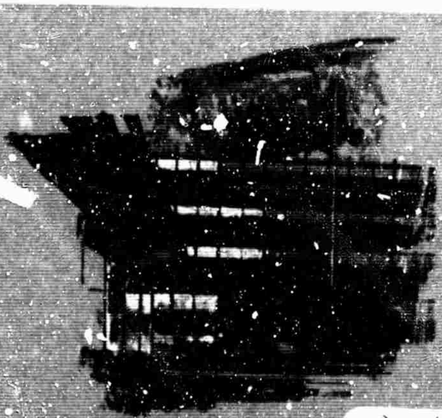
ABSORPTION BY CO_2 BETWEEN 1800 AND 2850 cm^{-1} (3.5-5.6 MICRONS)



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PHILCO-FORD CORPORATION
Aeronutronic Division
Newport Beach, California

Publication No. U-3857

Under Contract: NOnr 3560(00)
ARPA Order No. 237
Amendment #23/1-3-66

15 December 1966

SCIENTIFIC REPORT

ABSORPTION BY CO_2 BETWEEN 1800 AND 2850 cm^{-1}
(3.5-5.6 Microns)

Prepared for: Advanced Research Projects Agency
Washington 25, D.C.

Prepared by: David A. Gryvnak
Richard R. Patty
Darrell E. Burch
Earl E. Miller

Approved: Paul M. Sutton
Paul M. Sutton, Director
Physics Laboratory

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PHILCO-FORD CORPORATION
Aeronutronic Division
Newport Beach, Calif. • 92663

ABSTRACT

Transmission spectra in the 1800-2850 cm^{-1} region have been obtained for more than 100 samples of CO_2 and CO_2 mixed with N_2 and A. The spectral resolution was 2.5 cm^{-1}. Sample pressures varied from 0.0055 to 742 torr with absorber thicknesses covering the range from 0.081 to 84,400 atm cm_{STP}. Spectra of several samples at the lower pressures show the effect of Doppler broadening. Measurements in the 2400-2560 cm^{-1} region provide information about the absorption by the extreme wings of collision-broadened lines. Replotted transmission spectra and extensive tables of integrated absorptance for 116 samples are included.

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SECTION 1

INTRODUCTION AND SUMMARY

Absorption and emission by CO_2 in the 1800-2850 cm^{-1} region plays a very important part in the transfer of heat in the atmospheres of the earth and other planets. Because of many very strong lines in this region, there is appreciable absorption by atmospheric paths which are so short or at such low pressures that absorption in other regions of the infrared is almost negligible.

Several quantitative measurements on the absorption in this region have been made previously with low resolution for the purpose of determining the relationship between the integrated absorptance $\int A(\nu)d\nu$ and the parameters, absorber thickness and pressure.[1,2] The present investigation, which was undertaken to supplement the previous work, includes measurements on samples having much greater absorber thicknesses. Therefore, it has been possible to measure CO_2 absorption in spectral regions where it had not been observed previously. Other samples with long paths and very low pressures have provided data under conditions for which Doppler broadening of the absorption lines is important. Information on the absorption by the extreme wings of the strongest lines has also been obtained from measurements in the 2400-2560 cm^{-1} region.

The experimental methods are discussed in Section 2. Section 3 includes spectral curves for 116 samples of CO_2 alone and $CO_2 + N_2$ as well as a limited discussion of the results. Extensive tables of the integrated absorptance are included in Section 4. Tables of transmittance versus wavenumber are available from the authors for workers who require them.

Additional measurements with resolution less than 0.5 cm^{-1} will be made in this region by us in the future. The results will be used to identify many of the very weak bands and to determine the contributions of various bands in regions where several of them may overlap.

SECTION 2

EXPERIMENTAL

2.1 INSTRUMENTAL

Samples of CO_2 alone and mixtures of CO_2 with N_2 or A were contained in a multiple-pass absorption cell whose base length is approximately 29 meters. The cell was used at 4, 8, 16, and 32 passes, giving path lengths of 121, 237, 469, and 933 meters, respectively. Radiation from a Nernst glower traversed the absorption cell and formed an image of the source on the slit of a Perkin Elmer Model 112 spectrometer which employed an LiF prism and a thermocouple detector. While a spectrum was being scanned, the spectrometer slits were adjusted continuously by a string cam which coupled the slit micrometer to the Littrow screw that rotated the prism. The cam, which was designed and built in our laboratory, adjusted the slits so that the signal from the detector was approximately constant while scanning a spectrum with the absorption cell evacuated. The spectral slitwidth was approximately 2.5 cm^{-1}.

The monochromator was flushed with dry N_2, and the remainder of the optical path outside the absorption cell was contained in vacuum tanks in order to eliminate absorption by atmospheric gases. Wavenumber calibration was obtained from H_2O, CO_2, CH_4, N_2O and CO absorption lines whose positions are known. Details of the multiple-pass cell and the spectrometer have been described previously.[3,4]

2.2 SAMPLING PROCEDURE

The gases used for samples were obtained from commercial cylinders. The N_2 was high-purity dry grade with less than 10 parts H_2O per million, and the CO_2 contained traces of H_2O and CO. It is probably safe to assume that all the isotopes were present in their natural abundances (C^{12}, 98.9%; C^{13}, 1.1%; O^{16}, 99.76%; O^{17}, 0.04%; O^{18}, 0.20%; H, 99.9844%; D, 0.0156%).

An Hg manometer was used to measure pressures in the range from 50 torr to 1 atm; a manometer containing a special oil was used for pressures between 1.5 and 50 torr. Some of the lower pressures were measured by a McLeod gauge; other pressures of pure CO_2 which were too low to measure accurately with any of the gauges were determined by expanding CO_2 into the cell from a cylinder filled to a pressure that could be measured accurately. The volume of the cylinder was approximately 0.001 times that of the absorption cell. The ratio of the pressure in the cylinder to the resulting pressure in the cell was determined by using enough CO_2 that the pressure in the cell was several torr, which was high enough to be measured accurately. We then assumed that the ratio of pressures was the same at lower pressures. When the initial pressure in the cylinder was greater than approximately 1 atm, it was necessary to account for the non-linearity in the relation between CO_2 density and pressure. From the Van der Waal's constants for CO_2, we can show that the density is proportional to $p(1 + 0.005p)$ if p, the pressure in atm, is less than approximately 15.

Adsorption of CO_2 on the walls of the cylinder and the absorption cell probably gives rise to the greatest uncertainty in determining CO_2 pressures by the expansion method. If the percent adsorbed was independent of pressure, very little error was introduced. However, it seems possible that a greater percentage of gas would be adsorbed when it is first added until a film is formed on the surface; after this, the percentage adsorbed would decrease as the pressure increases. No measurements were made to determine if such a saturation phenomenon occurred in our system. But if it did occur at pressures less than approximately 0.1 torr, the values we used for very low CO_2 pressures are probably too high. We compared the integrated absorptance of a few samples of $CO_2 + N_2$ in which the CO_2 pressure was determined by expansion to some previous results[1] for samples with shorter paths and higher CO_2 pressures which could be measured accurately. The integrated absorptance of the earlier samples was usually slightly greater than that of present samples having the same absorber thickness and equivalent pressure. Therefore, it seems likely that there were small systematic errors, possibly due to adsorption, in the pressures we determined by the expansion method.

In view of the above discussion, the quoted values of CO_2 pressures below 0.1 torr are probably less than 8 percent too high or less than 2 percent too low.

Mixtures of $CO_2 + N_2$ or CO_2 + A were formed by adding the N_2 or A to the cell after the CO_2 was introduced. Fans installed in the cell were used to mix the gases. Several different samples, each at a different total pressure, were formed from the same CO_2. The same mixture was also frequently investigated at four different path lengths: 121, 237, 469, and 933 meters.

The absorber thickness u was calculated by the use of the following equation.

$$u(\text{atm cm})_{STP} = (1 + 0.005p)\ p\ L\ 273/296, \qquad (2\text{-}1)$$

where L is the geometrical path length in cm and p is the partial pressure of CO_2 in atm. The term (273/296) accounts for the difference in density between standard temperature (273°K) and room temperature (296°K) at which the measurements were made. The quantity (1 + 0.005p), which accounts for the non-linearity in the relation between the density of CO_2 and its pressure, is negligible except for pressures greater than approximately 1 atm. It could be neglected for samples included in the present study, but it has been included in a computer program used to calculate sample parameters for pressures as high as 15 atm.

When working with mixtures of CO_2 + N_2, it is convenient to use an equivalent pressure P_e which is proportional to the half-width of the absorption lines, regardless of the composition of the mixture. We have found that such an equivalent pressure is given by

$$P_e = 1.3\ p + (P - p), \qquad (2\text{-}2)$$

where P is the total pressure, and p is the partial pressure of CO_2. It is noted that P_e approaches P for a very dilute mixture of CO_2 in N_2 ($p \ll P$).

Table 2-1 includes the parameters for 116 samples of CO_2 and CO_2 + N_2. The CO_2 partial pressure p, the total pressure P, and the equivalent pressure P_e are given in torr and in atm. Also included are references to the transmittance curves and the integrated absorptance tables. Samples of CO_2 + A which are discussed in Section 3.3 were scanned only over the region above 2400 cm^{-1} and are not included in Table 2-1.

2.3 RECORDING AND REDUCTION OF DATA

A spectrum of each sample was scanned over a sufficiently wide region that there was essentially no absorption at the starting and end points. Spectral curves called background curves were scanned over the same spectral regions with the cell evacuated. The shapes of the background curves varied with the number of passes of the cell because of the variation in reflectivity with wavenumber. Therefore, it was necessary to scan background curves at the same paths as those used for the samples.

TABLE 2-1

SAMPLE PARAMETERS

Sam. No.	p	P	P_e	p	P	P_e
	torr	torr	torr	atm	atm	atm
1	742	742	969	0.976	0.976	0.275
2	742	742	969	0.976	0.976	0.275
3	208	208	271	0.274	0.274	0.356
4	742	742	969	0.976	0.976	1.28
5	101	101	131	0.133	0.133	0.173
6	208	208	271	0.274	0.274	0.356
7	208	740	803	0.274	0.974	0.0563
8	51.5	51.5	67.0	0.0678	0.0678	0.0881
9	101	101	131	0.133	0.133	0.173
10	208	208	271	0.274	0.274	0.356
11	208	740	803	0.274	0.974	1.06
12	51.5	51.5	67.0	0.0678	0.0678	0.0881
13	208	208	271	0.274	0.274	0.356
14	208	740	803	0.274	0.974	1.06
15	26.8	26.8	34.8	0.0353	0.0353	0.0459
16	26.8	229	237	0.0353	0.301	0.312
17	26.7	26.7	34.7	0.0351	0.0351	0.0457
18	26.7	229	237	0.0351	0.301	0.312
19	3.20	3.20	4.16	0.00421	0.00421	0.00547
20	26.7	26.7	34.7	0.0351	0.0351	0.0457
21	26.7	229	237	0.0351	0.301	0.312
22	3.20	3.20	4.16	0.00421	0.00421	0.00547
23	3.20	10.9	11.9	0.00421	0.0143	0.0156
24	3.20	32.9	33.9	0.00421	0.0433	0.0446
25	3.20	103	104	0.00421	0.136	0.137
26	0.80	0.80	1.04	0.00105	0.00105	0.00137
27	3.20	3.20	4.16	0.00421	0.00421	0.00547
28	3.20	10.9	11.9	0.00421	0.0143	0.0156
29	3.20	32.5	33.5	0.00421	0.0428	0.0440
30	3.20	103	104	0.00421	0.136	0.137
31	0.80	0.80	1.04	0.00105	0.00105	0.00137
32	3.20	3.20	4.16	0.00421	0.00421	0.00547
33	3.20	10.9	11.9	0.00421	0.0143	0.0156
34	3.20	32.5	33.5	0.00421	0.0428	0.0440
35	3.20	103	104	0.00421	0.136	0.137
36	0.400	0.400	0.520	0.000526	0.000526	0.000684
37	0.400	1.00	1.12	0.000526	0.00132	0.00147
38	0.400	3.20	3.32	0.000526	0.00421	0.00437
39	0.400	15.0	15.1	0.000526	0.0197	0.0199
40	0.400	100	100.1	0.000526	0.132	0.132

TABLE 2-1 (cont.)

Sam. No.	L Path m	u atm cm STP	Fig. in which spectral curve appears	Tables of integrated absorptance
1	933	84,400	3-1	4-1
2	469	42,400	3-1	4-1
3	933	23,600	3-1	4-1
4	237	21,400	3-1	4-1
5	933	11,400	3-1	4-1
6	469	11,900	3-1	4-1
7	469	11,900	3-1	4-1
8	933	5,830	3-1	4-1
9	469	5,750	3-1	4-1
10	237	5,990	3-1	4-1
11	237	5,990	3-2	4-1
12	469	2,930	3-2	4-1
13	121	3,060	3-2	4-1
14	121	3,060	3-2	4-1
15	469	1,530	3-2	4-1
16	469	1,530	3-2	4-1
17	237	768	3-2	4-2
18	237	768	3-2	4-2
19	933	362	3-2	4-2
20	121	392	3-2	4-2
21	121	392	3-3	4-2
22	469	182	3-3	4-2
23	469	182	3-3	4-2
24	469	182	3-3	4-2
25	469	182	3-3	4-2
26	933	90.6	3-3	4-2
27	237	92.0	3-3	4-2
28	237	92.0	3-3	4-2
29	237	92.0	3-3	4-2
30	237	92.0	3-3	4-2
31	469	45.5	3-3	4-2
32	121	47.0	3-3	4-2
33	121	47.0	3-3	4-2
34	121	47.0	3-3	4-2
35	121	47.0	3-3	4-2
36	469	22.8	3-4	4-3
37	469	22.8	3-4	4-3
38	469	22.8	3-4	4-3
39	469	22.8	3-4	4-3
40	469	22.8	3-4	4-3

TABLE 2-1

SAMPLE PARAMETERS

Sam. No.	p	P	P_e	p	P	P_c
	torr	torr	torr	atm	atm	atm
41	0.100	0.100	0.130	0.000132	0.000132	0.000171
42	0.200	0.200	0.260	0.000263	0.000263	0.000342
43	0.400	0.400	0.520	0.000526	0.000526	0.000684
44	0.400	1.00	1.12	0.000526	0.00132	0.00147
45	0.400	3.20	3.32	0.000526	0.00421	0.00437
46	0.400	15.0	15.1	0.000526	0.0197	0.0199
47	0.400	100.0	100.1	0.000526	0.132	0.132
48	0.051	0.051	0.066	0.000067	0.000067	0.000087
49	0.100	0.100	0.130	0.000132	0.000132	0.000171
50	0.200	0.200	0.260	0.000263	0.000263	0.000342
51	0.400	0.400	0.520	0.000526	0.000526	0.000684
52	0.400	1.00	1.12	0.000526	0.00132	0.00147
53	0.400	3.20	3.32	0.000526	0.00421	0.00437
54	0.400	15.0	15.1	0.000526	0.0197	0.0199
55	0.400	100.0	100.1	0.000526	0.132	0.132
56	0.025	0.025	0.033	0.000033	0.000033	0.000043
57	0.025	0.054	0.062	0.000033	0.000071	0.000081
58	0.025	0.114	0.122	0.000033	0.000150	0.000160
59	0.025	0.294	0.302	0.000033	0.000387	0.000397
60	0.025	0.723	0.731	0.000033	0.000951	0.000961
61	0.025	1.88	1.89	0.000033	0.00247	0.00248
62	0.025	5.25	5.26	0.000033	0.00691	0.00692
63	0.025	14.5	14.5	0.000033	0.0191	0.0191
64	0.025	39.0	39.0	0.000033	0.0513	0.0513
65	0.025	100.0	100.0	0.000033	0.132	0.132
66	0.012	0.012	0.016	0.000016	0.000016	0.000021
67	0.025	0.025	0.033	0.000033	0.000033	0.000043
68	0.025	0.054	0.062	0.000033	0.000071	0.000081
69	0.025	0.114	0.122	0.000033	0.000150	0.000160
70	0.025	0.294	0.302	0.000033	0.000387	0.000397
71	0.025	0.723	0.731	0.000033	0.000951	0.000961
72	0.025	1.88	1.89	0.000033	0.00247	0.0248
73	0.025	5.25	5.26	0.000033	0.00691	0.00692
74	0.025	14.5	14.5	0.000033	0.0191	0.0191
75	0.025	39.0	39.0	0.000033	0.0513	0.0513
76	0.025	100.0	100.0	0.000033	0.132	0.132
77	0.0055	0.0055	0.0072	0.0000072	0.0000072	0.0000094
78	0.012	0.012	0.016	0.000016	0.000016	0.000021
79	0.025	0.025	0.033	0.000033	0.000033	0.000043
80	0.025	0.054	0.062	0.000033	0.000071	0.000081

TABLE 2-1 (cont.)

