from the room temperature values of R. b_D is obtained from extrapolation of the resistivity at very low temperatures and with the help of Eq. (5). The calculated resistivity and Hall curves are shown in Figs. 1 and 2 together with the experimental curves for two of the samples. For the other samples, experiment and theory also agree. However, except when the Hall coefficients are measured to very low temperatures, it is not always possible to ascertain whether the carriers in the impurity bands behave as electrons or as holes. The mobility in the impurity bands varies between 10^{-4} and 100 cm²/volt-sec. for impurity concentration between approximately 10^{14} and 10^{17}/cc.

* Work assisted by Signal Corps contract.
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Infra-Red Spectra of Condensed Oxygen and Nitrogen*

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INFRA-RED absorption spectra of condensed O_2 and N_2 have been obtained using a model 12-B Perkin-Elmer spectrometer. The chemically purified gases were purified further by distillation of the liquids, and were finally condensed in a variable thickness low temperature cell[1] fitted with silver chloride windows. Since induced infra-red absorption is weak, a sample thickness of about 7.5 mm was employed throughout the temperature range investigated, 35° to 85°K. A NaCl prism was used in the study of the O_2 fundamental, and a LiF prism for N_2. Careful corrections for water vapor and carbon dioxide absorption gave a reproducibility of ±2 percent transmission on different runs at the same temperature.

Figure 1 shows the absorption in the 1550 cm⁻¹ region of the liquid, solid-γ-, and solid-β-O_2. The central frequency at 1559 cm⁻¹ in the liquid is the same within experimental error as that given for the gas by Crawford and his co-workers.[2] There is no detectable frequency shift as the liquid freezes to solid-γ at 55°K, nor is the transmission reduced. β-O_2, however, is highly scattering, and to register spectra of this phase a slit-width ten times greater than that used for the liquid was necessary.

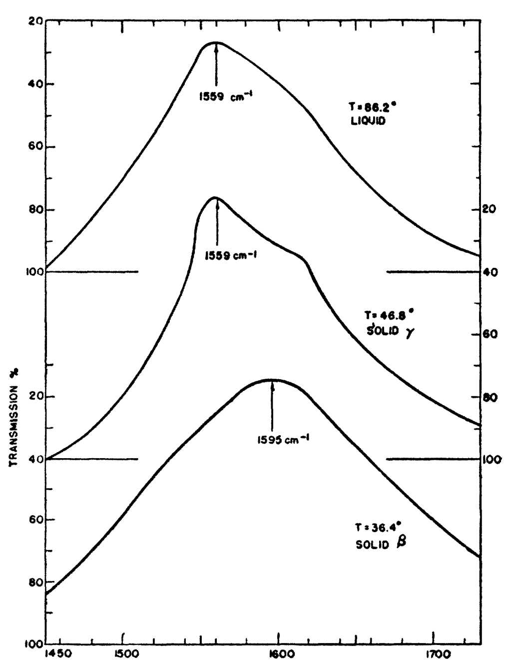

FIG. 1. Infra-red absorption spectra of condensed oxygen.

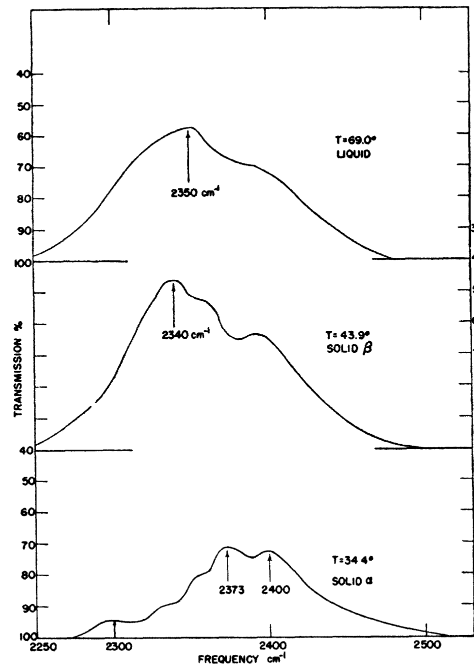

FIG. 2. Infra-red absorption spectra of condensed nitrogen.

The analogous results for the three condensed phases of N_2 are shown in Fig. 2. As the liquid freezes at 63°K the character of the absorption remains unchanged, but as the temperature is lowered further there is a gradual shift of the central peak from 2350 to 2336 cm⁻¹ at 39°K. On going from solid-β to solid-γ at 36°K, transmission is somewhat reduced and the band center is replaced by two distinct peaks of equal intensity at 2373 and 2400 cm⁻¹.

The fact that the fundamental vibrational band appears in β-N_2 but only weakly in the α-form suggests that in the former phase the molecules are disordered, while in the latter they are ordered.[3] The two strong peaks in the α-N_2 spectrum are probably librational modes having frequencies[3,4] of 40 and 69 cm⁻¹ in combination with the comparatively weak fundamental; a weaker subtractive combination is found at 2300 cm⁻¹. An interpretation of the spectrum of β-O_2 cannot be made at this time because of the unusually poor resolution encountered.

A more detailed account of this work and a possible interpretation of the observed envelopes will be presented later.

* This work was supported in part by the ONR under contract with The Ohio State University Research Foundation.
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Beta-Gamma-Angular Correlation Experiments*

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IN recent months several positive examples of beta-gamma-directional correlation have been found. Correlations have been reported for Rb^{86},[1,2] Tm^{170},[2] and Sb^{124}.[3] In many cases, however, no correlation seems to exist.[4]