Status Report

Vacuum Ultraviolet Spectra of Atoms and Light Molecules

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Research carried out under NASA Order No. R-64
dated June 7, 1962; NBS Project No. 2210461

Project Leader: Dr. A. M. Bass

Reporting Period: August 1, 1964 - October 31, 1964

1. The following technical report was prepared:

   "A New Method for Cooling Photoconductive Detectors"
   by S. Abramowitz, A. E. Ledford, Jr. and A. M. Bass,
   NBS Technical Report No. 8554, Sept. 15, 1964.

   This manuscript has been submitted to Applied Optics for publication.

2. The scanning vacuum ultraviolet monochromator in conjunction with the liquid hydrogen cryostat (described in the preceding Status Report) has been used to study the products produced by the photolysis of molecular species frozen in inert matrices. It is planned to examine the products of the photolysis of low molecular weight hydrocarbons and of nitrogen-containing molecules. The species to be studied are those that are of particular significance in the interpretation of photochemical reactions in astrophysical environments.

   Preliminary studies in this connection have included the production of the free radical CF_2 in a low temperature matrix by the photolysis of CF_3N_3. We have observed the ultraviolet absorption spectrum of CF_2 and have found an additional band on the long wavelength side of the previously reported band system. This will require modification of the vibrational numbering of this band system by at least one unit. This system will be studied further.

   The photolytically induced reaction in a low temperature deposit between CO and t-N_2F_2 has been found to produce the free radical FCO. The ultraviolet spectrum of this radical has been observed and measured. A manuscript has been prepared on this work and will be submitted to the Journal of Chemical Physics.

3. In the infrared work is in progress on the study of the spectra associated with atomic reactions in the gas phase. In particular, an attempt will be made to observe the absorption spectrum of the radical OH produced in the reaction between H-atoms and NO_2. In addition the wavelength region from 1 to 4 microns will be investigated for emission spectra from molecular species excited in a microwave discharge.