Sam. No.	L Path m	u atm cm STP	Fig. in which spectral curve appears	Tables of integrated absorptance
41	933	11.3	3-4	4-3
42	469	11.4	3-4	4-3
43	237	11.5	3-4	4-3
44	237	11.5	3-4	4-3
45	237	11.5	3-4	4-3
46	237	11.5	3-4	4-3
47	237	11.5	3-4	4-3
48	933	5.8	3-4	4-3
49	469	5.69	3-4	4-3
50	237	5.75	3-4	4-3
51	121	5.87	3-4	4-3
52	121	5.87	3-4	4-3
53	121	5.87	3-4	4-3
54	121	5.87	3-4	4-3
55	121	5.87	3-4	4-3
56	933	2.8	3-4	4-4
57	933	2.8	3-4	4-4
58	933	2.8	3-4	4-4
59	933	2.8	3-4	4-4
60	933	2.8	3-4	4-4
61	933	2.8	3-4	4-4
62	933	2.8	3-4	4-4
63	933	2.8	3-4	4-4
64	933	2.8	3-4	4-4
65	933	2.8	3-4	4-4
66	933	1.4	3-5	4-4
67	469	1.4	3-5	4-4
68	469	1.4	3-5	4-4
69	469	1.4	3-5	4-4
70	469	1.4	3-5	4-4
71	469	1.4	3-5	4-4
72	469	1.4	3-5	4-4
73	469	1.4	3-5	4-4
74	469	1.4	3-5	4-4
75	469	1.4	3-5	4-4
76	469	1.4	3-5	4-4
77	933	0.62	3-5	4-5
78	469	0.68	3-5	4-5
79	237	0.72	3-5	4-5
80	237	0.72	3-5	4-5

TABLE 2-1

SAMPLE PARAMETERS

Sam. No.	p torr	P torr	P_e torr	p atm	P atm	P_e atm
81	0.025	0.114	0.122	0.000033	0.000150	0.000160
82	0.025	0.294	0.302	0.000033	0.000387	0.000397
83	0.025	0.723	0.731	0.000033	0.000951	0.000961
84	0.025	1.88	1.89	0.000033	0.00247	0.00248
85	0.025	5.25	5.26	0.000033	0.00691	0.00692
86	0.025	14.5	14.5	0.000033	0.0191	0.0191
87	0.025	39.0	39.0	0.000033	0.0513	0.0513
88	0.025	100.0	100.0	0.000033	0.132	0.132
89	0.0055	0.0055	0.0072	0.0000072	0.0000072	0.0000094
90	0.012	0.012	0.016	0.000016	0.000016	0.000021
91	0.025	0.025	0.033	0.000033	0.000033	0.000043
92	0.025	0.054	0.062	0.000033	0.000071	0.000081
93	0.025	0.114	0.122	0.000033	0.000150	0.000160
94	0.025	0.294	0.302	0.000033	0.000387	0.000397
95	0.025	0.723	0.731	0.000033	0.000951	0.000961
96	0.025	1.88	1.89	0.000033	0.00247	0.00248
97	0.025	5.25	5.26	0.000033	0.00691	0.00692
98	0.025	14.5	14.5	0.000033	0.0191	0.0191
99	0.025	39.0	39.0	0.000033	0.0513	0.0513
100	0.025	100.0	100.0	0.000033	0.132	0.132
101	0.0055	0.0055	0.0072	0.0000072	0.0000072	0.0000094
102	0.012	0.012	0.016	0.000016	0.000016	0.000021
103	0.012	0.126	0.130	0.000016	0.000166	0.000171
104	0.012	0.384	0.388	0.000016	0.000505	0.000510
105	0.012	1.20	1.20	0.000016	0.00158	0.00158
106	0.012	3.45	3.45	0.000016	0.00454	0.00454
107	0.012	10.2	10.2	0.000016	0.0134	0.0134
108	0.012	32.5	32.5	0.000016	0.0428	0.0428
109	0.012	100.4	100.4	0.000016	0.132	0.132
110	0.0055	0.0055	0.0072	0.0000072	0.0000072	0.0000094
111	0.0055	0.197	0.199	0.0000072	0.000259	0.000261
112	0.0055	0.600	0.602	0.0000072	0.000789	0.000792
113	0.0055	1.89	1.89	0.0000072	0.00249	0.00249
114	0.0055	8.51	8.51	0.0000072	0.0112	0.0112
115	0.0055	29.5	29.5	0.0000072	0.0388	0.0388
116	0.0055	102	102	0.0000072	0.134	0.134

TABLE 2-1 (cont.)

Sam. No.	L Path m	u atm cm STP	Fig. in which spectral curve appears	Tables of integrated absorptance
81	237	0.72	3-5	4-5
82	237	0.72	3-5	4-5
83	237	0.72	3-5	4-5
84	237	0.72	3-5	4-5
85	237	0.72	3-5	4-5
86	237	0.72	3-5	4-5
87	237	0.72	3-5	4-5
88	237	0.72	3-5	4-5
89	469	0.31	3-5	4-5
90	237	0.35	3-5	4-5
91	121	0.37	3-5	4-5
92	121	0.37	3-5	4-5
93	121	0.37	3-5	4-5
94	121	0.37	3-5	4-5
95	121	0.37	3-5	4-5
96	121	0.37	3-6	4-5
97	121	0.37	3-6	4-5
98	121	0.37	3-6	4-5
99	121	0.37	3-6	4-5
100	121	0.37	3-6	4-5
101	237	0.16	3-6	4-6
102	121	0.18	3-6	4-6
103	121	0.18	3-6	4-6
104	121	0.18	3-6	4-6
105	121	0.18	3-6	4-6
106	121	0.18	3-6	4-6
107	121	0.13	3-6	4-6
108	121	0.18	3-6	4-6
109	121	0.18	3-6	4-6
110	121	0.081	3-6	4-6
111	121	0.081	3-6	4-6
112	121	0.081	3-6	4-6
113	121	0.081	3-6	4-6
114	121	0.081	3-6	4-6
115	121	0.081	3-6	4-6
116	121	0.081	3-6	4-6

Each spectrum was examined and compared with others as a check for consistency. Small corrections were made to account for spurious deflections and for absorption by H_2O and CO impurities in the sample. The transmittance was determined from the ratio of the deflection on the sample curve to the deflection on the background curve at the same wavenumber. Each spectral curve then was replotted and digitized by the method described previously.[3] Pairs of values related to transmittance and wavenumber were punched on IBM cards which served as input for a computer program used to calculate transmittance and integrated absorptance as a function of wavenumber. The replotted spectra are shown in Section 3 and tables of integrated absorptance appear in Section 4.

SECTION 3

RESULTS AND DISCUSSION

3.1 TRANSMISSION SPECTRA

Curves of transmittance versus wavenumber are shown in Figs. 3-1 through 3-6 for the 116 samples of CO_2 and $CO_2 + N_2$ listed in Table 2-1. The curves were replotted from the original curves obtained with a spectral resolution of approximately 2.5 cm^{-1}. Small corrections were made to account for absorption by CO near 2140 cm^{-1} and by H_2O from 2800 to 2870 cm^{-1} and from 1815 to 1870 cm^{-1}.

Table 3-1 includes a list of absorption bands expected in this region. Evidence of many of them can be seen in the transmission spectra, although most of the absorption is due to the very strong 00^01 band and two medium strength bands, 11^10 and 03^10. Features of several of the bands listed in Table 3-1, as well as others not listed, can probably be identified in spectra with higher resolution which we plan to obtain.

TABLE 3-1

CO_2 ABSORPTION BANDS BETWEEN 1800 AND 2800 cm^{-1}

Band Center cm^{-1}		Upper Level	Lower Level*	Molecular Species+
1846.29		$05^{1}0$	$02^{2}0$	
1886.	H	$04^{0}0$	$01^{1}0$	
1896.00		$05^{1}0$	$02^{0}0$	
1917.67		$04^{2}0$	$01^{1}0$	
1932.5	H	$03^{1}0$		
2003.5		$12^{0}0$	$01^{1}0$	
2004.01		$13^{1}0$	$02^{2}0$	
2053.72		$13^{1}0$	$02^{0}0$	
2076.5	H	$11^{1}0$		
2094.		$12^{2}0$	$01^{1}0$	
2137.	H	$20^{0}0$	$01^{1}0$	
2165.30		$21^{1}0$	$02^{2}0$	
2215.01		$21^{1}0$	$02^{2}0$	
2327.48		$02^{0}1$	$02^{0}0$	
2336.66		$01^{1}1$	$01^{1}0$	
2349.3	H	$00^{0}1$		
2429.41		$10^{0}1$		
2500.42		$04^{0}0$		$C^{12}O^{16}O^{18}$
2548.33		$04^{0}0$ PI		
2614.24		$12^{0}0$		$C^{12}O^{16}O^{18}$
2670.90		$12^{0}0$ PI		
2757.04		$20^{0}0$		$C^{12}O^{16}O^{18}$
2797.02		$20^{0}0$ PI		

H denotes that the position of the band center is from Herzberg[5]; all others were calculated from energy levels given by Stull, Wyatt and Plass[6].

* Lower level is $00^{0}0$ unless indicated otherwise.

\+ All species are the $C^{12}O^{16}O^{16}$ molecule except as noted.

PI denotes pressure-induced bands.

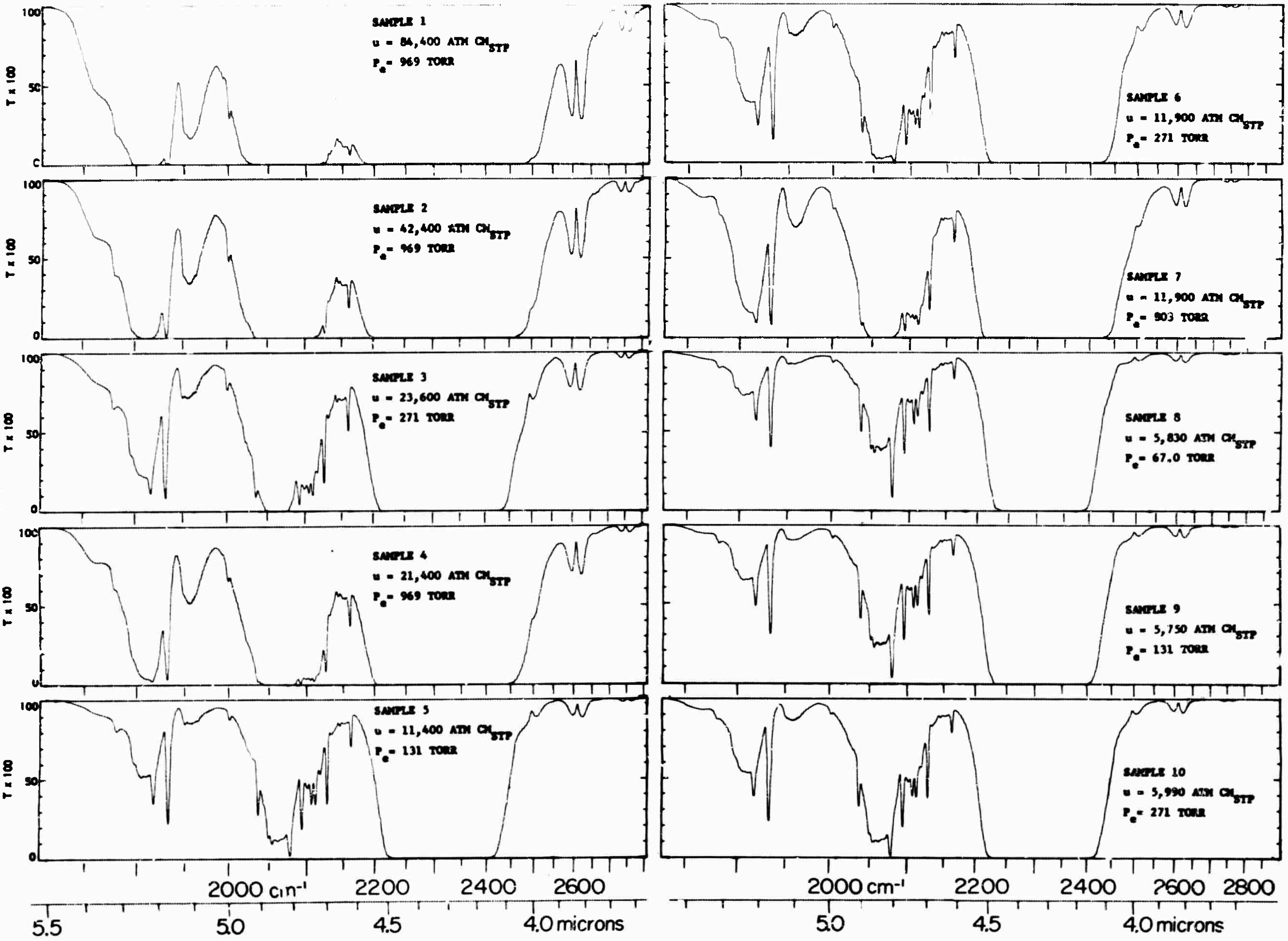
T x 100
100
50
0
SAMPLE 1
u = 84,400 ATM CM$_{STP}$
P$_e$ = 969 TORR
SAMPLE 2
u = 42,400 ATM CM$_{STP}$
P$_e$ = 969 TORR
SAMPLE 3
u = 23,600 ATM CM$_{STP}$
P$_e$ = 271 TORR
SAMPLE 4
u = 21,400 ATM CM$_{STP}$
P$_e$ = 969 TORR
SAMPLE 5
u = 11,400 ATM CM$_{STP}$
P$_e$ = 131 TORR
SAMPLE 6
u = 11,900 ATM CM$_{STP}$
P$_e$ = 271 TORR
SAMPLE 7
u = 11,900 ATM CM$_{STP}$
P$_e$ = 903 TORR
SAMPLE 8
u = 5,830 ATM CM$_{STP}$
P$_e$ = 67.0 TORR
SAMPLE 9
u = 5,750 ATM CM$_{STP}$
P$_e$ = 131 TORR
SAMPLE 10
u = 5,990 ATM CM$_{STP}$
P$_e$ = 271 TORR
2000 cm^{-1}
2200
2400
2600
2800
5.5
5.0
4.5
4.0 microns

Fig. 3-1

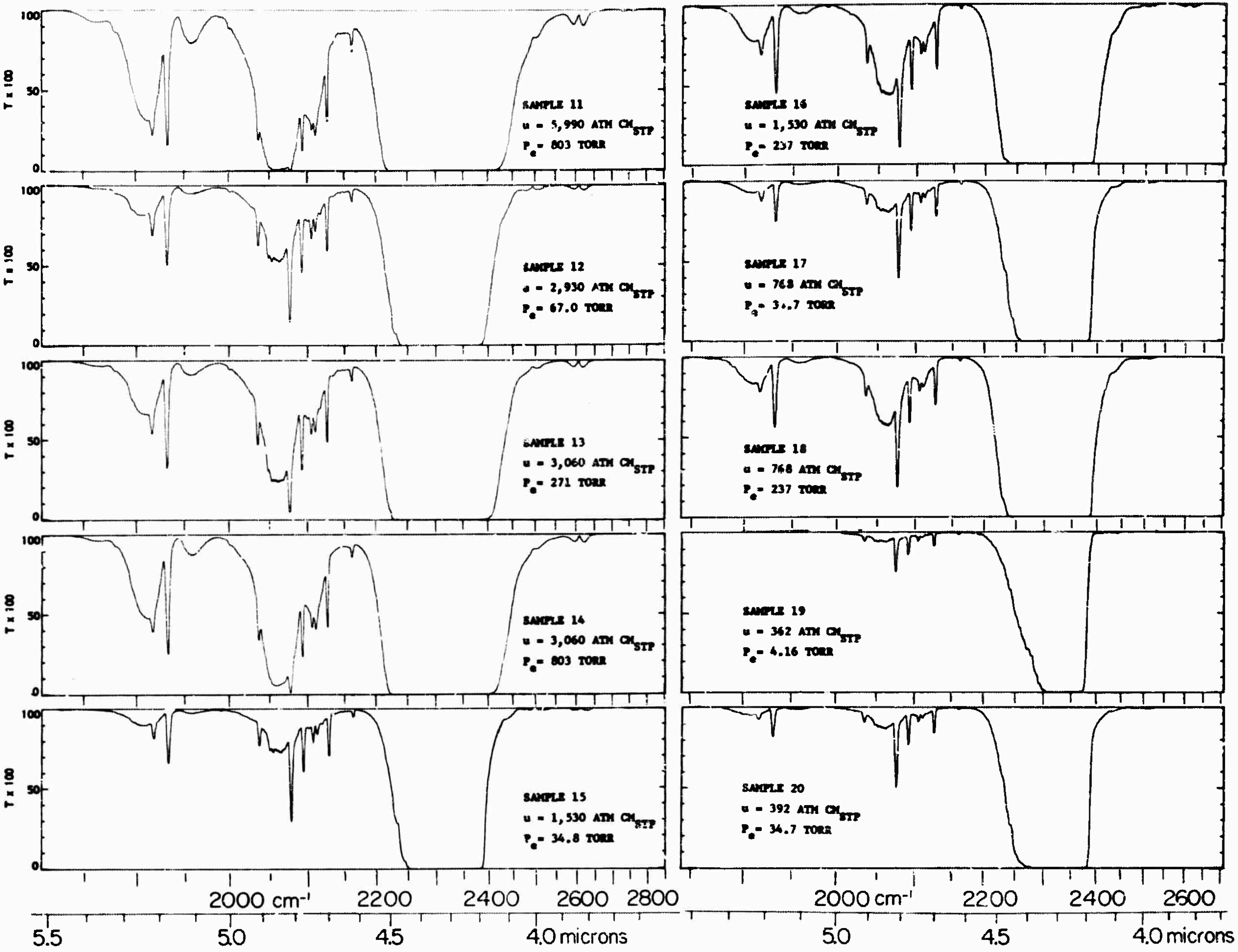
T x 100
100
50
0
SAMPLE 11
u = 5,990 ATM CM$_{STP}$
P$_e$ = 803 TORR
SAMPLE 12
a = 2,930 ATM CM$_{STP}$
P$_e$ = 67.0 TORR
SAMPLE 13
u = 3,060 ATM CM$_{STP}$
P$_e$ = 271 TORR
SAMPLE 14
u = 3,060 ATM CM$_{STP}$
P$_e$ = 803 TORR
SAMPLE 15
u = 1,530 ATM CM$_{STP}$
P$_e$ = 34.8 TORR
SAMPLE 16
u = 1,530 ATM CM$_{STP}$
P$_e$ = 237 TORR
SAMPLE 17
u = 768 ATM CM$_{STP}$
P$_a$ = 34.7 TORR
SAMPLE 18
u = 768 ATM CM$_{STP}$
P$_e$ = 237 TORR
SAMPLE 19
u = 362 ATM CM$_{STP}$
P$_e$ = 4.16 TORR
SAMPLE 20
u = 392 ATM CM$_{STP}$
P$_e$ = 34.7 TORR
2000 cm^{-1}
2200
2400
2600
2800
5.5
5.0
4.5
4.0 microns

