These facts encourage the use of the SA in other integral equations which do not amplify the error so much. Furthermore, it appears worthwhile in such integral equations to apply the SA in higher dimensional configuration spaces, since, judging by the values of $R^{(2)}$ and $R^{(3)}$, the maximum value of $R^{(n)}$ seems to approach unity rapidly as n increases. The maximum value of $R^{(2)}$ is equal to the maximum value of $g^{(2)}$, since the singlet distribution function is unity, and at v/v_0 of 1.60 is about 5, while the corresponding value of $R^{(3)}$ is 1.4. Finally, it is unlikely that the conclusions reached here will be altered if an attractive potential of interaction is present as well since, as a first approximation, the attractive potential can be considered as only providing a uniform negative potential over the entire system. It is planned, however, to check this point for square-well molecules with molecular dynamics.

*On leave from the Lawrence Radiation Laboratory, University of California, Livermore, California, where the computations were carried out.

[1]J. S. Rowlinson, Mol. Phys. 6, 517 (1963).
[2]B. R. A. Nijboer and L. van Hove, Phys. Rev. 85, 777 (1952).
[3]J. G. Kirkwood, J. Chem. Phys. 3, 300 (1935).
[4]B. J. Alder and T. E. Wainwright, J. Chem. Phys. 31, 459 (1959).
[5]J. G. Kirkwood, E. K. Maun, and B. J. Alder, J. Chem. Phys. 18, 1040 (1950).
[6]M. Wertheim, Phys. Rev. Letters 8, 321 (1963).
[7]J. G. Kirkwood, V. A. Lewinson, and B. J. Alder, J. Chem. Phys. 20, 929 (1952).

DETECTION OF PLASMA RADIATION FROM ELECTRON-BOMBARDED Al AND Mg FOILS

E. T. Arakawa, R. J. Herickhoff,* and R. D. Birkhoff
Health Physics Division, Oak Ridge National Laboratory,† Oak Ridge, Tennessee
(Received 20 February 1964)

A suggestion by Ferrell[1] in 1958 has led to an intensive search for monochromatic photons from the decay of plasma oscillations in electron-bombarded metal foils.[2,3] A peak in the Ag spectrum at 3300 Å has been observed previously but the interpretation is complicated by interband effects.[4] The band structure of Al has been shown to be nearly free electronlike and should provide a better test for the plasma oscillation theory. Electron energy loss experiments show sharp discrete losses in Al at multiples of 15.3 eV.[5] The decay of this plasmon should be accompanied by the emission of photons at approximately 800 Å.

The details of the present experiment have been described previously.[3] Self-supported Al foils 600 Å to 800 Å in thickness were bombarded with 60- to 100-keV electrons. The light emitted at 30° from the foil normal was analyzed with a 50-cm Seya-Namioka vacuum ultraviolet spectrometer. The detector was an EMI-6256B photomultiplier whose quartz window was coated with sodium salicylate. A sharp peak at 815 Å ± 15 Å was found in the Al spectrum (Fig. 1) in good agreement with the characteristic energy loss experiments and with theoretical predictions. The theoretical spectrum was calculated by inserting the optical constants of Al determined by Hunter[6] into the transition radiation equation given by Ritchie and Eldridge.[7]

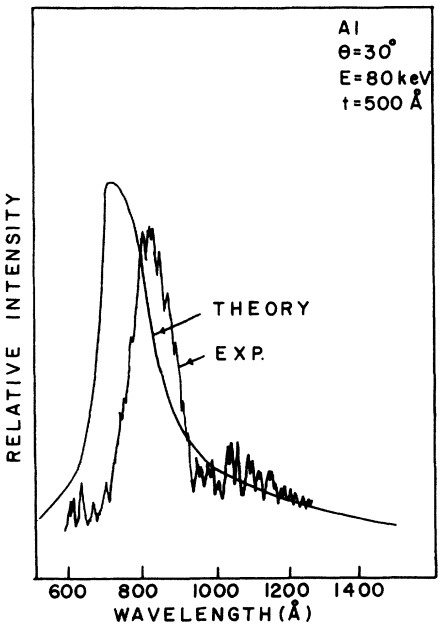

FIG. 1. Photon emission from electron-bombarded Al foil 800 Å in thickness (spectrum uncorrected for spectrometer response).

