and the frozen solution always appeared dark blue when first formed. The rings of frozen solution were tested for persistent currents by removing them from the magnetic field and bringing them up quickly to a compass needle immersed in liquid nitrogen. The compass needle was enclosed in a brass case with a glass top which was tight enough to prevent liquid nitrogen from entering. The sensitivity of 0.02 oersted was found to be unaffected by immersion in the liquid nitrogen. The solution into which the cells were dipped was kept free of moisture with a stream of precooled nitrogen, and its concentration was kept approximately at one molar by adding fresh liquid ammonia from time to time as the volume of solution decreased by evaporation. Twenty-four trials were made with fields ranging from a few oersteds to 1000; in no case was there any indication of a persistent current.

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[1] R. A. Ogg, Jr., Phys. Rev. **69**, 243 (1946).

Superconductivity in Solid Metal-Ammonia Solutions

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THROUGH the courtesy of Drs. Boorse *et al.*, their concurrently appearing communication was submitted to the author before publication. The implications of such a report make it advisable to publish at this time the experimental details which lack of space caused to be omitted from the previous communication.[1]

The conductivity cell was U-shaped, constructed of Pyrex capillary tubing some 10 cm in length and 0.2 mm in bore, with flanged ends sealed to relatively large reservoir vessels, the latter containing strip platinum electrodes. The sodium-ammonia solutions were prepared directly in the cell, while the latter was immersed in a bath of liquid ammonia. Resistances were measured with a direct current bridge. After calibration, estimates of concentration could be made from the measured resistance at $-33°C$.

In typical experiments, measured resistances at $-33°C$ were of the order of 10,000 ohms. On *slow* cooling to temperatures slightly above the melting point (some $-80°C$) the resistance *increased* by a factor of some three to five. Behavior on rapid immersion of the cell in liquid oxygen was distinctly erratic, but the typical result consisted of a rapid resistance decrease to some few hundred ohms, followed by a sudden breaking of the circuit, as shrinkage caused fracture of the column. On then immersing the cell in a pre-cooled pentane bath at some $-95°C$, expansion usually caused reclosing of the circuit, with a fairly constant resistance of the order of 10 to 50 ohms. Further slow temperature rise caused practically no change until the melting point was reached, when the resistance suddenly rose to values of the order of 30,000–50,000 ohms. In a few cases the systems remained conducting at liquid oxygen temperature, with practically no change in the (relatively small) resistance between $-180°C$ and the melting point. Such behavior, the variability of the lowest obtainable resistances, and the obvious difficulties with mechanical breakage strongly suggest that even the small residual resistances found were largely caused by poor contacts. Such large resistance changes were observed only with solutions in the concentration range characterized by liquid-liquid phase separation. It must be observed that the phenomenon is of the nature of a *discontinuity* at the melting point of the rapidly frozen solid solution, and is not to be confused with the exponential temperature dependence of the resistance of a solid semiconductor.

Cells for study of persistent currents were constructed (afresh for each trial) of thin circular microscope cover glasses, separated by a small center spacer of extremely thin mica, fastened with vaseline. Each cell was attached to a glass rod handle. The cell was dipped into a sodium-ammonia solution (in the concentration range characterized by liquid-liquid phase separation) at $-33°C$, and allowed to fill by surface tension. It was then plunged rapidly into a Dewar vessel containing liquid oxygen, situated in a magnetic field of strength up to 1500 gauss. The cell was quickly transferred to another liquid oxygen bath containing a fixed search coil attached to a semi-ballistic galvanometer. Any residual magnetic moment was detected by "flipping" of the ring sample in the vicinity of the coil. Fields of the order of 0.05 gauss were detectable. Nearly two hundred trials, with differing concentrations and field strengths, yielded negative results. However, in seven cases unmistakable galvanometer deflections were observed, indicating rather rapidly decaying fields of the order of one or two gauss at the first measurement, but remaining of measurable magnitude for periods of one or two minutes. Since the decay constant of a current in a closed circuit is the ratio of the resistance to the self-inductance (the latter estimated from the cell geometry), it is apparent that this degree of persistence indicates a resistance of the order of 10^{-13} ohm or smaller. In view of the fact that the liquid samples possessed resistances of the order of a thousand ohms, the solids in question may fairly be said to be superconducting.

The very large proportion of negative results seems to be in accord with expectations from the obvious contact difficulties encountered in the resistance studies. The solids probably crack into a micro mosaic pattern, and it would appear to be a very rare accident that the residual contact resistances are sufficiently small to allow an appreciably persistent current.

[1] R. A. Ogg, Jr., Phys. Rev. **69**, 243 (1946). See also April 1 and 15, 1946 issue, for erratum.

Note on the Problem of Uniform Rotation

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RECENTLY, in an article with the above title,[1] E. L. Hill considered the problem of determining the velocity as a function of position for a fluid rotating with constant angular velocity, according to relativity theory. However, his method of calculation appears questionable