Fig. 3-2

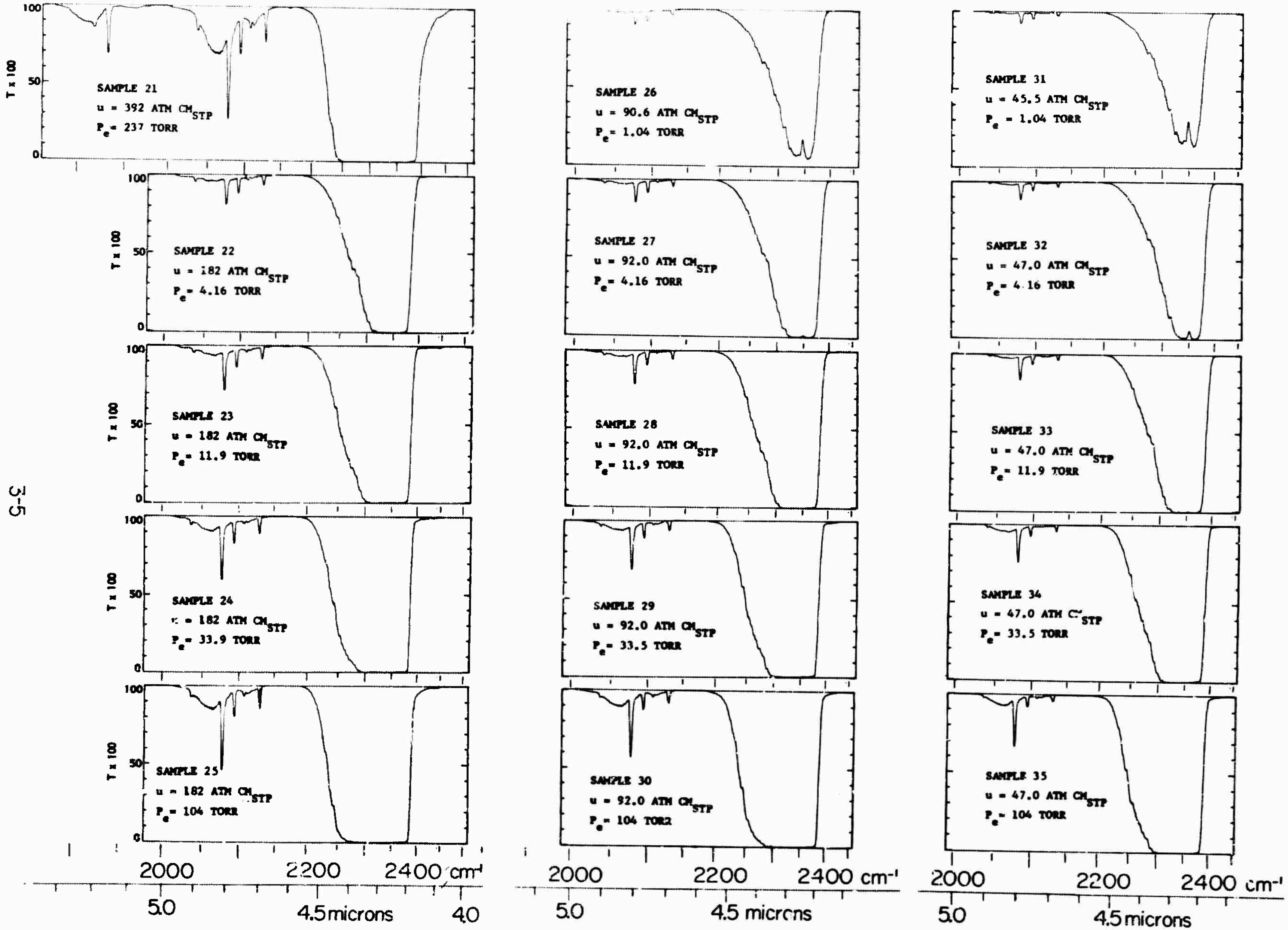
T x 100
100
50
0
SAMPLE 21
u = 392 ATM CM$_{STP}$
P_e = 237 TORR
SAMPLE 22
u = 182 ATM CM$_{STP}$
P_e = 4.16 TORR
SAMPLE 23
u = 182 ATM CM$_{STP}$
P_e = 11.9 TORR
SAMPLE 24
u = 182 ATM CM$_{STP}$
P_e = 33.9 TORR
SAMPLE 25
u = 182 ATM CM$_{STP}$
P_e = 104 TORR
SAMPLE 26
u = 90.6 ATM CM$_{STP}$
P_e = 1.04 TORR
SAMPLE 27
u = 92.0 ATM CM$_{STP}$
P_e = 4.16 TORR
SAMPLE 28
u = 92.0 ATM CM$_{STP}$
P_e = 11.9 TORR
SAMPLE 29
u = 92.0 ATM CM$_{STP}$
P_e = 33.5 TORR
SAMPLE 30
u = 92.0 ATM CM$_{STP}$
P_e = 104 TORR
SAMPLE 31
u = 45.5 ATM CM$_{STP}$
P_e = 1.04 TORR
SAMPLE 32
u = 47.0 ATM CM$_{STP}$
P_e = 4.16 TORR
SAMPLE 33
u = 47.0 ATM CM$_{STP}$
P_e = 11.9 TORR
SAMPLE 34
u = 47.0 ATM CM$_{STP}$
P_e = 33.5 TORR
SAMPLE 35
u = 47.0 ATM CM$_{STP}$
P_e = 104 TORR
2000
2200
2400 cm^{-1}
5.0
4.5 microns
4.0

Fig. 3-3

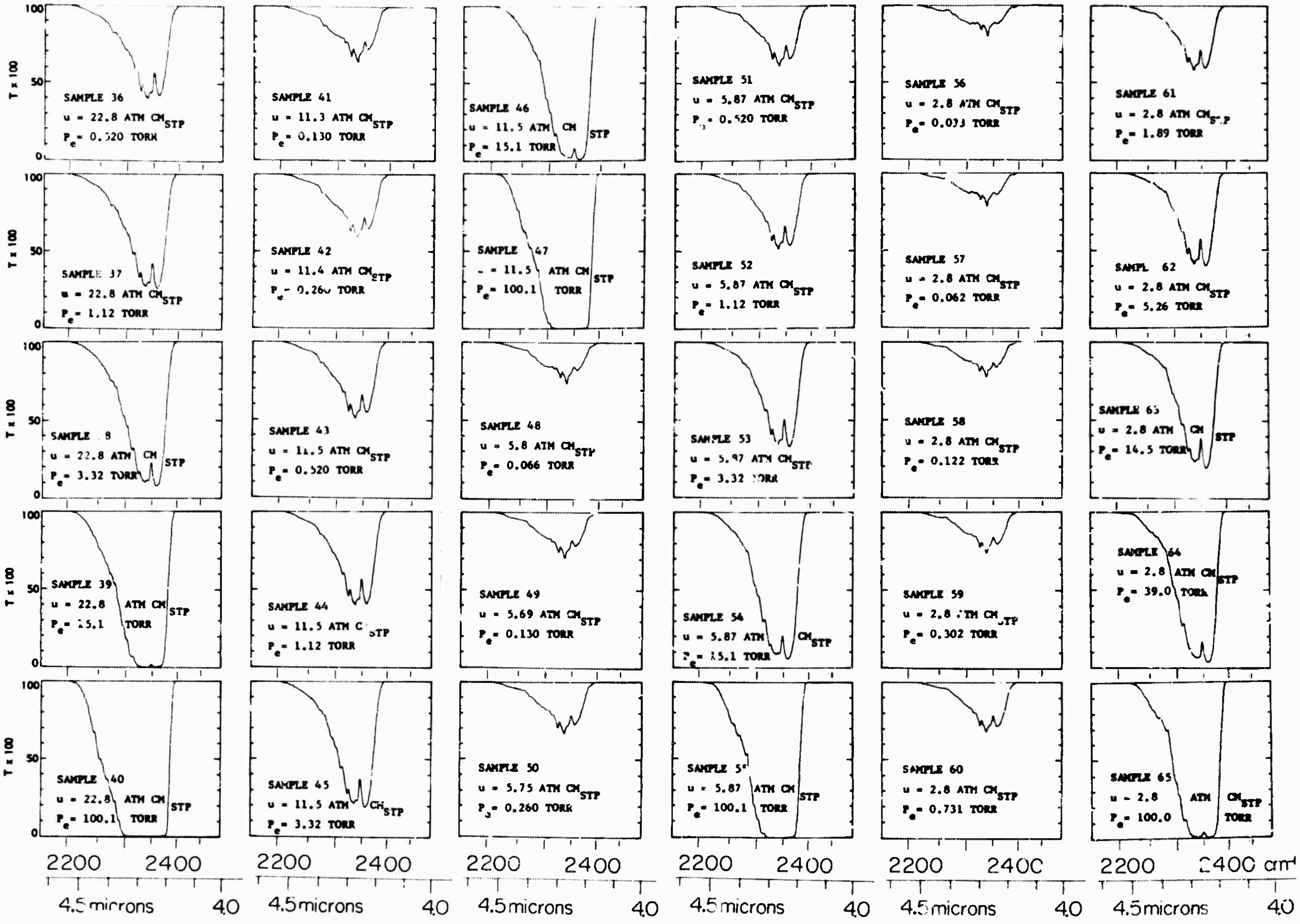
T x 100
100
50
0
SAMPLE 36
u = 22.8 ATM CM$_{STP}$
P$_e$ = 0.520 TORR
SAMPLE 37
u = 22.8 ATM CM$_{STP}$
P$_e$ = 1.12 TORR
SAMPLE 38
u = 22.8 ATM CM$_{STP}$
P$_e$ = 3.32 TORR
SAMPLE 39
u = 22.8 ATM CM$_{STP}$
P$_e$ = 15.1 TORR
SAMPLE 40
u = 22.8 ATM CM$_{STP}$
P$_e$ = 100.1 TORR
SAMPLE 41
u = 11.3 ATM CM$_{STP}$
P$_e$ = 0.130 TORR
SAMPLE 42
u = 11.4 ATM CM$_{STP}$
P$_e$ = 0.260 TORR
SAMPLE 43
u = 11.5 ATM CM$_{STP}$
P$_e$ = 0.520 TORR
SAMPLE 44
u = 11.5 ATM CM$_{STP}$
P$_e$ = 1.12 TORR
SAMPLE 45
u = 11.5 ATM CM$_{STP}$
P$_e$ = 3.32 TORR
SAMPLE 46
u = 11.5 ATM CM$_{STP}$
P$_e$ = 15.1 TORR
SAMPLE 47
u = 11.5 ATM CM$_{STP}$
P$_e$ = 100.1 TORR
SAMPLE 48
u = 5.8 ATM CM$_{STP}$
P$_e$ = 0.066 TORR
SAMPLE 49
u = 5.69 ATM CM$_{STP}$
P$_e$ = 0.130 TORR
SAMPLE 50
u = 5.75 ATM CM$_{STP}$
P$_e$ = 0.260 TORR
SAMPLE 51
u = 5.87 ATM CM$_{STP}$
P$_e$ = 0.520 TORR
SAMPLE 52
u = 5.87 ATM CM$_{STP}$
P$_e$ = 1.12 TORR
SAMPLE 53
u = 5.97 ATM CM$_{STP}$
P$_e$ = 3.32 TORR
SAMPLE 54
u = 5.87 ATM CM$_{STP}$
P$_e$ = 15.1 TORR
SAMPLE 55
u = 5.87 ATM CM$_{STP}$
P$_e$ = 100.1 TORR
SAMPLE 56
u = 2.8 ATM CM$_{STP}$
P$_e$ = 0.033 TORR
SAMPLE 57
u = 2.8 ATM CM$_{STP}$
P$_e$ = 0.062 TORR
SAMPLE 58
u = 2.8 ATM CM$_{STP}$
P$_e$ = 0.122 TORR
SAMPLE 59
u = 2.8 ATM CM$_{STP}$
P$_e$ = 0.302 TORR
SAMPLE 60
u = 2.8 ATM CM$_{STP}$
P$_e$ = 0.731 TORR
SAMPLE 61
u = 2.8 ATM CM$_{STP}$
P$_e$ = 1.89 TORR
SAMPLE 62
u = 2.8 ATM CM$_{STP}$
P$_e$ = 5.26 TORR
SAMPLE 63
u = 2.8 ATM CM$_{STP}$
P$_e$ = 14.5 TORR
SAMPLE 64
u = 2.8 ATM CM$_{STP}$
P$_e$ = 39.0 TORR
SAMPLE 65
u = 2.8 ATM CM$_{STP}$
P$_e$ = 100.0 TORR
2200
2400
cm^{-1}
4.5 microns
4.0

Fig. 3-4

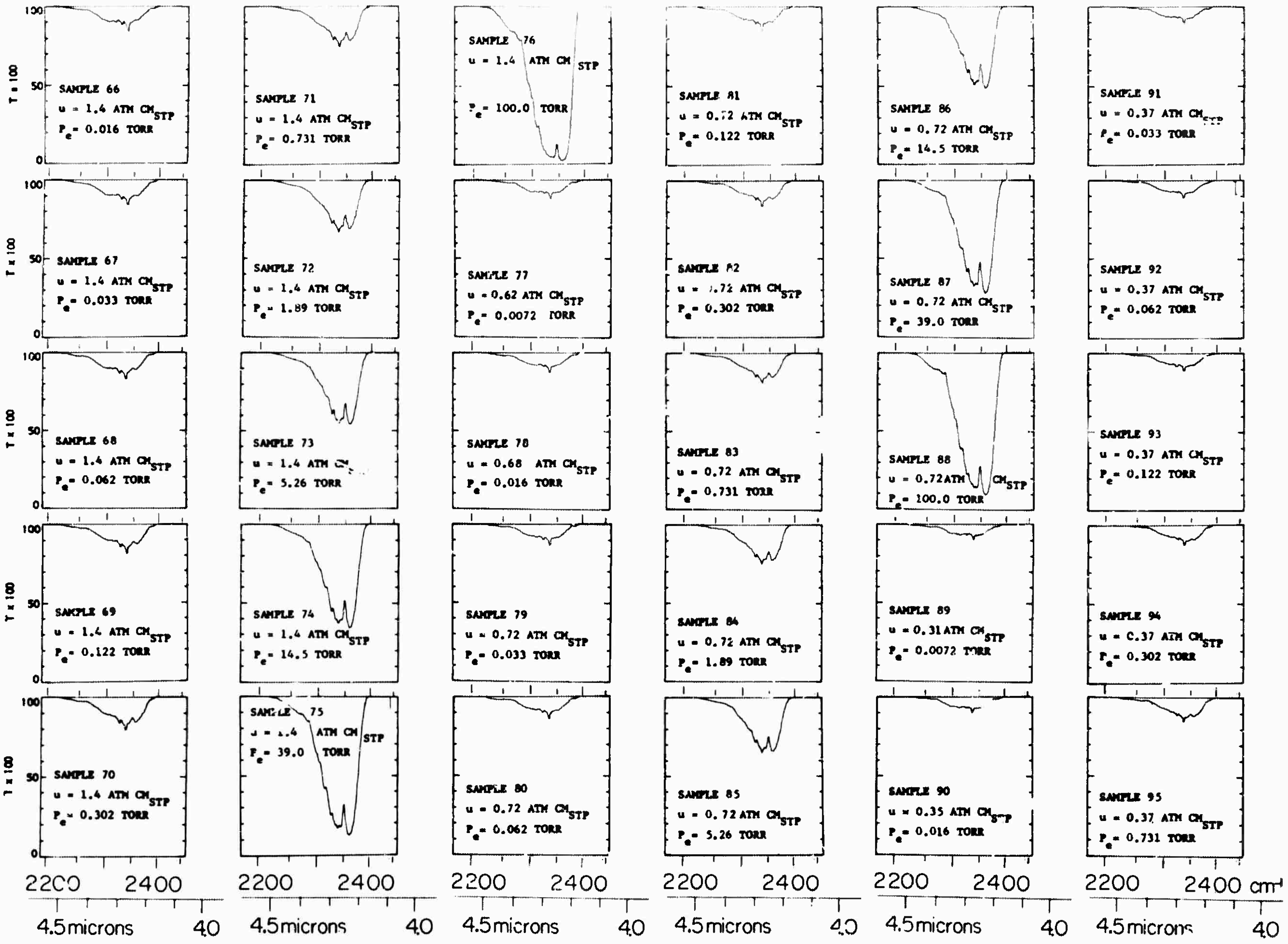
T x 100
100
50
0
SAMPLE 66
u = 1.4 ATM CM$_{STP}$
P$_e$= 0.016 TORR
SAMPLE 67
u = 1.4 ATM CM$_{STP}$
P$_e$= 0.033 TORR
SAMPLE 68
u = 1.4 ATM CM$_{STP}$
P$_e$= 0.062 TORR
SAMPLE 69
u = 1.4 ATM CM$_{STP}$
P$_e$= 0.122 TORR
SAMPLE 70
u = 1.4 ATM CM$_{STP}$
P$_e$= 0.302 TORR
SAMPLE 71
u = 1.4 ATM CM$_{STP}$
P$_e$= 0.731 TORR
SAMPLE 72
u = 1.4 ATM CM$_{STP}$
P$_e$= 1.89 TORR
SAMPLE 73
u = 1.4 ATM CM
P$_e$= 5.26 TORR
SAMPLE 74
u = 1.4 ATM CM$_{STP}$
P$_e$= 14.5 TORR
SAMPLE 75
u = 1.4 ATM CM STP
P$_e$= 39.0 TORR
SAMPLE 76
u = 1.4 ATM CM STP
P$_e$= 100.0 TORR
SAMPLE 77
u = 0.62 ATM CM$_{STP}$
P$_e$= 0.0072 TORR
SAMPLE 78
u = 0.68 ATM CM$_{STP}$
P$_e$= 0.016 TORR
SAMPLE 79
u = 0.72 ATM CM$_{STP}$
P$_e$= 0.033 TORR
SAMPLE 80
u = 0.72 ATM CM$_{STP}$
P$_e$= 0.062 TORR
SAMPLE 81
u = 0.72 ATM CM$_{STP}$
P$_e$= 0.122 TORR
SAMPLE 82
u = 0.72 ATM CM$_{STP}$
P$_e$= 0.302 TORR
SAMPLE 83
u = 0.72 ATM CM$_{STP}$
P$_e$= 0.731 TORR
SAMPLE 84
u = 0.72 ATM CM$_{STP}$
P$_e$= 1.89 TORR
SAMPLE 85
u = 0.72 ATM CM$_{STP}$
P$_e$= 5.26 TORR
SAMPLE 86
u = 0.72 ATM CM$_{STP}$
P$_e$= 14.5 TORR
SAMPLE 87
u = 0.72 ATM CM$_{STP}$
P$_e$= 39.0 TORR
SAMPLE 88
u = 0.72ATM CM$_{STP}$
P$_e$= 100.0 TORR
SAMPLE 89
u = 0.31 ATM CM$_{STP}$
P$_e$= 0.0072 TORR
SAMPLE 90
u = 0.35 ATM CM$_{STP}$
P$_e$= 0.016 TORR
SAMPLE 91
u = 0.37 ATM CM$_{STP}$
P$_e$= 0.033 TORR
SAMPLE 92
u = 0.37 ATM CM$_{STP}$
P$_e$= 0.062 TORR
SAMPLE 93
u = 0.37 ATM CM$_{STP}$
P$_e$= 0.122 TORR
SAMPLE 94
u = 0.37 ATM CM$_{STP}$
P$_e$= 0.302 TORR
SAMPLE 95
u = 0.37 ATM CM$_{STP}$
P$_e$= 0.731 TORR
2200
2400 cm^{-1}
4.5 microns
4.0

