NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Technical Memorandum 33-541

A Compilation of Laboratory Spectra

J. S. Margolis

(NASA-CR-126985) A COMPILATION OF LABORATORY SPECTRA J.S. Margolis (Jet Propulsion Lab.) 15 May 1972 4 p CSCL 20H

N72-25648

Unclas

G3/24 30446

RECEIVED NASA STI FACILITY INPUT BRANCH JUL 7 2

JUL 7 2

Reproduced by NATIONAL TECHNICAL INFORMATION SERVICE U S Department of Commerce Springfield VA 22151

JET PROPULSION LABORATORY

CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA, CALIFORNIA

May 15, 1972

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Technical Memorandum 33-541

A Compilation of Laboratory Spectra

J. S. Margolis

JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

May 15, 1972

Prepared Under Contract No. NAS 7-100
National Aeronautics and Space Administration

PRECEDING PAGE BLANK NOT FILMED

PREFACE

The work described in this memorandum was performed by the Space Sciences Division of the Jet Propulsion Laboratory.

PRECEDING PAGE BLANK NOT FILMED

CONTENTS

ABSTRACT

This report contains an up-to-date listing of the spectra obtained in the spectroscopy laboratory and a complete description of the experimental conditions.

INTRODUCTION

The Spectroscopy Laboratory at the Jet Propulsion Laboratory acquires the spectra of many molecules under conditions which may be of interest to investigators in other laboratories. For this reason we have compiled an up-to-date listing of our spectra with a complete description of the experimental conditions.

The spectrometers used are either a 1.8-m Jarrell-Ash vacuum scanning spectrometer or a Beckman model IR-12. The Jarrell-Ash spectrometer is equipped with a 20-cm (8-in.) 300 ℓ/mm grating which is blazed at 5.7 μ; the best resolution achieved is 0.03 cm^{-1}. The best resolution obtainable from the Beckman IR-12 is about 1 cm^{-1}. The entire light path, from source to detector, used in the Jarrell-Ash spectrometer is evacuable, and no spurious atmospheric absorptions are observed under the ordinary operating conditions. The Beckman IR-12 instrument is continuously flushed with dry nitrogen obtained from boiled-off liquid N_2.

There are a number of short cells up to 40 cm in length for use with the Jarrell-Ash spectrometer. However, the main one is a 2-m White cell which can be pressurized up to 2.0×10^5 N/m^2 (2 atm) absolute pressure. The path length may be varied in steps of 8 m. Usable path lengths up to 160 m have been obtained with this White cell.

Molecules	Spectral region, μm	Pressure, N/cm^2 (torr)	Path	Slit width, μm	Instrument	Operator
H_2CO	3.543 - 3.560	4.00×10^2 (3)	10 cm		J. A. 1.8 m	R. Beer
	3.506 - 3.543					
	3.445 - 3.505					
	3.366 - 3.445					
	3.300 - 3.355					
	3.225 - 3.300					
	3.604 - 3.635					
	3.354 - 3.360					
	3.800 - 3.908					
	3.620 - 4.000					
HCOOH	3.750 - 4.050	1.40×10^2 (1.045)	8 m		J. A. 1.8 m	R. Beer
H_2S	3.850 - 3.900	6.65×10^3 (50)	16 m		J. A. 1.8 m	R. Beer
	3.600 - 3.650					
	3.650 - 3.700					
	3.750 - 3.800					
	3.675 - 3.700					
	3.650 - 3.675					
	3.750 - 3.781					
	3.750 - 3.800					
	3.600 - 3.625					
	3.600 - 3.650					
	3.700 - 3.750					
	3.800 - 3.850					
CH_3SH	3.600 - 3.680	6.65×10^2 (5)	16 m		J. A. 1.8 m	R. Beer
	3.852 - 3.874					
	3.775 - 4.000					
	3.870 - 3.977					
	3.680 - 3.850					
CH_4	3.975 - 4.000	6.65×10^2 (5)	16 m		J. A. 1.8 m	R. Beer
	3.900 - 3.950					
	3.710 - 3.810					
	3.810 - 3.895					
C_2H_2	3.600 - 3.783	5.33×10^3 (40)	8 m		J. A. 1.8 m	R. Beer
	3.660 - 3.874					
NO_2:N_2O_4	3.400 - 3.475	1.33×10^3 (100)	10 cm		J. A. 1.8 m	R. Beer
	3.500 - 3.675					
	3.700 - 3.925					
	3.795 - 3.923					
COS	4.15 - 3.37	6.65×10^2 (50)	10 cm		Beckman I. R. 12	R. Beer
H_2S	4.00 - 3.45	6.65×10^4 (500)	10 cm			R. Beer
HCOOH	4.16 - 2.46	6.65×10^2 (5)	10 cm			R. Beer
	4.08 - 3.30	6.65×10^3 (50)				
C_2H_2	4.16 - 3.42	6.65×10^3 (50)				R. Beer
	4.16 - 3.42	6.65×10^4 (500)				
NO_2/N_2O_4	4.08 - 3.42	4.00×10^4 (302)				R. Beer
CH_3Cl	4.16 - 3.13	6.65×10^3 (50)				R. Beer
	3.57 - 3.13	2.66×10^4 (200)				
	4.16 - 3.33	6.65×10^4 (500)				
CH_3OH	4.16 - 3.57	2.66×10^4 (200)				R. Beer
	4.16 - 3.17	6.65×10^3 (50)				
	3.65 - 3.45	1.33×10^3 (10)				
CH_3SH	4.00 - 3.50	6.65×10^3 (50)				R. Beer
	4.00 - 3.16	2.66×10^4 (200)				
	4.16 - 3.23	6.65×10^3 (50)				
HCOH	4.16 - 3.37	4.00×10^2 (3)				R. Beer

