium character, and which arise as a consequence of the dependence of the surface tension at the boundary of the superconducting and normal phases on the orientation of this boundary with respect to the lattice. The great scatter of the results of various experiments, which is connected with the imperfections of the lattice of the specimens, does not permit a completely reliable quantitative check. However, qualitatively speaking, the two samples that we investigated gave results in agreement, namely, that the free energy of the specimen, as a function of the angle between the field and the tetragonal axis has maxima in the [100] and [001] directions. The intermediate minimum is located approximately at an angle of 25-35° with respect to the tetragonal axis. The height of the maxima for our samples (diameter 12.6 mm, 50% superconducting phase) was of the order of 10^{-3} erg. These results are evidently in qualitative agreement with the anisotropies of the penetration depth found by Pippard[1].

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Heat of Vaporization of Oxygen in the Temperature Range 80-106°K

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UP to the present time the heats of vaporization of condensable gases as a function of temperature have been little studied, although they are of both practical and theoretical interest. The basic theoretical methods of calculating heats of vaporization require the knowledge of a great number of other quantities. Experimental determinations have been few and insufficiently reliable.

We have undertaken to investigate the heat of vaporization of oxygen from 80° to 106°K by a precision method which we have developed, carried out as follows. A calorimeter contains an evaporator filled with the liquid, and a measured amount of power is applied. The vapor which forms is collected by condensation in a light tank and weighed at room temperature on an analytical balance. During the weighing period the evaporation process goes on in another similar flask.

The apparatus which has been constructed for this purpose includes:

(1) a vacuum adiabatic calorimeter, similar to the one described previously[1], with a number of changes and improvements;

(2) a system of two capillaries leading out of the calorimeter; one is used during filling and evaporation, and the other is connected to a mercury manometer;

(3) a gas system consisting of two thin-walled stainless steel tanks, closed by vents of original construction, a Bourdon manometer, and operating valves used during the period of evaporation.

Thirty-five measurements were made of the heat of evaporation at seven different temperatures. The