Fig. 3-5

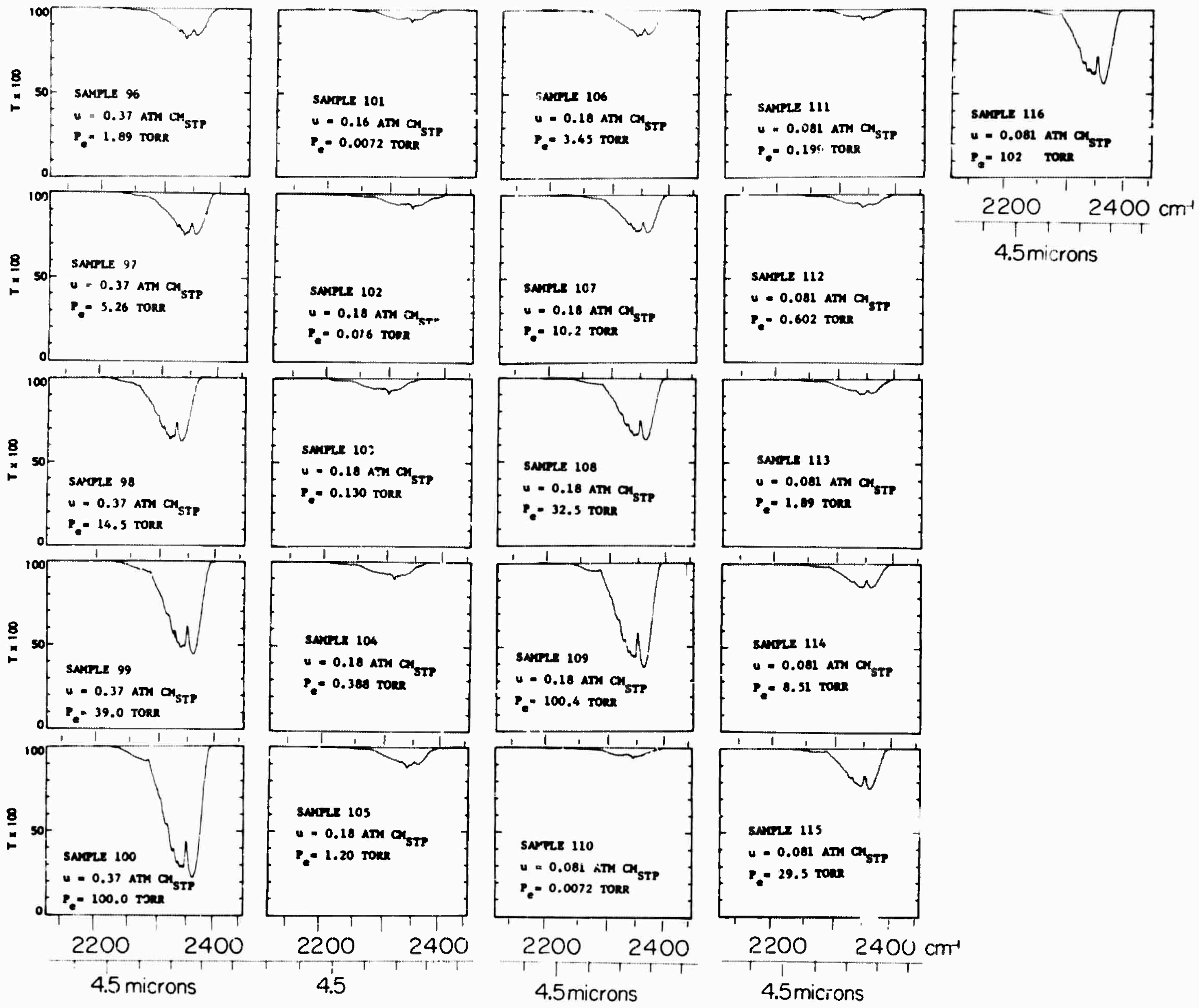
100
50
0
T x 100
SAMPLE 96
u = 0.37 ATM CM$_{STP}$
P$_e$ = 1.89 TORR
SAMPLE 97
u = 0.37 ATM CM$_{STP}$
P$_e$ = 5.26 TORR
SAMPLE 98
u = 0.37 ATM CM$_{STP}$
P$_e$ = 14.5 TORR
SAMPLE 99
u = 0.37 ATM CM$_{STP}$
P$_e$ = 39.0 TORR
SAMPLE 100
u = 0.37 ATM CM$_{STP}$
P$_e$ = 100.0 TORR
SAMPLE 101
u = 0.16 ATM CM$_{STP}$
P$_e$ = 0.0072 TORR
SAMPLE 102
u = 0.18 ATM CM$_{STP}$
P$_e$ = 0.076 TORR
SAMPLE 103
u = 0.18 ATM CM$_{STP}$
P$_e$ = 0.130 TORR
SAMPLE 104
u = 0.18 ATM CM$_{STP}$
P$_e$ = 0.388 TORR
SAMPLE 105
u = 0.18 ATM CM$_{STP}$
P$_e$ = 1.20 TORR
SAMPLE 106
u = 0.18 ATM CM$_{STP}$
P$_e$ = 3.45 TORR
SAMPLE 107
u = 0.18 ATM CM$_{STP}$
P$_e$ = 10.2 TORR
SAMPLE 108
u = 0.18 ATM CM$_{STP}$
P$_e$ = 32.5 TORR
SAMPLE 109
u = 0.18 ATM CM$_{STP}$
P$_e$ = 100.4 TORR
SAMPLE 110
u = 0.081 ATM CM$_{STP}$
P$_e$ = 0.0072 TORR
SAMPLE 111
u = 0.081 ATM CM$_{STP}$
P$_e$ = 0.199 TORR
SAMPLE 112
u = 0.081 ATM CM$_{STP}$
P$_e$ = 0.602 TORR
SAMPLE 113
u = 0.081 ATM CM$_{STP}$
P$_e$ = 1.89 TORR
SAMPLE 114
u = 0.081 ATM CM$_{STP}$
P$_e$ = 8.51 TORR
SAMPLE 115
u = 0.081 ATM CM$_{STP}$
P$_e$ = 29.5 TORR
SAMPLE 116
u = 0.081 ATM CM$_{STP}$
P$_e$ = 102 TORR
2200
2400
2400 cm^{-1}
4.5 microns
4.5

Fig. 3-6

3.2 INTEGRATED ABSORPTANCE

The integrated absorptance over the region from 2190 to 2425 cm^{-1} is plotted versus P_e on log-log scales in Fig. 3-7 for Samples 36 through 116. Each solid curve corresponds to the value of absorber thickness indicated. The broken curve with slope of 0.5 has been included for comparison with the other curves. The integrated absorptance of a band composed of non-overlapping strong lines having the Lorentz line shape is proportional to $(uP_e)^{0.5}$. (A strong line is essentially opaque over a region a few times as wide as the width of the line.) The $(uP_e)^{0.5}$ dependence would give rise to a curve of slope 0.5 on the log-log plot in Fig. 3-7. We see that the slopes of several of the curves are slightly less than 0.5 for pressures between 10 and 100 torr. The deviation from the $(uP_e)^{0.5}$ relationship for pressures greater than 10 torr is due to overlapping of the lines and the presence of weak lines. The effect of overlapping is particularly important for the larger values of u.

The slopes of the curves representing the smaller values of absorber thickness are seen to decrease with decreasing pressure. The increased absorptance at low pressure is due to the Doppler broadening of the absorption lines. The Lorentz line shape, which is a good approximation to collision-broadened lines, is quite different from the pressure independent Doppler line shape. The absorption coefficient in the wings of a Doppler shaped line decreases much more rapidly with the distance from the center than does a Lorentz line. Therefore, under certain conditions, the absorption in the wings of a line is due to collision broadening, while Doppler broadening dominates near the line center. Essentially all the absorption by a low pressure sample with very small absorber thickness occurs near the line center; therefore, its integrated absorptance is independent of pressure. However, in the case of a low pressure sample with intermediate absorber thickness, there is appreciable absorption in the wings of the lines where collision broadening is dominant. Therefore, the integrated absorptance is slightly dependent on pressure. The increasing dependence on P_e as u increases can be seen by comparing the slopes of the curves in Fig. 3-7 in the region near $P_e = 0.1$ torr. Plass[7] has given a theoretical discussion of the absorption by lines in which either Doppler broadening or collision broadening is dominant as well as lines in which both types of broadening make significant contributions.

Figure 3-8 shows the relation between integrated absorptance and absorber thickness for different values of P_e. The curve corresponding to 1000 torr represents data from Burch, Gryvnak, and Williams[1] and is included for comparison. The other curves were cross plotted from the curves in Fig. 3-7. Curves corresponding to absorption by non-overlapping strong lines with the Lorentz shape would be parallel to the comparison line whose slope is 0.5.[7] Segments of the 10 torr and 100 torr curves are

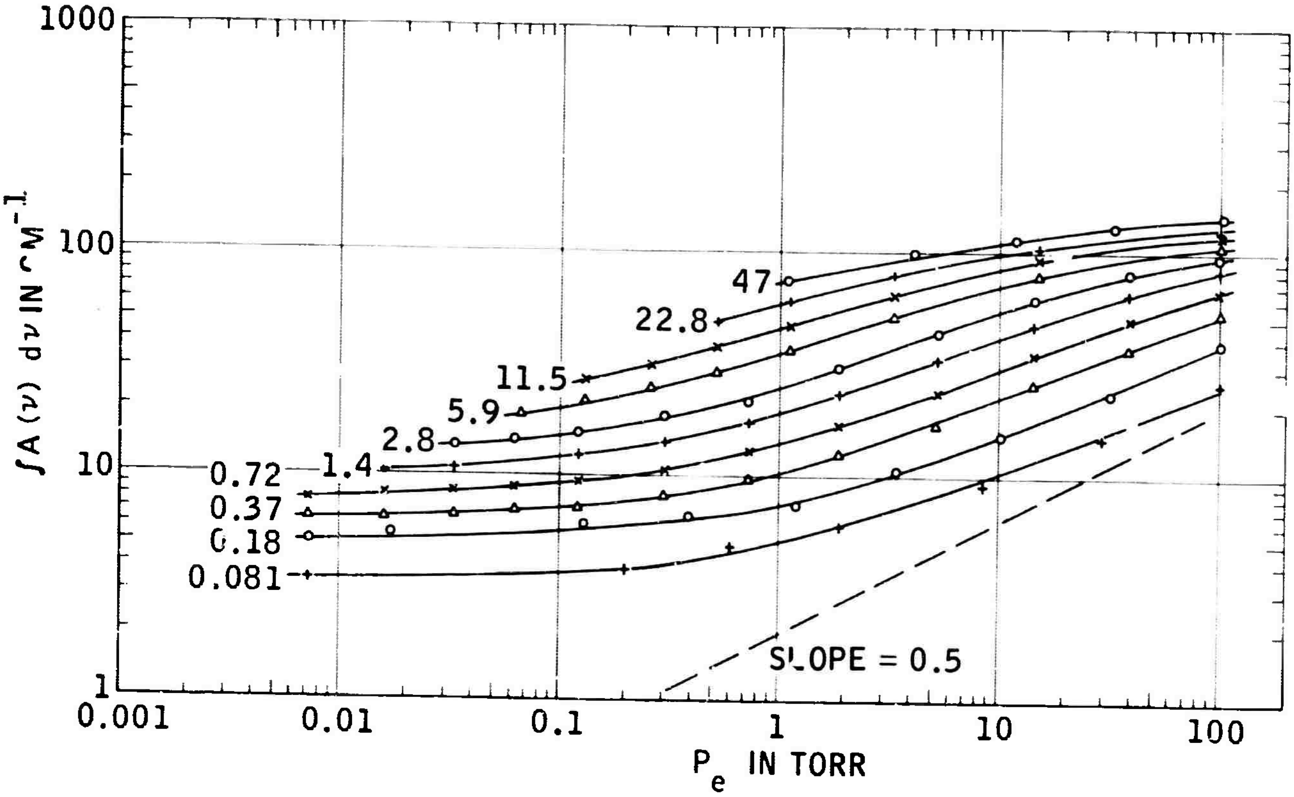

Fig. 3-7 THE INTEGRATED ABSORPTANCE OF THE 2190–2425 cm^{-1} REGION VERSUS EQUIVALENT PRESSURE.

Each curve corresponds to the indicated value of absorber thickness in atm cm$_{STP}$. The broken line with slope = 0.5 is shown for comparison.

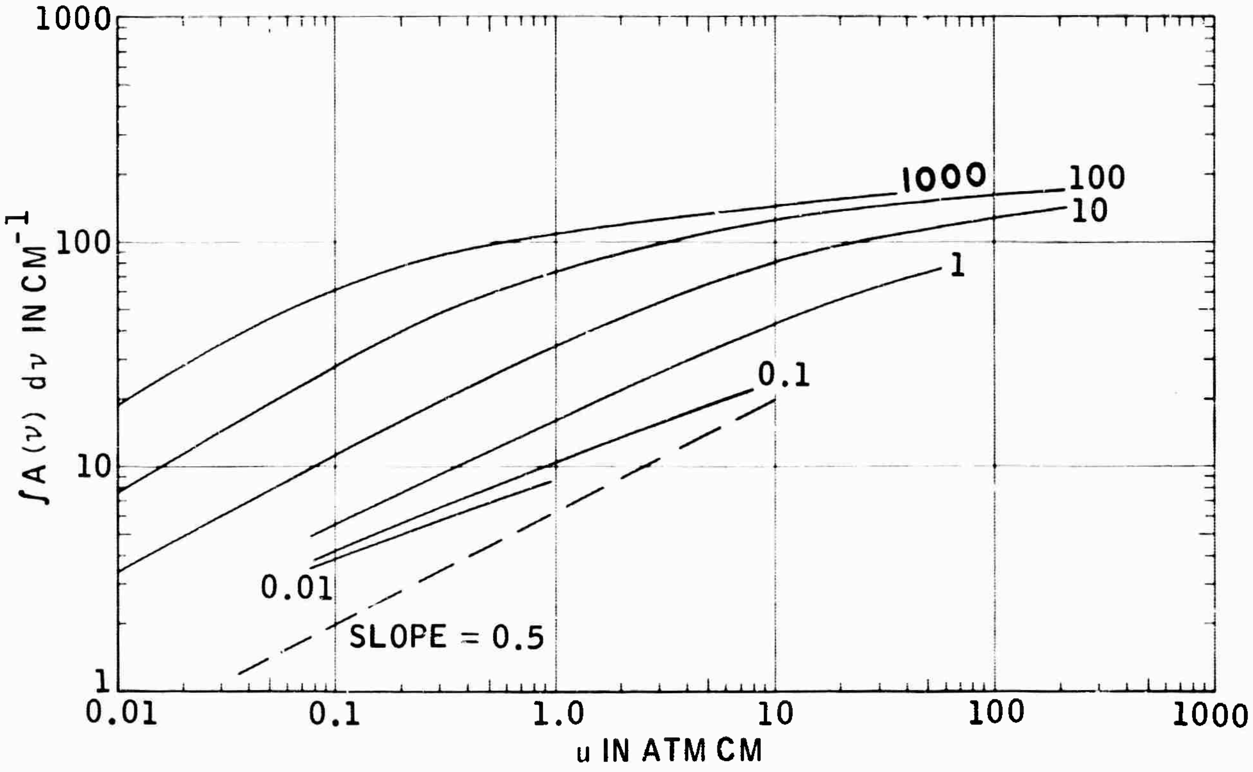

Fig. 3-8 THE INTEGRATED ABSORPTANCE OF THE 2190-2425 cm^{-1} REGION VERSUS ABSORBER THICKNESS.

Each curve corresponds to the indicated value of equivalent pressure in torr. The broken line with slope 0.5 is shown for comparison.

seen to be nearly parallel to the comparison line, indicating that integrated absorptance is approximately proportional to $u^{0.5}$ for the values of u and P_e represented.

The relation between the integrated absorptance and the parameter uP_e is shown in Fig. 3-9. The integrated absorptance can be expressed as a function of this convenient parameter when the absorption is primarily due to strong lines with the Lorentz shape.[7] Under this condition, all the curves corresponding to different pressures coincide. Although none of the curves coincide, except when the absorption is nearly complete throughout much of the band, the 1, 10, and 100 torr curves occur near each other for uP_e greater than approximately 10 atm cm_{STP} torr. For smaller values of uP_e at lower pressures, the curves are separated because of Doppler broadening, indicating that the integrated absorptance cannot be related to the single variable uP_e.

