V. MICROWAVE SPECTROSCOPY

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A. ZEEMAN EFFECT

Study of the Zeeman effect in the water molecule has been substantially completed, with lines of the three isotopic modifications H_2O, HDO, and D_2O having been measured. In all cases the magnetic splitting factor agrees with theory within experimental error. In the case of D_2O, the identity of the absorption line at 10,919 Mc/sec, ascribed to D_2O by D. W. Posener of this laboratory, was confirmed by the Zeeman measurements. A detailed report on the work is in preparation.

B. F. Burke

B. HIGH-TEMPERATURE MICROWAVE SPECTROSCOPY

After several unsuccessful attempts to observe absorption lines in KCl vapor with the high-temperature microwave spectrograph previously described, the valve in the pumping lead was removed and success was obtained. The KCl molecular transitions $J = 2$ for $v = 0$ and $v = 1$ were observed and measured.

Two new high-temperature systems were designed. They both differ from the previous one in that they use a section of waveguide enclosed with the sample in a Vycor cell. In one system the guide is split in a plane parallel to the long cross-sectional dimension, with upper and lower halves acting as Stark electrodes. In the other a conventional Stark septum supported by quartz insulators is used. The first system has been constructed and is ready for testing.

P. A. Tate

C. WATER MOLECULE

From its Stark effect the line at 10,919.39 Mc/sec has been tentatively assigned to the $2_{20} - 3_{13}$ transition of D_2O, a conclusion which is supported by Zeeman-effect measurements (see above).

The Stark components of the lines at 10,947.13 Mc/sec and 26,880.38 Mc/sec have been resolved and the splittings measured. The lines appear to arise from P- or R-branch transitions of HDO, but definite identification does not appear to be feasible on the basis of the Stark effect alone. Calculation of some of the molecular parameters of HDO, based on the observed microwave spectrum, is proceeding.

D. W. Posener

D. PARAMAGNETIC RESONANCE IN OXYGEN GAS

Apparatus for the study of the Zeeman splittings of molecular oxygen levels is being built up. This spectrum has been studied in the X-band (R. Beringer, J. G. Castle, Jr. Phys. Rev. 81, 82, 1951), but only tentative identification of many lines was possible because of the difficulty of the calculations. It is planned to study the spectrum in the S-band, where interpretation should be easier. An S-band klystron oscillator has been stabilized to a silver-plated cavity resonant in the TM_{010} mode. The necessary vacuum system is being completed, and tests of the entire system should be possible in the near future.

M. Tinkham