Molecules	Spectral region, μm	Pressure, N/cm^2 (torr)	Path	Slit width, μm	Instrument	Operator
CH_3F	3.57 - 3.00 3.57 - 2.96	6.65×10^3 (50) 2.66×10^4 (200)				R. Beer
N_2O	2.3 - 2.252	1.33×10^3 (10)	8 m	47	J. A. 1.8 m	J. Margolis
N_2O/N_2	2.300 - 2.252	$1.33\times10^3/9.85\times10^4$ (10/740)	8 m	47	J. A. 1.8 m	J. Margolis
$N_2O/N2$	2.300 - 2.252	$1.33\times10^2/1.0\times10^5$ (1.0/749)	8 m	47	J. A. 1.8 m	J. Margolis
N_2O/N_2	2.3000 - 2.252	$4.00\times10^2/6.60\times10^3$ (3.0/497)	8 m	47	J. A. 1.8 m	J. Margolis
N_2O	2.3000 - 2.252	4.00×10^2 (3.0)	8 m	47	J. A. 1.8 m	J. Margolis
N_2O	2.2925 - 2.2520	1.33×10^2 (1.023)		47	J. A. 1.8 m	J. Margolis
N_2O	2.2975 - 2.2520	4.00×10^2 (3.046)	8 m	47	J. A. 1.8 m	J. Margolis
N_2O	2.3050 - 2.2990	1.33×10^3 (10)	8 m	47	J. A. 1.8 m	J. Margolis
NH_3/H_2	2.2750 - 2.1775	$2.00\times10^2/6.65\times10^4$ (1.507/501)	16 m	45	J. A. 1.8 m	J. Margolis
NH_3	2.2750 - 2.1750	4.40 (0.33)	16 m	45	J. A. 1.8 m	J. Margolis
NH^3/H_2	2.3370 - 2.2640	$2.7\times10^2/7.98\times10^4$ (2.03/598)	16 m	45	J. A. 1.8 m	J. Margolis
NH_3/H_2	2.3400 - 2.3255	$1.33\times10^2/7.98\times10^4$ (1.000/599)	16 m	45	J. A. 1.8 m	J. Margolis
NH_3/N_2O	2.3125 - 2.1740	$1.34\times10^2/1.50\times10^2$ (1.010/1.130)	16 m	45	J. A. 1.8 m	J. Margolis
NH_3/CO	2.3755 - 2.1770	$40.0/3.40\times10^2$ (0.334/2.562)	16 m	45	J. A. 1.8 m	J. Margolis
NH_3/CO	2.3760 - 2.2440	$1.46\times10^2/1.45\times10^2$ (1.100/1.087)	16 m	45	J. A. 1.8 m	J. Margolis
NH_3	2.3625 - 2.2745	1.45×10^2 (1.093)	16 m	45	J. A. 1.8 m	J. Margolis
NH_3/CO	2.4020 - 2.2510	$5.50\times10^2/3.35\times10^2$ (4.137/2.517)	16 m	45	J. A. 1.8 m	J. Margolis
NH_3	2.3375 - 2.2750	40.0 (0.333)	16 m	45	J. A. 1.8 m	J. Margolis
NH_3	2.3375 - 2.2750	136.0 (1.019)	16 m	45	J. A. 1.8 m	J. Margolis
NH_3	2.3625 - 2.3020	134.0 (1.100)	8 m	50	J. A. 1.8 m	J. Margolis
NH_3	2.3375 - 2.2750	136.0 (1.019)	8 m	50	J. A. 1.8 m	J. Margolis
NH_3	2.2750 - 2.1750	132 (0.990)	8 m	50	J. A. 1.8 m	J. Margolis
N_2O	2.83 - 2.93	$40-4.0\times10^4$ (0.3-300)	0.4-32 m	70	J. A. 1.8 m	R. Toth
N_2O	2.93 - 3.04	$40-4.0\times10^4$ (0.3-300)	0.4-32 m	70	J. A. 1.8 m	R. Toth
H_2CO	2.79 - 2.96	40.0-66.5 (0.3-0.5)	8-16 m	60	J. A. 1.8 m	R. Toth
CO_2	2.05 - 2.15	$(1.0-6.65)\times10^2$ (1-5)	8-16 m	70	J. A. 1.8 m	R. Toth
Solar Spect.	2.375 - 2.325			70	J. A. 1.8 m	R. Toth
Solar Spect.	3.475 - 3.429			120	J. A. 1.8 m	R. Toth
Solar Spect.	1.920 - 1.595			90	J. A. 1.8 m	R. Toth
Solar Spect.	2.41 - 2.315			70	J. A. 1.8 m	R. Toth
Solar Spect.	2.410 - 2.218			70	J. A. 1.8 m	R. Toth
Solar Spect.	2.045 - 1.908			60	J. A. 1.8 m	R. Toth
Solar Spect.	1.913 - 1.823			65	J. A. 1.8 m	R. Toth
Solar Spect.	1.800 - 1.380			65	J. A. 1.8 m	R. Toth