3.3 ABSORPTION BETWEEN 2400 AND 2580 cm^{-1}

A few very weak isotopic bands and two pressure-induced bands occur between 2400 and 2580 cm^{-1}, but most of the absorption in this region is due to the extreme wings of the very strong lines of the 00^01 band. The centers of all the lines of this band are confined to the region below the band head near 2400 cm^{-1}. We were able to account for the isotopic and pressure-induced bands in the 2400-2580 cm^{-1} region and to determine the amount of absorption by the wings of the strong lines. From the results we were able to derive curves from which the absorptance due to the wings of the strong lines can be determined for samples of CO_2, $CO_2 + N_2$, or CO_2 + A.

The transmittance T(ν) at wavenumber ν is related to absorber thickness u and absorption coefficient K(ν) according to the following equation.

$$T(\nu) = \exp\left[-K(\nu)\, u\right], \qquad \text{or} \qquad K(\nu) = -\frac{1}{u} \ln T(\nu). \tag{3-1}$$

The total absorption coefficient K(ν) due to the wings of CO_2 lines broadened by CO_2 and N_2 is given by

$$K(\nu) = \left[p/p^o\right] K_s^o(\nu) + \left[p_{N_2}/p^o\right] K_{N_2}^o(\nu). \tag{3-2}$$

The quantity $K_s^o(\nu)$ is the self-broadening absorption coefficient which arises from CO_2-CO_2 collisions when the CO_2 pressure is 1 atm. Similarly, $K_{N_2}^o(\nu)$ is the N_2-broadening coefficient due to CO_2-N_2 collisions when the

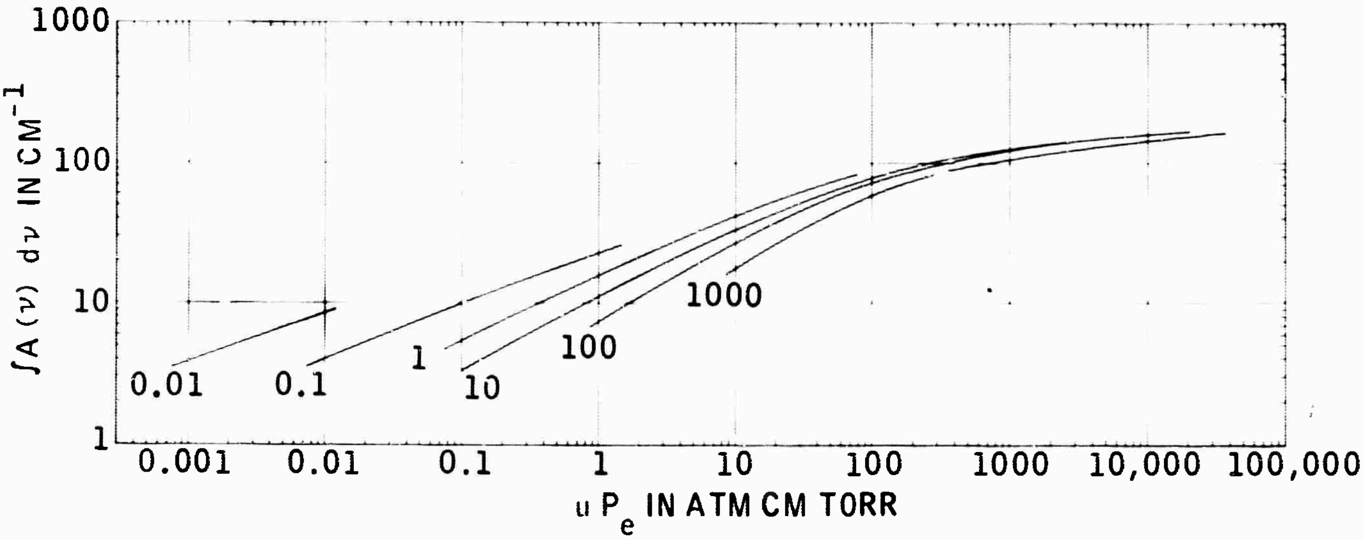

Fig. 3-9 THE INTEGRATED ABSORPTANCE OF THE 2190-2425 cm^{-1} REGION VERSUS THE PRODUCT OF ABSORBER THICKNESS AND EQUIVALENT PRESSURE.

Each curve corresponds to the indicated value of equivalent pressure.

N_2 partial pressure is 1 atm. The superscripts (^{o}) denote standard pressure, 1 atm. The partial pressures of CO_2 and N_2 in atm are p and p_{N_2}, respectively. Equation (3-2) can be used for mixtures of CO_2 plus any non-absorbing broadening gas, such as A, by substituting the appropriate broadening coefficient and partial pressure.

Since no line centers occur in this region, except for those in the very weak bands whose absorption was accounted for, there is no unresolved structure within the 2.5 cm^{-1} spectral slitwidth. Therefore, the observed transmittance is a very good approximation to the true transmittance. The absorption coefficient determined from the observed transmittance by the use of Eq. (3-1) also approximates the true coefficient that would be observed with infinite resolution.

Values of the normalized self-broadening coefficient $K_S^o(\nu)$ were determined from several of the larger samples of pure CO_2 by the use of Eqs. (3-1) and (3-2). These values were then substituted in Eq. (3-2) in order to find values of $K_{N_2}^o(\nu)$ and $K_A^o(\nu)$ from samples containing these broadening gases. The results are shown in Fig. 3-10, where each of the normalized absorption coefficients is plotted against wavenumber. Points have not been included in the curves at wavenumbers where there is appreciable absorption by the isotopic and pressure-induced bands. Therefore, these curves represent only the contribution of the wings of strong lines whose centers occur below 2400 cm^{-1}. Winters, Silverman, and Benedict[8] have made similar measurements in this region. Their work does not extend to wavenumbers as high as ours, but the two sets of results are in good agreement over the region covered by both.

Since the positions, strengths, and widths of the lines are known, it is apparent that considerable information about the shapes of the extreme wings of the lines can be obtained. A report[9] dealing with the shapes of the lines in this region, as well as in the 1.4 μ and 2.7 μ regions is being prepared.

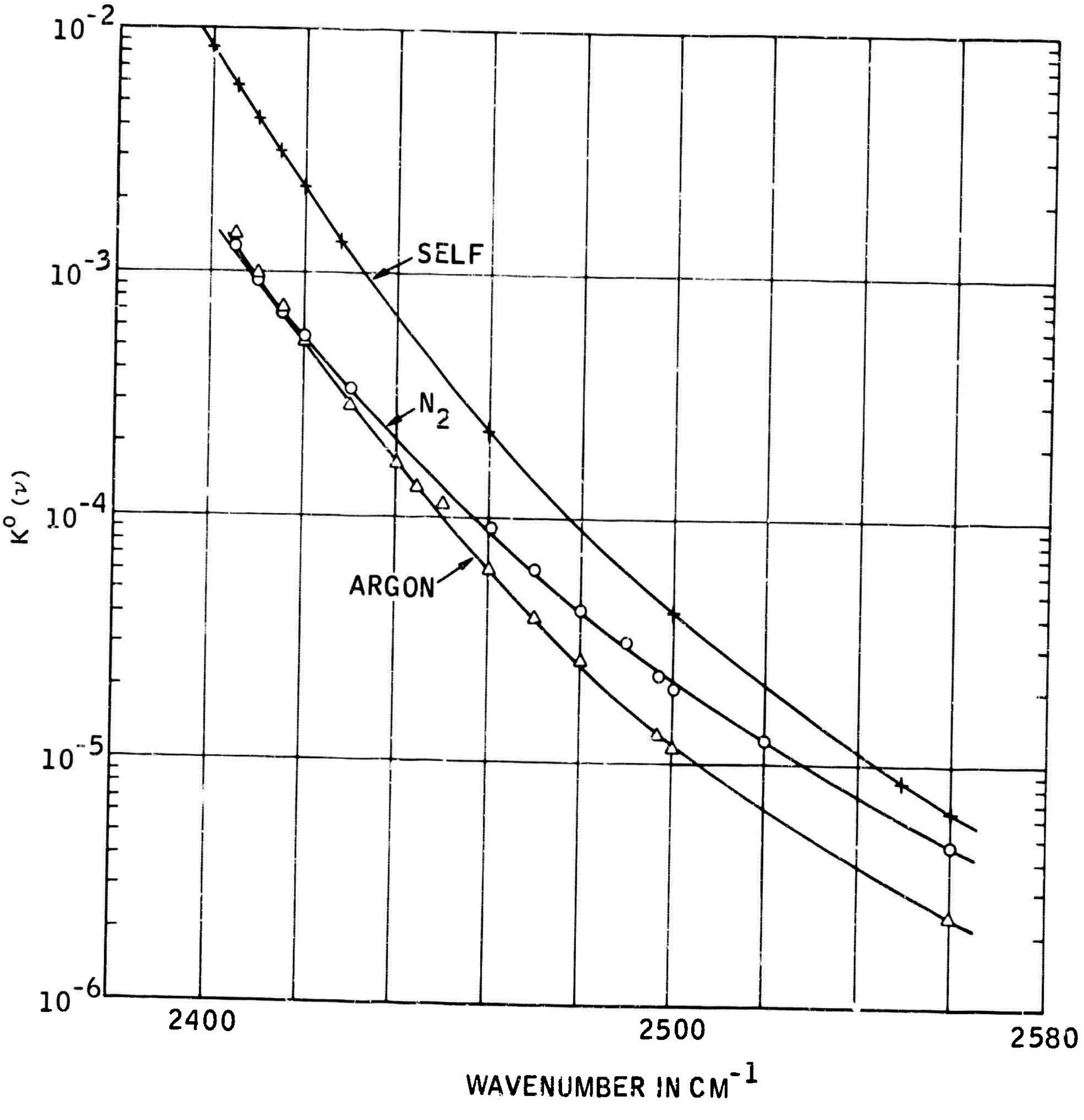

Fig. 3-10 THE NORMALIZED ABSORPTION COEFFICIENT VERSUS WAVENUMBER FOR CO_2 BETWEEN 2400 AND 2580 cm^{-1}.

The upper curve corresponds to self-broadened CO_2, i.e., pure CO_2, at 1 atm pressure. The lower two curves correspond to samples of CO_2 diluted in the gases indicated at 1 atm. The curves represent only the contribution of the lines whose centers occur below 2400 cm^{-1}.

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SECTION 4

TABLES OF INTEGRATED ABSORPTANCE

Values of the integrated absorptance $\int_{\nu}^{\nu'} A(\nu)d\nu$ for Samples 1 to 116 are shown in Tables 4-1 to 4-6. The sample number and the parameters are listed at the top of each column along with ν', the upper limit of integration. The integrated absorptance between any two wavenumbers tabulated is equal to the difference between the values given at those two points.

The integrated absorptance was calculated from values of transmittance which were determined from the spectra at points 1 cm^{-1} apart. This interval is sufficiently small that the original spectra can be reconstructed with little loss of structure by plotting the transmittance values and joining the points with straight lines.

The samples included in the various tables are as follows:

Sample No.	Table
1 to 16	4-1
17 to 35	4-2
36 to 55	4-3
56 to 76	4-4
77 to 100	4-5
101 to 116	4-6