In order to verify the fact that the peak in the Al spectrum was 815Å radiation and not due to scattered photons, a LiF filter which only transmits radiation of wavelengths longer than 1100 Å

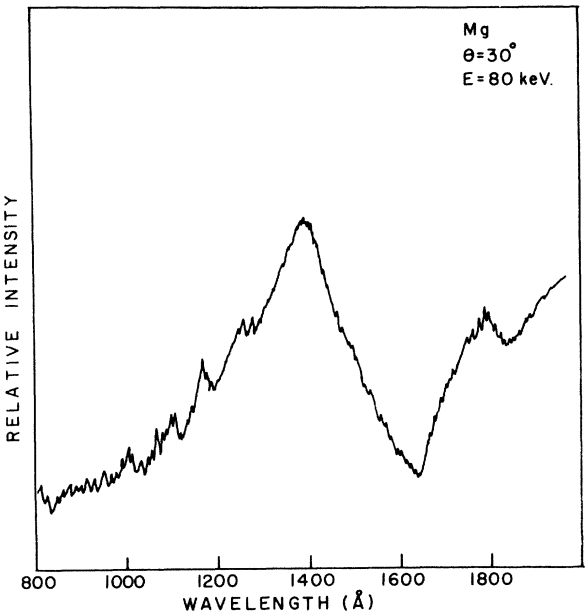

FIG. 2. Photon emission from electron-bombarded Mg foil (spectrum uncorrected for spectrometer response).

was inserted into the light path. The peak at 815 Å disappeared when the filter was inserted. As a further test, experiments with electron-bombarded Ag and Au foils showed no such peak in this region. Foils of Mg were also bombarded yielding a broad peak at 1400 Å and a sharp peak at 1800 Å (Fig. 2) in good agreement with characteristic energy loss experiments. Whether the optical emission at 1800 Å corresponds to the 7.0-eV surface plasmon loss remains to be seen. The improved resolution obtainable by measuring photon energies instead of electron energies makes possible detailed investigations of characteristic energy losses heretofore limited by the difficulty in making accurate electron energy loss measurements.

The authors are indebted to Dr. W. R. Hunter for sending us a preprint of the optical constants of Al, and to Dr. R. H. Ritchie and Dr. R. N. Hamm for the theoretical computations.

*Oak Ridge Institute of Nuclear Studies Fellow from Vanderbilt University, Nashville, Tennessee.

†Operated by Union Carbide Corporation for the U. S. Atomic Energy Commission.

[1]R. A. Ferrell, Phys. Rev. 111, 1214 (1958).

[2]W. Steinmann, Phys. Rev. Letters 5, 470 (1960); R. W. Brown, P. Wessel, and E. P. Trounson, Phys. Rev. Letters 5, 472 (1960); H. Boersch, C. Radeloff, and G. Sauerbrey, Phys. Rev. Letters 7, 52 (1961).

[3]A. L. Frank, E. T. Arakawa, and R. D. Birkhoff, Phys. Rev. 126, 1947 (1962).

[4]H. Ehrenreich and H. R. Philipp, Phys. Rev. 128, 1622 (1962).

[5]C. J. Powell and J. B. Swan, Phys. Rev. 118, 640 (1960).

[6]W. R. Hunter, J. Opt. Soc. Am. 54, 208 (1964).

[7]R. H. Ritchie and H. B. Eldridge, Phys. Rev. 126, 1935 (1962).

SUPERCONDUCTIVITY IN GERMANIUM TELLURIDE

R. A. Hein and J. W. Gibson
U. S. Naval Research Laboratory, Washington, D. C.

and

R. Mazelsky, R. C. Miller, and J. K. Hulm
Westinghouse Research Laboratories, Pittsburgh, Pennsylvania

(Received 20 February 1964)

Theoretical calculations by Cohen[1] have indicated that highly doped, many-valleyed semiconductors and semimetals might become superconducting at temperatures around 0.1°K. We report here some results on germanium telluride, a material which at normal temperatures behaves like a p-type semiconductor[2] with moderate mobility ($\mu \sim 100$) and high effective mass ($m^*/m_0 \sim 1$). Due to the large number of carriers, $\eta \sim 0.9 \times 10^{21}$, the forbidden gap has never been accurately determined. At a temperature ~50°C below the melting point (723°C), the resistivity starts to decrease with increasing temperature indicating a gap of very roughly 1/2 to 1 eV. Above about 400°C the crystal structure is cubic and at lower temperatures it is rhombohedral. The rhombohedral angle decreases from 90° above the transition to ~88½° at room temperature and is essentially constant at lower temperatures.

Our measurements show that this material be-