Molecules	Spectral region, μm	Pressure, N/cm^2 (torr)	Path	Slit width, μm	Instrument	Operator
N_2O	2.30 - 2.25	$40\text{-}1.33\times10^3$ (0.33-10.0)	8 m	50	J. A. 1.8 m	J. Margolis
N_2O	2.85 - 2.25	6.65×10^3 (500)	41 cm	50	J. A. 1.8 m	J. Margolis
NH_3	3.2 - 2.25	$66.5\text{-}6.65\times10^4$ (0.5-500)	8 m	65	J. A. 1.8 m	J. Margolis
N_2O	3.1 - 2.90	$(1.33\text{-}6.65)\times10^2$ (1-5)	41 cm	65	J. A. 1.8 m	J. Margolis
N_2O	2.3 - 2.250	2.66×10^2 - 6.65×10^4 (2-500)	8 m	50	J. A. 1.8 m	J. Margolis
N_2O	2.3 - 2.275	5.33×10^4 (400)	41 cm	50	J. A. 1.8 m	J. Margolis
N_2O/N_2	2.2875 - 2.25	$2.66\times10^2/6.65\times10^4$ (2/500)	8 m	50	J. A. 1.8 m	J. Margolis
NO_2	3.475 - 3.400	6.5×10^4 (4.9)	16 m	170	J. A. 1.8 m	R. Toth
H_2CO	3.55 - 3.39	40.0 (0.3)	16 m	100	J. A. 1.8 m	R. Toth
NO_2	3.53 - 3.39	$(1.33\text{-}6.65)\times10^2$ (1.0-5.0)	16 m	100	J. A. 1.8 m	R. Toth
C_2H_4	3.43 - 3.09	1.0×10^2 - 6.65×10^3 (0.75-50.0)	8 m	100	J. A. 1.8 m	R. Toth
C_2H_4	3.415 - 3.11	$(1.06\text{-}1.33)\times10^2$ (0.8-1.0)	41 cm	90	J. A. 1.8 m	R. Toth
NH_3	2.385 - 2.15	$(4.0\text{-}8.0)\times10^2$ (3.0-6.0)	8 m	45	J. A. 1.8 m	R. Toth
H_2CO	3.20 - 2.70	53.5 (0.40)	48 m	75	J. A. 1.8 m	R. Toth
H_2O	3.4 - 3.00	1.39×10^3 (10.4)	48 m	100	J. A. 1.8 m	R. Toth
H_2O	3.158 - 3.1	4.05×10^2 (3.03)	48 m	100	J. A. 1.8 m	R. Toth

NASA — JPL — Coml., L.A., Calif.