Table 4-1 $\int_{\nu}^{\nu^{0}} A(\nu)\,d\nu$

Sam. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
p(atm)	9.76×10^{-1}	5.76×10^{-1}	2.76×10^{-1}	5.76×10^{-1}	1.23×10^{-1}	2.76×10^{-1}	2.76×10^{-1}	8.78×10^{-2}	1.33×10^{-1}	2.76×10^{-1}	2.76×10^{-1}	8.78×10^{-2}	3.76×10^{-1}	2.76×10^{-1}	3.53×10^{-2}	3.53×10^{-2}
P_e(atm)	1.13×10^{-1}	3.73×10^{-1}	3.36×10^{-1}	1.28×10^{0}	1.73×10^{-1}	3.53×10^{-1}	3.53×10^{-2}	8.81×10^{-2}	1.73×10^{-1}	3.50×10^{-1}	1.06×10^{0}	8.82×10^{-2}	3.50×10^{-1}	1.06×10^{0}	6.30×10^{-2}	9.42×10^{-2}
ℓ (cm)	8.44×10^{0}	6.24×10^{0}	2.36×10^{0}	2.16×10^{0}	1.14×10^{0}	1.18×10^{0}	1.18×10^{0}	3.83×10^{0}	7.73×10^{0}	3.99×10^{0}	5.99×10^{0}	2.83×10^{0}	3.06×10^{0}	3.04×10^{0}	1.39×10^{0}	1.59×10^{0}
ν (cm^{-1})	ν^0= 2850 cm^{-1}	ν^0= 2850 cm^{-1}	ν^0= 2850 cm^{-1}	ν^0= 2850 cm^{-1}	ν^0= 2800 cm^{-1}	ν^0= 2800 cm^{-1}	ν^0= 2800 cm^{-1}	ν^0= 2800 cm^{-1}	ν^0= 2800 cm^{-1}	ν^0= 2800 cm^{-1}	ν^0= 2800 cm^{-1}	ν^0= 2700 cm^{-1}	ν^0= 2700 cm^{-1}	ν^0= 2700 cm^{-1}	ν^0= 2700 cm^{-1}	ν^0= 2700 cm^{-1}
2850.00	0.	0.	0.	0.												
2845.00	0.	0.	0.	0.												
2840.00	0.	0.	0.	0.												
2835.00	0.	0.	0.	0.												
2830.00	0.	0.	0.	[illegible]												
2825.00	0.	0.	0	0.												
2820.00	0.001	0.	0.	0.												
2815.00	0.011	0.004	0.	0.												
2810.00	0.054	0.014	0.	0.												
2805.00	0.159	0.059	0.	0.												
2800.00	0.299	0.125	0.000	0.000	0.	0.	0.	0.	0.	0.	0.					
2795.00	0.457	0.221	0.015	0.022	0.	0.	0.	0.	0.	0.	0.					
2790.00	0.742	0.335	0.053	0.064	0.	0.	0.	0.	0.	0.	0.					
2785.00	0.965	0.464	0.102	0.107	0.	0.000	0.000	0.	0.	0.	0.					
2780.00	1.375	0.654	0.179	0.176	0.007	0.012	0.006	0.005	0.001	0.001	0.009					
2775.00	1.952	0.954	0.301	0.298	0.035	0.040	0.044	0.028	0.024	0.025	0.045					
2770.00	2.697	1.346	0.474	0.466	0.069	0.124	0.119	0.062	0.057	0.062	0.090					
2765.00	3.311	1.786	0.673	0.670	0.167	0.211	0.204	0.104	0.092	0.104	0.137					
2760.00	4.145	2.149	0.802	0.828	0.223	0.280	0.265	0.147	0.122	0.132	0.172					
2755.00	4.607	2.313	0.832	0.877	0.236	0.294	0.312	0.180	0.135	0.144	0.183					
2750.00	4.821	2.339	0.916	0.961	0.237	0.323	0.333	0.187	0.146	0.144	0.204					
2745.00	5.555	2.927	1.086	1.130	0.319	0.386	0.406	0.225	0.178	0.204	0.249					
2740.00	6.304	3.433	1.253	1.313	0.408	0.465	0.488	0.276	0.219	0.255	0.304					
2735.00	6.810	3.640	1.382	1.449	0.479	0.523	0.554	0.325	0.260	0.289	0.348					
2730.00	7.175	3.822	1.416	1.517	0.514	0.552	0.595	0.349	0.286	0.301	0.371					
2725.00	7.391	3.925	1.429	1.536	0.521	0.556	0.606	0.352	0.287	0.301	0.373					
2720.00	7.503	4.016	1.429	1.567	0.521	0.556	0.606	0.352	0.287	0.301	0.373					
2715.00	7.661	4.112	1.429	1.622	0.521	0.556	0.604	0.352	0.287	0.301	0.373					
2710.00	7.843	4.234	1.429	1.673	0.521	0.556	0.606	0.352	0.287	0.301	0.373					
2705.00	8.160	4.374	1.429	1.741	0.521	0.556	[illegible]	0.352	0.287	0.301	0.376					
2700.00	8.465	4.592	1.429	1.822	0.521	0.556	0.606	0.352	0.287	0.301	0.373	0.	0.	0.	0.	0.
2695.00	8.690	4.764	1.429	1.925	0.521	0.558	0.604	0.352	0.287	0.301	0.373	0.	0.	0.	0.	0.
2690.00	9.391	5.024	1.429	2.056	0.521	0.569	0.622	0.352	0.287	0.301	0.381	0.	[illegible]	0.	0.	0.
2685.00	9.944	5.326	1.430	2.218	0.521	0.582	0.637	0.352	0.287	0.308	0.404	0.	0.	0.	0.	0.
2680.00	10.762	5.682	1.446	2.296	0.527	0.601	0.656	0.352	0.287	0.316	0.428	0.	0.	0.	0.	0.
2675.00	11.516	6.111	1.483	2.617	0.569	0.629	0.673	0.352	0.287	0.334	0.463	0.	0.	0.	0.	0.
2670.00	12.433	6.706	1.540	2.863	0.583	0.666	0.701	0.352	0.292	0.356	0.508	0.	0.	0.	0.	0.
2665.00	13.464	7.039	1.622	3.119	0.623	0.703	0.743	0.360	0.320	0.381	0.566	0.	0.	0.002	0.	0.
2660.00	14.341	7.607	1.736	3.374	0.666	0.736	0.790	0.368	0.357	0.411	0.597	0.	0.001	0.006	0.	0.
2655.00	15.457	8.169	1.896	3.663	0.726	0.878	0.848	0.430	0.403	0.457	0.660	0.	0.011	0.026	0.	0.
2650.00	16.737	8.646	2.144	4.016	0.810	0.919	0.977	0.492	0.467	0.514	0.742	0.006	0.041	0.056	0.	0.
2645.00	18.376	9.613	2.330	4.516	0.958	1.149	1.157	0.577	0.550	0.603	0.865	0.036	0.084	0.116	0.004	0.004
2640.00	20.636	11.182	3.163	[illegible]	1.214	1.506	1.492	0.713	0.691	0.792	1.078	0.100	0.166	[illegible]	0.032	0.025
2635.00	23.676	13.161	4.394	[illegible]	1.430	2.042	2.044	0.928	0.930	1.084	1.423	0.217	0.304	0.312	0.083	0.047
2630.00	27.167	15.531	5.467	7.967	2.131	2.747	2.674	1.199	1.251	1.477	1.676	0.370	0.504	0.429	0.153	0.140
2625.00	30.709	17.666	6.472	8.656	2.733	3.464	3.750	1.493	1.616	1.897	2.153	0.535	0.731	0.631	0.216	0.237
2620.00	33.066	18.866	7.136	10.642	3.210	4.024	4.498	1.751	1.945	2.212	2.727	0.671	0.928	1.072	0.272	0.306
2615.00	35.490	21.026	7.717	11.226	3.461	4.288	4.818	1.861	2.160	2.357	2.915	0.736	1.016	1.157	0.296	0.332
2610.00	38.412	22.659	8.661	12.199	3.739	4.677	5.240	2.020	2.288	2.540	3.169	0.791	1.049	1.203	0.313	0.336
2605.00	41.666	24.917	9.432	13.669	4.269	4.864	5.563	2.239	2.527	2.865	3.566	0.912	1.271	1.488	0.355	0.416
2600.00	43.140	27.271	10.517	[illegible]	4.722	5.934	6.600	2.490	2.853	3.235	3.996	1.069	1.461	1.722	0.403	0.494
2595.00	48.394	29.366	11.469	16.183	5.167	6.502	7.316	2.726	3.162	3.555	4.406	1.172	1.672	1.932	0.455	0.533
2590.00	51.233	31.078	12.211	17.161	5.541	6.934	8.136	2.915	3.408	3.796	4.710	1.271	1.818	2.097	0.500	0.596
2585.00	53.616	32.666	12.745	17.569	5.775	7.222	8.595	3.036	3.576	3.967	4.956	1.334	1.915	2.219	0.519	0.620
2580.00	55.672	33.605	13.120	17.946	5.924	7.416	8.721	3.117	3.681	4.048	5.131	[illegible]	1.971	[illegible]	0.519	0.632
2575.00	57.964	34.666	13.166	18.127	6.019	7.543	9.196	3.176	3.746	4.118	5.277	1.402	2.031	[illegible]	0.519	0.632
2570.00	[illegible]	35.705	13.533	19.606	6.066	7.656	9.455	3.202	3.768	4.194	5.416	1.410	2.041	[illegible]	0.519	0.632
2565.00	61.368	36.763	[illegible]	20.163	6.132	7.752	9.720	3.225	3.823	4.203	5.567	1.422	2.048	2.574	0.519	0.632
2560.00	63.472	37.471	13.964	20.804	6.177	7.850	9.997	3.245	3.838	4.241	5.735	1.437	2.101	2.672	0.519	0.632
2555.00	65.840	39.365	14.224	21.441	6.229	7.969	10.322	3.270	3.893	4.296	5.915	1.457	2.142	2.769	0.519	0.632
2550.00	68.437	40.869	14.516	22.506	6.301	8.130	10.700	3.301	3.927	4.366	6.126	1.477	2.196	2.826	0.516	0.632
2545.00	71.119	42.601	14.862	23.480	6.395	8.479	11.121	3.340	3.966	4.444	6.363	1.500	2.260	3.077	[illegible]	0.632
2540.00	74.663	44.535	15.270	24.567	6.566	8.662	11.445	3.369	4.02	4.560	6.656	1.510	2.334	3.233	[illegible]	0.632
2535.00	77.966	46.710	15.754	25.656	6.651	8.730	12.355	3.444	[illegible]	[illegible]	6.979	1.571	2.424	3.425	0.521	0.642
2530.00	81.592	49.217	16.174	27.166	6.840	9.063	12.727	3.592	4.19	[illegible]	7.360	1.621	[illegible]	3.666	0.535	0.666
2525.00	85.464	52.642	17.181	29.696	7.047	[illegible]	13.692	3.650	4.327	5.007	[illegible]	1.690	2.662	3.914	0.566	0.694
2520.00	89.959	55.310	18.595	31.101	7.446	[illegible]	14.665	3.805	4.513	5.261	8.367	1.790	2.831	4.235	0.607	0.766
2515.00	94.524	56.926	19.635	33.562	7.902	10.787	15.658	4.009	4.764	5.636	9.066	1.925	3.056	4.620	0.659	0.810
2510.00	99.236	62.766	20.667	36.646	8.432	11.603	17.235	4.240	[illegible]	6.066	9.869	2.074	3.306	5.056	0.714	0.866
2505.00	104.033	[illegible]	22.323	38.692	8.877	12.432	18.717	4.489	5.361	6.324	10.996	2.227	3.566	5.514	0.766	0.978
2500.00	108.817	70.316	23.675	42.063	9.432	13.166	20.206	4.663	5.655	6.936	11.552	2.342	3.743	5.961	0.787	1.066
2495.00	111.754	75.257	25.196	[illegible]	9.866	14.026	21.816	4.856	5.674	7.336	12.466	2.431	4.026	6.496	0.800	1.066
2490.00	116.766	76.863	27.126	43.990	10.513	15.144	23.611	5.096	6.203	7.906	13.599	2.565	4.366	7.136	0.832	1.166
2485.00	123.486	84.613	29.375	52.956	11.364	16.336	26.396	5.385	6.614	8.611	14.676	2.736	4.737	7.891	0.877	1.276
2480.00	126.661	89.444	31.882	57.207	12.181	16.961	28.627	5.701	7.073	9.610	16.434	2.920	5.171	8.743	0.927	1.390
2475.00	133.663	88.353	34.616	61.464	13.132	19.702	31.395	6.035	7.969	10.297	18.115	3.066	5.661	9.705	0.973	1.515
2470.00	136.663	99.306	37.992	66.361	14.160	21.966	34.439	6.375	8.043	11.262	19.966	3.246	[illegible]	10.797	1.006	1.666
2465.00	141.683	104.303	40.840	[illegible]	15.313	23.666	37.769	6.727	8.969	12.425	22.110	[illegible]	6.828	[illegible]	1.034	1.791
2460.00	146.683	109.303	44.952	[illegible]	16.666	24.196	41.460	7.126	9.401	13.792	24.538	[illegible]	[illegible]	13.536	1.055	1.975
2455.00	151.681	114.303	48.863	[illegible]	18.358	29.210	45.555	7.679	10.330	15.512	27.361	3.967	8.586	15.756	1.111	2.220
2450.00	156.623	119.303	53.161	85.970	20.576	32.770	50.003	8.669	11.606	17.761	30.666	4.422	[illegible]	17.609	1.241	2.626
2445.00	163.467	124.303	57.926	90.666	23.291	36.789	54.713	9.470	13.227	20.461	34.667	5.044	11.666	20.129	1.432	3.192
2440.00	166.681	129.303	62.606	[illegible]	25.467	41.181	59.576	10.355	15.328	23.731	38.365	5.821	13.328	23.696	1.724	3.919
2435.00	173.667	134.303	67.769	100.966	30.145	45.667	64.510	12.314	17.765	27.453	43.163	6.744	16.400	27.088	2.043	4.766
2430.00	178.663	139.303	72.762	105.966	34.233	50.704	69.478	14.119	20.666	31.571	47.689	7.623	19.340	31.047	2.393	5.696
2425.00	183.687	144.303	77.762	110.666	38.658	55.669	74.472	16.300	23.956	36.048	[illegible]	9.129	22.656	35.372	2.806	6.780
2420.00	188.681	149.303	82.762	115.366	43.612	60.623	79.472	19.032	27.833	40.822	57.704	10.878	26.678	40.027	[illegible]	8.233
2415.00	193.683	154.303	[illegible]	120.666	48.311	65.622	84.472	22.319	32.183	45.759	62.666	13.040	31.365	44.881	4.161	10.078
2410.00	198.681	159.303	92.762	125.966	53.276	70.622	89.472	26.139	36.833	50.711	67.679	15.750	36.179	49.821	5.161	12.696
2405.00	203.681	164.303	97.762	130.666	58.273	75.622	94.472	30.432	41.720	55.703	72.679	19.006	41.005	54.795	6.470	15.227
2400.00	208.681	169.303	102.762	135.666	63.273	80.622	99.472	35.067	46.675	60.703	77.676	22.662	45.451	59.767	8.166	18.707
2395.00	213.681	174.303	107.762	140.966	68.273	85.622	104.472	38.931	51.666	65.703	82.679	27.228	50.457	64.761	10.416	22.836
2390.00	218.681	179.303	112.762	145.966	73.273	90.622	109.472	44.666	56.658	70.703	87.679	32.023	55.952	69.793	13.461	27.391
2385.00	223.681	184.303	117.762	150.966	78.273	95.622	114.472	49.672	61.666	75.703	92.679	36.931	60.957	74.793	18.366	32.570
2380.00	228.681	189.303	122.762	155.966	83.273	100.622	119.472	54.871	66.668	80.703	97.679	41.960	65.952	79.793	23.329	37.566
2375.00	233.681	194.303	127.762	160.966	88.273	105.622	124.472	59.871	71.668	85.703	102.679	46.960	70.952	84.793	28.324	42.566
2370.00	238.681	199.303	132.762	165.966	93.273	110.622	129.472	64.871	76.666	90.703	107.679	51.960	75.952	89.793	33.323	47.566
2365.00	243.681	[illegible]	137.762	170.966	98.273	115.622	134.472	69.871	81.668	95.703	112.679	56.960	80.952	94.793	38.323	52.566
2360.00	248.681	209.303	142.762	175.966	103.273	120.622	139.472	[illegible]	86.666	100.703	117.679	61.960	85.952	99.793	43.323	57.566
2355.00	253.681	214.303	147.762	180.966	108.273	125.622	144.472	79.871	91.668	105.703	122.679	66.960	90.952	104.793	48.323	62.566
2350.00	258.681	219.303	152.762	185.966	113.273	130.622	149.472	84.871	96.666	110.703	127.676	71.960	95.952	109.793	53.323	67.566
2345.00	263.681	224.303	157.762	190.966	118.273	135.622	154.472	89.871	101.666	115.703	132.676	76.960	100.952	114.793	58.323	72.566
2340.00	268.681	229.303	162.762	195.966	123.273	140.622	159.472	94.871	106.666	120.703	137.676	81.960	105.952	119.793	63.323	77.566
2335.00	273.681	234.303	167.762	200.966	128.273	145.622	164.472	99.871	111.666	125.703	142.679	86.960	110.952	124.793	68.323	82.566
2330.00	278.681	239.303	172.762	205.966	133.273	150.622	169.472	104.871	116.666	130.703	147.679	91.960	115.952	129.793	73.323	87.566

Table 4-1 $\int_{\nu}^{\nu'} A(\nu)\,d\nu$ (cont'd)

