OPTICAL SPECTRA AND MOLECULAR PARAMETERS OF LIGHT ELEMENT MOLECULES

by

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I. Personnel

A. S. Kanan, K. Sathianandan (not on contract funds),
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II. Research Progress

The following research progress is to be reported:

(a) Vacuum Ultraviolet Spectroscopy

Due to a malfunction in the vacuum system of the two-meter
McPherson spectrometer, Model 240, work on the spectrograph was interrupted
temporarily before it was repaired by the McPherson Company.

Oxygen difluoride (OF₂) was excited in a hollow cathode
discharge tube. No promising results were obtained in the visible and
ultraviolet region. Work is continued in the vacuum ultraviolet region
using various excitation devices.

A mixture of N₂ and Cl₂ was excited in a hollow cathode
discharge tube and emission spectra were observed in the visible and
ultraviolet regions. Preliminary studies did not indicate the presence
of species of interest. The vacuum ultraviolet region will be investigated.

(NO₂)₃ was prepared and excited in a microwave discharge.
The spectrum from this source is being investigated. A differential pumping
system was attached to the spectrometer at the entrance slit to allow
studies in windowless discharge tubes.

Absorption studies of various fluorides are planned.
(b) Visible and Near Ultraviolet Spectroscopy

Emission spectra from CF₄, HF₃, SiF₄, and H₂ introduced separately into the hot zone of the plasma were obtained. Preliminary studies showed successful mixing of these gases with the hot plasma. However, difficulties due to impurities in argon made it difficult to obtain spectra of CF, CF₂, HF, and H₂ molecules. The spectra of SiF and SiO were identified from the SiF₄-Ar system. Spectra of O₂ and NO were identified in the case of CF₄ and HF₃, respectively. An arrangement to inhibit interference of O₂ is under consideration.

(c) Infrared Spectroscopy

A special cell has been designed with cooling systems for work on the infrared spectrum of TeO₂ vapor. Also, several unsuccessful attempts were made to obtain the infrared spectrum of CrO₃ vapor. At elevated temperatures the substance decomposes to a series of lower oxides.

Infrared studies of SiF₂(matrix) have been considered and a plan for getting SiF₂ deposited is being devised.

(d) Thermodynamic Properties of Light Element Molecules

Mass spectrometric studies of NiF₂(g), MnF₂(g) and MnF(g) are in progress which will yield bond energies and heats of formation.

(e) Manuscripts and Meetings