Sam. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
p(atm)	5.76×10^{-1}	5.76×10^{-1}	2.74×10^{-1}	9.79×10^{-1}	1.17×10^{-1}	2.74×10^{-1}	2.74×10^{-1}	6.78×10^{-2}	1.73×10^{-1}	2.74×10^{-1}	2.74×10^{-1}	6.78×10^{-2}	2.74×10^{-1}	2.74×10^{-1}	3.33×10^{-2}	3.33×10^{-2}
P_e(atm)	2.75×10^{-1}	2.75×10^{-1}	3.56×10^{-1}	1.28×10^{0}	1.73×10^{-1}	3.56×10^{-1}	5.97×10^{-2}	6.83×10^{-2}	1.73×10^{-1}	3.56×10^{-1}	1.06×10^{0}	6.81×10^{-2}	3.56×10^{-1}	1.06×10^{0}	6.90×10^{-2}	3.12×10^{-1}
u(atm cm) STP	8.44×10^{4}	4.26×10^{5}	2.36×10^{5}	2.14×10^{4}	1.14×10^{4}	1.19×10^{4}	1.15×10^{4}	5.83×10^{4}	5.75×10^{3}	5.99×10^{4}	5.99×10^{3}	2.97×10^{3}	3.06×10^{3}	3.06×10^{3}	7.33×10^{3}	1.53×10^{3}
ν (cm^{-1})	$\nu' = 2850$ cm^{-1}	$\nu' = 2850$ cm^{-1}	$\nu' = 2850$ cm^{-1}	$\nu' = 2850$ cm^{-1}	$\nu' = 2800$ cm^{-1}	$\nu' = 2800$ cm^{-1}	$\nu' = 2800$ cm^{-1}	$\nu' = 2800$ cm^{-1}	$\nu' = 2800$ cm^{-1}	$\nu' = 2800$ cm^{-1}	$\nu' = 2800$ cm^{-1}	$\nu' = 2700$ cm^{-1}	$\nu' = 2700$ cm^{-1}	$\nu' = 2700$ cm^{-1}	$\nu' = 2700$ cm^{-1}	$\nu' = 2700$ cm^{-1}
2325.00	283.683	244.303	177.762	210.966	136.273	155.622	174.472	109.871	121.668	135.703	152.679	96.980	120.952	134.793	78.323	92.566
2320.00	288.683	249.303	182.762	215.966	141.273	160.622	179.472	114.871	126.668	140.703	157.679	101.980	125.952	139.793	83.323	97.566
2315.00	293.683	254.303	187.762	220.966	146.273	165.622	184.472	119.871	131.668	145.703	162.679	106.980	130.952	144.793	88.323	102.566
2310.00	298.683	259.303	192.762	225.966	151.273	170.622	189.472	124.871	136.668	150.703	167.679	111.980	135.952	149.793	93.323	107.566
2305.00	303.683	264.303	197.762	230.966	156.273	175.622	194.472	129.871	141.668	155.703	172.679	116.980	140.952	154.793	98.323	112.566
2300.00	308.683	269.303	202.762	235.966	161.273	180.622	199.472	134.871	146.668	160.703	177.679	121.980	145.952	159.793	103.323	117.566
2295.00	313.683	274.303	207.762	240.966	166.273	185.622	204.472	139.871	151.668	165.703	182.679	126.980	150.952	164.793	108.323	122.566
2290.00	318.683	279.303	212.762	245.966	171.273	190.622	209.472	144.871	156.668	170.703	187.679	131.980	155.952	169.793	113.323	127.566
2285.00	323.683	284.303	217.762	250.966	176.273	195.622	214.472	149.871	161.668	175.703	192.679	136.980	160.952	174.793	118.323	132.566
2280.00	328.683	289.303	222.762	255.966	181.273	200.622	219.472	154.871	166.668	180.703	197.679	141.980	165.952	179.793	123.323	137.566
2275.00	333.683	294.303	227.762	260.966	186.273	205.622	224.472	159.871	171.668	185.703	202.679	146.980	170.952	184.793	128.323	142.566
2270.00	338.683	299.303	232.762	265.966	191.273	210.622	229.472	164.871	176.668	190.703	207.679	151.980	175.952	189.793	133.323	147.566
2265.00	343.683	304.303	237.762	270.966	196.273	215.622	234.472	169.871	181.668	195.703	212.679	156.980	180.952	194.793	138.323	152.566
2260.00	348.683	309.303	242.762	275.966	201.273	220.622	239.472	174.871	186.668	200.703	217.679	161.980	185.952	199.793	143.323	157.566
2255.00	353.683	314.303	247.762	280.966	206.273	225.622	244.472	179.871	191.668	205.703	222.679	166.980	190.952	204.793	148.320	162.566
2250.00	358.683	319.303	252.762	285.966	211.273	230.622	249.472	184.871	196.668	210.703	227.679	173.960	195.932	209.787	153.302	167.566
2245.00	363.683	324.303	257.762	290.966	216.277	235.622	254.472	189.871	201.668	215.703	232.679	178.973	200.952	[illegible]	158.151	172.566
2240.00	368.683	329.303	262.762	295.966	221.273	240.622	259.472	194.871	206.668	220.703	237.679	181.956	205.952	219.795	162.818	177.566
2235.00	373.683	334.303	267.762	300.966	226.273	245.622	264.472	198.848	211.668	225.703	242.679	188.776	210.943	224.793	166.953	182.517
2230.00	378.683	339.303	272.762	305.966	231.273	250.622	269.472	204.776	216.668	230.703	247.679	191.380	215.823	229.792	170.490	187.375
2225.00	383.667	344.303	277.762	310.966	236.258	255.622	274.472	209.493	221.668	235.688	252.676	195.550	220.787	234.782	173.578	191.840
2220.00	388.683	349.303	282.762	315.966	241.189	260.612	279.472	213.701	226.205	240.601	257.665	198.385	225.313	239.888	175.669	195.559
2215.00	393.683	354.303	287.760	320.966	247.869	265.455	284.472	217.242	230.520	245.162	262.551	201.703	229.189	244.157	177.570	198.574
2210.00	398.683	359.303	292.661	325.963	251.270	269.659	289.640	219.899	233.961	249.084	267.060	203.619	232.205	247.846	178.749	200.325
2205.00	403.683	364.303	297.272	330.954	255.359	273.612	294.396	221.850	236.533	252.208	270.896	204.958	234.360	250.608	179.541	201.590
2200.00	408.663	369.290	[illegible]	335.837	256.018	276.675	297.061	223.250	238.532	254.527	273.404	205.354	235.858	252.536	180.053	202.388
2195.00	413.663	374.221	304.479	340.414	260.063	278.063	301.412	224.244	239.961	256.234	276.168	206.679	236.871	253.882	180.400	202.905
2190.00	418.879	379.029	307.671	344.569	261.636	280.851	304.036	224.842	240.951	257.457	277.640	206.894	237.597	254.796	180.627	203.236
2185.00	423.663	383.575	309.577	348.126	262.760	282.196	305.263	225.433	241.668	258.318	278.048	207.192	238.046	255.788	180.772	203.433
2180.00	428.529	387.734	311.636	351.151	263.586	283.215	307.501	225.778	242.181	258.990	279.953	207.391	238.387	255.956	180.861	203.949
2175.00	433.256	391.478	313.008	354.007	264.230	283.931	308.732	226.029	242.902	258.420	280.944	207.539	236.638	256.224	180.919	203.615
2170.00	437.761	394.814	314.125	356.294	264.725	284.657	309.743	226.233	242.891	259.793	281.228	207.649	238.037	256.539	180.955	203.656
2165.00	442.219	398.116	315.688	358.746	265.623	285.910	311.291	226.731	243.658	260.473	282.121	207.871	238.289	257.071	181.093	203.787
2160.00	446.803	401.646	317.445	361.317	266.492	286.632	312.658	227.110	244.033	261.083	282.864	208.196	239.606	257.493	181.200	203.816
2155.00	451.246	405.177	318.745	363.469	267.226	287.762	313.930	227.462	244.495	261.608	283.675	208.392	241.902	257.462	181.274	203.862
2150.00	455.634	406.445	320.404	365.770	267.956	[illegible]	315.206	227.808	244.959	262.540	284.337	208.599	240.202	258.231	181.355	203.907
2145.00	458.888	411.422	324.353	367.965	268.735	288.642	316.498	228.165	245.456	262.684	285.123	208.827	240.518	258.623	181.449	203.969
2140.00	465.230	415.053	327.565	370.220	269.615	290.617	317.984	228.626	246.077	263.742	285.923	209.109	240.905	259.078	181.512	204.002
2135.00	468.795	418.743	329.543	372.693	270.857	[illegible]	319.749	229.150	[illegible]	264.149	286.977	209.653	241.392	259.633	181.731	204.128
2130.00	471.566	422.469	326.129	374.164	272.364	294.656	321.527	230.181	[illegible]	265.545	288.356	210.410	242.618	261.023	182.230	204.915
2125.00	476.496	427.641	331.496	377.346	274.490	296.875	325.835	231.472	248.615	267.503	291.247	211.399	243.994	262.878	182.978	205.966
2120.00	481.473	432.502	334.916	[illegible]	276.492	299.885	329.482	232.667	251.019	269.552	293.620	212.175	245.201	264.649	183.166	206.747
2115.00	486.472	437.452	338.614	[illegible]	278.856	302.621	333.658	233.979	252.740	271.645	296.990	213.132	246.965	266.974	183.865	207.809
2110.00	491.472	442.451	343.132	386.774	281.662	306.409	338.114	235.728	255.012	274.412	300.707	214.386	248.989	268.749	184.566	209.390
2105.00	496.472	447.451	347.633	389.656	284.848	309.959	342.677	237.564	257.126	277.220	304.299	[illegible]	251.032	272.438	185.381	210.969
2100.00	503.472	452.451	351.604	403.656	287.555	311.369	346.806	239.133	259.128	278.777	307.855	216.679	252.810	274.763	185.977	211.658
2095.00	508.472	457.451	356.055	408.024	290.614	317.231	351.208	241.090	261.779	282.779	311.166	218.404	255.099	277.356	186.608	213.185
2090.00	513.472	462.451	360.372	413.566	293.749	320.764	355.651	243.169	264.314	285.758	314.916	220.065	257.378	280.283	187.965	214.781
2085.00	518.472	467.451	364.772	418.562	296.813	324.714	360.337	244.891	266.476	288.820	318.655	221.444	258.701	283.486	188.755	216.279
2080.00	523.472	472.451	369.731	421.502	300.618	328.165	365.295	247.780	270.063	292.838	321.615	223.746	[illegible]	287.563	189.999	218.938
2075.00	528.472	477.451	374.728	428.562	303.524	334.250	370.264	251.691	274.653	297.540	328.541	227.134	267.361	292.330	192.663	222.499
2070.00	533.472	482.451	379.726	433.562	309.011	338.667	375.264	254.912	278.046	303.884	332.473	229.238	271.970	296.851	193.783	225.160
2065.00	538.472	487.451	384.728	438.562	314.215	343.909	380.266	257.325	281.775	309.118	336.410	231.540	275.722	301.479	195.095	227.908
2060.00	543.472	492.451	389.728	443.562	316.665	345.777	385.266	260.510	285.536	310.791	343.171	233.859	278.484	304.201	196.411	230.708
2055.00	548.472	497.451	394.726	448.562	321.079	353.647	390.264	263.519	288.276	315.288	348.155	236.130	282.248	310.901	197.666	233.452
2050.00	553.472	502.451	399.714	453.562	327.448	357.424	395.260	[illegible]	292.916	319.593	353.250	238.170	285.787	315.441	196.965	235.961
2045.00	558.472	507.451	404.562	458.560	331.162	362.733	400.257	268.476	295.917	323.289	357.826	240.020	286.620	319.446	198.816	237.924
2040.00	563.472	512.451	409.057	463.659	334.727	366.508	404.780	269.964	298.211	326.245	362.095	241.296	290.783	322.807	200.580	239.374
2035.00	568.472	517.417	413.470	468.311	337.438	370.195	409.443	271.775	300.728	329.250	365.922	242.774	293.037	325.792	201.496	240.905
2030.00	573.470	522.270	417.787	472.433	339.412	372.471	412.855	273.874	302.177	331.052	368.511	243.520	294.218	327.487	201.927	241.593
2025.00	578.472	526.666	419.777	476.667	341.151	374.836	415.647	274.800	303.366	332.567	370.460	244.177	295.207	328.677	202.258	242.088
2020.00	583.377	531.214	422.169	479.590	342.595	376.669	418.100	275.596	304.344	333.772	372.042	244.612	296.080	329.587	202.522	242.445
2015.00	588.067	535.157	424.531	482.954	343.707	378.021	420.028	276.117	305.076	334.696	373.248	245.010	296.574	330.313	202.792	242.781
2010.00	592.269	538.442	425.995	485.365	344.497	379.056	421.559	276.435	305.399	335.379	374.262	245.275	297.017	330.871	202.875	243.011
2005.00	595.980	541.461	427.616	487.461	345.054	379.751	422.709	276.765	305.981	335.887	374.578	245.463	297.136	331.266	202.966	243.166
2000.00	599.135	543.622	428.042	[illegible]	345.626	380.486	423.445	277.041	306.116	336.312	375.525	245.636	297.547	331.546	203.077	243.263
1995.00	601.816	545.719	428.585	[illegible]	345.962	380.720	424.123	277.177	306.511	336.542	375.617	245.724	297.716	331.476	203.079	243.308
1990.00	603.359	547.102	429.036	[illegible]	346.146	380.970	424.456	277.290	306.667	336.712	376.036	245.800	297.834	331.785	203.104	243.347
1985.00	605.276	548.683	429.212	491.257	346.362	381.135	424.740	277.467	306.775	336.983	376.211	245.858	297.884	331.818	203.175	243.390
1980.00	607.416	549.716	429.360	492.040	346.658	381.437	425.066	277.538	306.928	337.050	376.425	245.945	297.890	331.977	203.160	243.421
1975.00	610.111	550.159	430.474	493.166	347.000	381.920	425.530	277.767	307.146	337.145	376.773	246.050	298.148	332.120	203.190	243.681
1970.00	613.276	552.502	431.246	494.602	347.430	382.503	426.675	277.928	307.443	337.740	377.128	246.217	298.397	332.436	203.247	243.826
1965.00	616.876	555.273	432.177	496.560	348.000	383.357	427.701	278.212	307.826	338.280	378.149	246.417	298.729	332.927	203.320	243.861
1960.00	620.673	558.395	433.677	498.257	348.728	384.220	429.166	278.544	308.270	338.930	379.135	246.651	299.155	333.532	203.436	244.120
1955.00	625.016	561.436	435.272	501.437	349.456	385.186	430.550	278.804	308.747	339.596	[illegible]	246.890	299.592	334.110	203.555	244.307
1950.00	628.972	564.601	436.107	503.242	350.152	386.008	431.751	279.252	308.177	340.162	380.661	247.088	299.942	334.689	203.653	244.567
1945.00	631.777	566.973	437.201	504.660	350.622	384.358	432.174	279.431	309.368	340.398	381.151	247.169	300.070	334.622	203.703	244.669
1940.00	634.752	568.322	437.800	[illegible]	350.901	386.417	432.954	279.847	309.596	340.710	381.508	247.285	300.198	334.794	203.746	244.750
1935.00	639.095	572.179	439.408	508.756	352.898	388.146	435.202	280.622	310.767	342.172	383.147	248.098	301.133	336.096	204.045	245.453
1930.00	644.036	575.257	441.457	512.919	355.200	391.435	437.675	282.522	311.050	344.827	385.188	249.579	303.311	338.531	204.100	247.124
1925.00	648.903	581.217	446.078	[illegible]	354.569	393.752	441.441	283.174	313.021	346.055	388.116	250.033	304.167	339.808	205.298	247.674
1920.00	653.251	585.146	449.459	521.115	359.666	398.577	445.144	284.314	315.374	348.025	391.076	250.870	305.580	341.890	205.688	248.629
1915.00	[illegible]	591.161	453.459	525.990	361.511	399.972	449.580	286.079	317.547	350.775	394.751	252.161	307.603	344.017	206.404	249.977
1910.00	663.851	[illegible]	457.660	530.802	363.961	403.063	[illegible]	287.166	319.275	353.047	398.170	252.867	309.278	347.387	206.879	251.107
1905.00	668.891	[illegible]	461.647	537.518	366.267	404.064	457.550	288.704	321.006	355.304	401.441	253.867	310.416	348.834	207.318	252.205
1900.00	671.884	[illegible]	465.143	539.942	368.519	406.782	461.566	289.848	322.613	356.468	404.336	254.769	312.362	351.319	207.866	253.156
1895.00	[illegible]	[illegible]	466.155	543.569	370.347	410.996	464.675	291.067	323.575	358.115	406.576	255.449	313.968	353.654	209.212	253.856
1890.00	681.513	[illegible]	470.142	[illegible]	371.428	412.764	[illegible]	291.604	324.766	360.120	408.060	255.857	314.131	354.340	208.496	254.272
1885.00	687.704	[illegible]	471.049	549.261	372.316	413.446	[illegible]	292.112	325.116	360.880	408.994	256.150	314.578	354.877	208.675	254.515
1880.00	691.751	[illegible]	473.554	[illegible]	373.276	414.365	[illegible]	292.574	325.573	361.415	409.666	256.396	314.899	355.206	208.797	254.640
1875.00	695.125	622.767	474.473	552.560	373.921	415.026	470.247	292.011	326.207	361.423	410.079	256.522	315.076	355.387	209.565	254.771
1870.00	698.157	624.715	475.599	553.660	374.417	415.569	470.841	293.160	326.477	362.200	410.424	256.627	315.239	355.564	208.918	254.841
1865.00	700.964	626.512	476.415	554.116	374.604	416.106	471.448	293.111	326.742	362.404	410.767	256.722	315.408	355.719	208.854	254.902
1860.00	703.556	627.757	477.462	[illegible]	375.317	416.534	[illegible]	293.467	326.579	362.820	411.146	256.816	315.562	355.877	208.977	254.963
1855.00	705.956	629.596	478.191	[illegible]	375.454	416.985	472.508	293.614	327.166	[illegible]	411.480	256.878	315.684	356.006	208.866	254.996
1850.00	[illegible]	[illegible]	[illegible]	[illegible]	375.848	417.240	472.913	293.723	327.280	363.190	411.490	256.916	315.784	356.085	208.944	254.991
1845.00	[illegible]	[illegible]	479.742	[illegible]	376.095	417.432	473.056	293.763	327.363	363.303	411.874	256.960	315.810	356.125	208.946	254.997
1840.00	[illegible]	[illegible]	479.457	[illegible]	376.155	417.516	473.196	293.815	327.397	363.366	411.603	256.945	315.836	356.140	208.864	254.887
1835.00	713.667	632.205	[illegible]	[illegible]	376.164	417.539	473.204	293.839	327.405	363.383	411.916	256.865	315.837	356.140	208.866	254.997
1830.00	715.522	[illegible]	479.822	[illegible]	376.196	417.540	473.264					256.945	315.817	356.140	208.964	254.997
1825.00	[illegible]	[illegible]	479.423	[illegible]	376.196	417.560	473.274									
1820.00	[illegible]	[illegible]	479.621	[illegible]	376.198	417.560	473.264									
1815.00	[illegible]	[illegible]	479.621	[illegible]	376.199	417.560	473.274									

Table. 4-2 $\int^{\nu'} A(\nu)\,d\nu$

Table 4-3 $\int_{\nu}^{\nu'} A(\nu)\,d\nu$

Sam. No.	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
p(atm)	5.26×10^{-4}	3.28×10^{-4}	5.28×10^{-4}	3.28×10^{-4}	3.28×10^{-4}	1.32×10^{-4}	2.83×10^{-4}	3.26×10^{-4}	5.28×10^{-4}	5.26×10^{-4}	5.26×10^{-4}	5.28×10^{-4}	8.7×10^{-8}	1.34×10^{-4}	2.63×10^{-4}	5.26×10^{-4}	5.26×10^{-4}	5.28×10^{-4}	5.26×10^{-4}	5.26×10^{-4}
P_N(atm)	8.06×10^{-4}	1.47×10^{-8}	4.37×10^{-8}	1.99×10^{-8}	1.32×10^{-3}	1.71×10^{-4}	3.42×10^{-4}	8.96×10^{-8}	1.47×10^{-8}	4.57×10^{-8}	1.99×10^{-2}	1.32×10^{-1}	8.7×10^{-6}	1.71×10^{-4}	3.42×10^{-4}	6.06×10^{-4}	1.47×10^{-8}	6.37×10^{-8}	1.99×10^{-8}	1.32×10^{-1}
w(atm cm) STP	2.28×10^{2}	9.38×10^{1}	9.28×10^{1}	9.28×10^{1}	2.28×10^{2}	1.13×10^{1}	1.14×10^{1}	1.15×10^{1}	1.15×10^{1}	1.15×10^{1}	1.15×10^{1}	1.15×10^{1}	5.8×10^{0}	5.85×10^{0}	5.75×10^{0}	5.87×10^{0}	5.87×10^{0}	5.87×10^{0}	5.87×10^{0}	5.87×10^{0}
ν (cm^{-1})	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}	$\nu'=2425$ cm^{-1}
2425.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2420.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2415.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2410.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2405.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2400.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2395.00	0.000	0.000	0.002	0.001	0.003	0.000	0.000	0.	0.001	0.001	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
2390.00	0.047	0.073	0.104	0.117	0.260	0.027	0.040	0.037	0.043	0.069	0.169	0.254	0.035	0.044	0.042	0.045	0.03[illegible]	0.041	0.083	0.143
2385.00	0.193	0.416	0.479	0.691	1.952	0.094	0.149	0.183	0.201	0.370	0.635	1.675	0.112	0.141	0.146	0.161	0.174	0.222	0.429	1.057
2380.00	0.627	0.954	1.572	2.912	5.805	0.244	0.351	0.465	0.654	1.173	2.176	4.968	0.231	0.289	0.369	0.344	0.506	0.758	1.555	3.516
2375.00	1.655	2.420	3.89[illegible]	6.653	10.730	0.661	0.849	1.135	1.701	2.909	5.247	9.783	0.483	0.611	0.531	0.967	1.291	2.048	3.921	7.747
2370.00	3.423	4.830	7.430	11.396	15.713	1.397	1.774	2.457	3.403	5.695	9.577	14.755	0.943	1.189	1.613	1.838	2.650	4.165	7.577	12.658
2365.00	5.784	7.970	11.705	16.392	20.708	2.411	3.074	4.216	5.916	9.280	14.361	19.740	1.573	1.977	2.663	3.130	4.48[illegible]	6.958	11.916	17.633
2360.00	8.544	11.524	16.272	21.331	25.706	3.640	4.674	6.323	8.738	13.218	19.302	24.738	2.342	2.940	3.909	4.697	6.668	10.152	16.542	22.622
2355.00	11.408	15.181	20.870	26.328	30.706	4.988	6.418	8.560	11.682	17.231	24.243	29.736	3.203	3.996	5.264	6.400	8.956	13.454	21.220	27.621
2350.00	13.954	18.491	25.138	31.295	35.706	6.257	8.017	10.573	14.247	20.860	29.066	34.736	4.049	4.992	6.491	7.926	11.007	16.403	25.[illegible]09	32.621
2345.00	16.294	21.501	29.231	36.229	40.706	7.565	9.540	12.396	16.634	24.195	33.733	39.736	4.870	5.976	7.679	9.360	12.878	19.090	29.751	37.621
2340.00	19.066	24.994	33.676	41.224	45.706	8.967	11.137	14.598	19.439	28.009	38.602	44.736	5.876	7.170	9.094	11.071	15.094	22.155	34.256	42.621
2335.00	22.068	28.571	38.157	46.224	50.706	10.657	13.285	16.945	22.366	31.904	43.427	49.736	7.077	8.521	10.681	12.929	17.438	25.356	38.786	47.621
2330.00	24.887	32.122	42.585	51.224	55.706	12.266	15.204	19.271	25.217	35.744	48.350	54.736	8.186	9.830	12.199	14.740	19.725	28.517	43.275	52.62[illegible]
2325.00	27.508	35.407	46.819	56.201	60.706	13.841	16.871	21.338	27.816	39.312	53.151	59.736	9.161	10.968	13.537	16.330	21.761	31.404	47.590	57.621
2320.00	30.147	38.635	50.926	61.126	65.706	15.192	18.651	23.438	30.411	42.802	57.840	64.736	10.189	12.172	14.906	17.970	23.803	34.236	51.765	62.620
2315.00	32.349	41.404	54.547	65.915	70.706	16.429	20.123	25.220	32.579	45.798	62.218	69.735	11.046	13.156	16.021	19.320	25.466	36.607	55.461	67.565
2310.00	34.352	43.949	57.983	70.578	75.706	17.571	21.461	26.812	34.551	48.564	66.376	74.725	11.862	14.092	17.056	20.521	26.986	38.764	58.932	72.426
2305.00	36.130	46.2[illegible]	61.102	75.089	80.706	18.598	22.461	28.246	36.244	51.038	70.310	79.680	12.626	14.941	17.985	21.591	28.318	40.713	62.117	77.119
2300.00	37.722	48.194	63.805	79.230	85.696	19.591	23.775	29.528	37.834	53.177	73.779	84.519	13.402	15.784	18.876	22.591	29.510	42.384	64.842	81.619
2295.00	39.175	49.989	66.263	83.071	90.630	20.532	24.800	30.696	39.206	55.095	76.928	89.170	14.155	16.541	19.705	23.906	30.588	43.869	67.311	85.790
2290.00	40.551	51.650	68.501	86.594	95.404	21.431	25.710	31.780	40.476	56.833	79.764	93.546	14.881	17.268	20.480	24.349	31.569	45.18[illegible]	69.515	89.566
2285.00	41.774	53.099	70.492	89.619	99.859	22.276	26.680	32.747	41.562	58.288	82.131	97.422	15.546	17.932	21.179	25.098	32.410	46.286	71.283	92.798
2280.00	42.825	54.316	71.937	92.159	103.951	23.049	27.468	33.601	42.495	59.459	84.026	100.755	16.138	18.525	21.799	25.756	33.119	47.162	72.664	95.321
2275.00	43.769	55.405	73.319	94.419	107.777	23.715	28.175	34.349	43.314	60.507	85.709	103.804	16.642	19.039	22.330	26.337	33.742	47.931	73.873	97.631
2270.00	44.649	56.406	74.573	96.454	111.331	24.327	28.601	35.016	44.054	61.440	87.214	106.560	17.078	19.485	22.798	26.839	34.289	48.612	74.930	99.650
2265.00	45.426	57.288	75.667	98.248	114.546	24.826	29.336	35.580	44.669	62.241	88.516	108.961	17.436	19.854	23.170	27.244	34.748	49.181	75.825	101.400
2260.00	46.011	57.972	76.577	99.606	117.531	25.168	29.712	35.987	45.138	62.888	89.615	111.219	17.690	20.124	23.449	27.539	35.088	49.630	76.579	103.024
2255.00	46.516	58.536	77.343	101.145	120.158	25.503	30.048	36.332	45.513	63.423	90.545	113.140	17.918	20.374	23.704	27.790	35.384	50.008	77.212	104.404
2250.00	46.928	59.004	77.980	102.315	122.577	25.765	30.340	36.635	45.875	63.695	91.370	114.865	18.121	20.604	23.931	28.020	35.851	50.340	77.762	105.644
2245.00	47.268	59.401	78.485	103.232	124.441	26.040	30.597	36.904	46.174	64.291	92.029	116.197	18.294	20.810	24.131	28.234	35.881	50.620	78.206	106.579
2240.00	47.564	59.746	78.899	103.975	125.964	26.267	30.831	37.142	46.437	64.618	92.550	117.241	18.449	20.993	24.311	28.418	36.082	50.857	78.559	107.286
2235.00	47.827	60.040	79.235	104.536	127.107	26.453	31.030	37.350	46.655	64.88[illegible]	92.947	117.990	18.581	21.151	24.466	28.570	36.240	51.044	78.811	107.776
2230.00	48.040	60.272	79.490	104.926	127.813	26.61[illegible]	31.200	37.518	46.825	65.087	93.241	118.447	18.682	21.280	24.593	28.691	36.358	51.184	78.989	108.071
2225.00	48.197	60.446	79.693	105.192	128.269	26.747	31.338	37.637	46.918	65.242	93.444	118.723	18.762	21.36[illegible]	24.680	28.780	36.444	51.279	79.104	108.223
2220.00	48.309	60.569	79.820	105.358	128.513	26.836	31.431	37.718	47.012	65.344	93.563	118.860	18.821	21.421	24.737	28.838	36.508	51.339	79.170	108.286
2215.00	48.369	60.646	79.908	105.446	128.624	26.899	31.490	37.770	47.063	65.404	93.629	118.912	18.858	21.448	24.771	28.873	36.544	51.373	79.199	108.318
2210.00	48.429	60.703	79.960	105.487	128.676	26.932	31.525	37.801	47.094	65.461	93.663	118.940	18.876	21.460	24.781	28.886	36.560	51.390	79.211	108.333
2205.00	48.447	60.735	79.987	105.510	128.711	26.937	31.534	37.811	47.107	65.497	93.677	118.956	18.878	21.460	24.781	28.886	36.561	51.391	79.211	108.334
2200.00	48.450	60.743	79.991	105.519	128.727	26.937	31.534	37.811	47.107	65.498	93.678	118.956	18.878	21.460	24.781	28.886	36.561	51.391	79.211	108.334
2195.00	48.450	60.743	79.991	105.520	128.729	26.937	31.534	37.811	47.107	65.498	93.678	118.956	18.878	21.460	24.781	28.886	36.561	51.391	79.211	108.334
2190.00	48.450	60.743	79.991	105.520	128.729	26.937	31.534	37.811	47.107	65.498	93.678	118.956	18.878	21.460	24.781	28.886	36.561	51.391	79.211	108.334

Table 4-4 $\int^{\nu'} A(\nu)\,d\nu$

Run No.	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
p(atm)	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	1.60 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]	3.30 × 10[illegible]
P_x (atm)	4.30×10^{-5}	8.10×10^{-5}	1.60×10^{-4}	2.97×10^{-4}	5.41×10^{-4}	1.40×10^{-3}	8.92×10^{-3}	1.91×10^{-2}	3.13×10^{-2}	1.32×10^{-1}	2.10×10^{-5}	9.30×10^{-5}	8.10×10^{-5}	1.60×10^{-4}	3.37×10^{-4}	3.61×10^{-4}	2.08×10^{-3}	8.32×10^{-3}	1.91×10^{-2}	5.13×10^{-2}	1.32×10^{-1}
u(atm cm) STP	2.00×10^{0}	2.00×10^{0}	2.00×10^{0}	2.00×10^{0}	1.00×10^{0}	2.00×10^{0}	1.00×10^{0}	2.00×10^{0}	2.00×10^{0}	2.00×10^{0}	1.40×10^{0}	1.40×10^{0}	1.40×10^{0}	1.40×10^{0}	1.40×10^{0}	1.40×10^{0}	1.40×10^{0}	1.40×10^{0}	1.40×10^{0}	1.40×10^{0}	1.40×10^{0}
ν (cm^{-1})	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2425$ cm^{-1}	$\nu' = 2423$ cm^{-1}
2425.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2420.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2415.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2410.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2405.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2400.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2395.00	0.001	0.	0.000	0.	0.001	0.	0.000	0.000	0.001	0.	0.	0.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2390.00	0.041	0.015	0.036	0.034	0.030	0.022	0.020	0.028	0.052	0.039	0.035	0.014	0.018	0.023	0.015	0.039	0.025	0.027	0.029	0.035	0.022
2385.00	0.109	0.078	0.117	0.114	0.121	0.126	0.150	0.245	0.441	0.919	0.072	0.076	0.085	0.093	0.081	0.126	0.112	0.191	0.214	0.340	0.382
2380.00	0.192	0.157	0.225	0.255	0.330	0.407	0.637	0.977	1.974	2.434	0.192	0.159	0.170	0.189	0.182	0.284	0.322	0.524	0.754	1.234	1.780
2375.00	0.349	0.320	0.439	0.557	0.812	1.064	1.791	2.573	4.209	5.962	0.232	0.29[illegible]	0.289	0.340	0.389	0.604	0.766	1.512	1.994	3.186	4.410
2370.00	0.624	0.618	0.847	1.108	1.658	2.249	3.622	5.206	7.041	10.577	0.432	0.465	0.492	0.621	0.797	1.107	1.585	2.673	4.051	6.299	7.663
2365.00	1.029	1.051	1.399	1.877	2.775	3.820	6.099	8.997	11.966	15.495	0.679	0.753	0.823	1.023	1.350	1.908	2.750	4.687	6.805	10.147	13.335
2360.00	1.538	1.912	2.086	2.804	4.106	5.704	8.971	12.572	17.338	20.479	1.007	1.129	1.253	1.538	2.026	2.952	4.175	6.945	9.963	14.403	18.186
2355.00	2.122	2.259	2.871	3.630	5.515	7.708	11.929	16.597	22.125	25.471	1.414	1.600	1.792	2.146	2.788	3.999	5.714	8.907	13.250	18.713	23.058
2350.00	2.719	2.912	3.923	4.739	6.757	9.486	14.902	20.282	26.683	30.609	1.866	2.106	2.294	2.750	3.539	4.956	7.099	10.904	16.173	22.941	27.788
2345.00	3.328	3.558	4.374	5.922	7.940	11.096	17.861	23.555	31.008	35.291	2.330	2.609	2.820	3.335	4.232	5.832	8.322	12.703	18.775	26.259	32.249
2340.00	4.023	4.317	5.256	6.982	9.393	12.992	19.662	27.301	35.962	40.221	2.847	3.171	3.427	4.020	5.053	6.873	9.790	14.820	21.814	30.319	37.031
2335.00	4.937	5.208	6.209	7.904	10.902	15.006	22.509	31.111	40.320	45.204	3.515	3.888	4.18[illegible]	4.851	6.010	8.040	11.347	17.039	24.928	34.405	41.792
2330.00	5.730	6.306	7.229	9.046	12.348	16.952	25.277	34.868	44.925	50.178	4.155	4.541	4.885	5.605	6.961	9.157	12.872	19.171	27.995	38.406	46.520
2325.00	6.430	6.846	8.059	10.057	13.936	18.994	27.795	38.366	49.382	55.128	4.955	5.109	5.490	6.295	7.668	10.140	14.227	21.083	30.749	42.114	51.141
2320.00	7.164	7.936	8.922	11.084	14.925	20.413	30.243	41.749	53.956	59.994	5.192	5.602	6.117	6.932	8.426	11.112	15.591	22.934	33.417	45.778	55.612
2315.00	7.757	8.262	9.932	11.912	15.973	21.805	32.252	44.913	57.493	64.919	5.651	6.190	6.629	7.479	9.060	11.908	16.979	24.43[illegible]	35.924	48.897	59.729
2310.00	8.397	8.892	10.325	12.976	16.940	22.881	34.305	47.248	61.098	69.[illegible]	6.144	6.654	7.147	8.021	9.690	12.640	17.649	25.305	37.623	51.754	63.534
2305.00	8.963	9.489	10.947	13.391	17.794	24.203	35.718	49.394	64.437	73.299	6.918	7.141	7.650	8.539	10.229	13.297	18.497	26.995	39.465	5[illegible]287	67.137
2300.00	9.577	10.123	11.562	14.093	18.591	25.197	37.082	51.544	67.197	76.992	7.109	7.937	8.157	9.059	10.784	13.919	19.294	28.019	40.871	56.349	70.110
2295.00	10.139	10.714	12.154	14.759	19.320	26.098	38.295	53.282	69.702	80.338	7.580	8.121	8.652	9.548	11.308	14.486	19.957	28.923	42.157	58.198	72.712
2290.00	10.633	11.275	12.702	15.370	19.949	26.895	39.343	54.809	71.901	83.520	8.034	8.572	9.114	10.003	11.790	15.004	20.567	29.716	43.265	59.773	74.898
2285.00	11.141	11.766	13.193	15.904	20.524	27.550	40.162	56.017	73.621	85.669	8.449	8.959	9.513	10.402	12.201	15.451	21.081	30.344	44.120	60.955	76.754
2280.00	11.574	12.235	13.610	16.364	21.005	28.075	40.782	56.909	74.991	87.593	8.797	9.207	9.891	10.747	12.546	15.823	21.490	30.834	44.740	61.784	77.971
2275.00	11.923	12.628	13.988	16.749	21.423	28.540	41.344	57.704	76.113	88.934	9.080	9.561	10.144	11.037	12.843	16.131	21.834	31.291	45.279	62.524	79.027
2270.00	12.220	12.942	14.298	17.080	21.769	28.945	41.844	58.397	77.104	90.279	9.318	9.784	10.343	11.277	13.080	16.389	22.116	31.612	45.730	63.137	79.950
2265.00	12.431	13.203	14.539	17.337	22.024	29.272	42.275	58.989	77.939	91.455	9.491	9.956	10.527	11.459	13.252	16.587	22.351	31.909	46.111	63.682	80.758
2260.00	12.587	13.376	14.709	17.521	22.228	29.529	42.624	59.492	78.689	92.599	9.623	10.102	10.666	11.600	13.395	16.761	22.555	32.175	46.435	64.195	81.529
2255.00	12.758	13.553	14.858	17.694	22.412	29.734	42.959	59.917	79.340	93.519	9.743	10.226	10.787	11.757	13.532	16.885	22.739	32.416	46.749	64.627	82.193
2250.00	12.929	13.718	14.989	17.868	22.582	29.974	43.207	60.301	79.908	94.341	9.853	10.341	10.910	11.876	13.671	17.018	22.908	32.624	47.011	64.973	82.749
2245.00	13.089	13.859	15.114	18.034	22.741	30.169	43.423	60.624	80.392	94.964	9.960	10.439	11.028	11.982	13.795	17.135	23.059	32.801	47.230	65.245	83.172
2240.00	13.225	13.984	15.229	18.172	22.872	30.340	43.600	60.880	80.747	95.439	10.054	10.532	11.124	12.082	13.889	17.231	23.181	32.942	47.407	65.451	83.479
2235.00	13.322	14.101	15.310	18.279	22.975	30.486	43.747	61.060	80.995	95.747	10.124	10.608	11.200	12.175	13.961	17.319	23.277	33.046	47.532	65.615	83.678
2230.00	13.400	14.198	15.345	18.358	23.055	30.577	43.846	61.187	81.129	95.930	10.186	10.658	11.245	12.252	14.024	17.378	23.351	33.121	47.611	65.729	83.783
2225.00	13.453	14.291	15.402	18.405	23.111	30.651	43.916	61.279	81.208	96.023	10.229	10.689	11.278	12.307	14.070	17.421	23.395	33.170	47.655	65.783	83.850
2220.00	13.479	14.295	15.423	18.429	23.142	30.699	43.957	61.338	81.259	96.084	10.259	10.698	11.294	12.338	14.092	17.444	23.414	33.195	47.681	65.824	83.890
2215.00	13.483	14.301	15.427	18.432	23.148	30.730	43.984	61.379	81.292	96.130	10.275	10.698	11.297	12.346	14.095	17.449	23.415	33.199	47.689	65.841	83.910
2210.00	13.483	14.301	15.427	18.432	23.148	30.745	43.998	61.400	81.316	96.162	10.279	10.698	11.297	12.346	14.095	17.449	23.415	33.199	47.699	65.847	83.913
2205.00	13.483	14.301	15.427	18.432	23.148	30.747	44.000	61.409	81.325	96.179											
[illegible]	13.483	14.301	15.427	18.432	23.148	30.747	44.000	61.409	81.327	96.183											

Table 4-5 $\int_{\nu}^{\nu'} A(\nu)\,d\nu$

Run No.	77	78	79	80	81	82	83	84	85	86	87	88
p(atm)	7.30 $\times 10^{-4}$	1.50 $\times 10^{-4}$	3.30 $\times 10^{-4}$	2.30 $\times 10^{-1}$	7.30 $\times 10^{-4}$	1.30 $\times 10^{-4}$	3.30 $\times 10^{-4}$	3.30 $\times 10^{-4}$	3.30 $\times 10^{-4}$	1.30 $\times 10^{-4}$	3.30 $\times 10^{-4}$	3.30 $\times 10^{-4}$
p_e(atm)	8.50 $\times 10^{-6}$	7.10 $\times 10^{-6}$	8.30 $\times 10^{-6}$	8.10 $\times 10^{-6}$	1.60 $\times 10^{-4}$	1.97 $\times 10^{-4}$	6.61 $\times 10^{-4}$	2.07 $\times 10^{-8}$	6.62 $\times 10^{-4}$	1.81 $\times 10^{-4}$	3.13 $\times 10^{-4}$	1.12 $\times 10^{-1}$
x(atm cm) STP	6.2 $\times 10^{-1}$	6.80 $\times 10^{-1}$	7.20 $\times 10^{-1}$	7.20 $\times 10^{-1}$	7.20 $\times 10^{-1}$	7.00 $\times 10^{-1}$	7.30 $\times 10^{-1}$	7.20 $\times 10^{-1}$	7.00 $\times 10^{-1}$	7.20 $\times 10^{-1}$	7.20 $\times 10^{-1}$	7.20 $\times 10^{-1}$
ν (cm^{-1})	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2427 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2422 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2427 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}
2425.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2420.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2415.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2410.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2405.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2400.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2395.00	0.	0.000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.001
2390.00	0.011	0.016	0.014	0.022	0.016	0.011	0.011	0.006	0.016	0.017	0.022	0.076
2385.00	0.077	0.041	0.060	0.058	0.081	0.045	0.067	0.057	0.087	0.157	0.209	0.351
2380.00	0.155	0.160	0.154	0.169	0.164	0.145	0.169	0.197	0.320	0.570	0.844	1.400
2375.00	0.277	0.251	0.240	0.263	0.265	0.288	0.382	0.541	0.654	1.490	2.270	3.549
2370.00	0.370	0.395	0.422	0.447	0.469	0.565	0.778	1.150	1.075	2.071	4.578	6.608
2365.00	0.567	0.615	0.644	0.706	0.766	0.879	1.374	1.992	2.153	3.126	7.648	11.016
2360.00	0.829	0.892	0.942	1.023	1.146	1.477	1.988	3.012	4.730	7.569	11.126	15.465
2355.00	1.150	1.241	1.155	1.421	1.676	2.045	2.746	4.129	6.606	10.097	14.661	19.976
2350.00	1.545	1.630	1.703	1.658	2.014	2.602	3.465	5.102	7.662	12.303	17.780	24.102
2345.00	1.941	2.036	2.224	2.307	2.571	3.155	4.144	6.048	9.244	14.294	20.612	27.926
2340.00	2.346	2.484	2.682	2.797	3.099	3.761	4.831	7.130	10.849	16.626	23.847	32.201
2335.00	2.670	3.011	3.173	3.405	3.731	4.521	5.817	8.292	12.516	19.077	[illegible]	36.474
2330.00	3.122	3.518	3.706	3.937	4.721	5.196	6.675	9.370	14.071	21.731	30.410	40.644
2325.00	3.715	3.937	4.237	4.401	4.628	5.767	7.751	10.349	15.657	23.365	33.119	44.594
2320.00	4.119	4.357	4.696	4.876	5.320	6.737	8.093	11.280	16.779	25.392	36.104	48.786
2315.00	4.465	4.728	5.091	5.281	5.750	6.817	8.682	12.081	17.868	26.956	38.457	51.871
2310.00	4.871	5.122	5.512	5.696	6.191	7.267	9.181	12.760	18.857	28.417	40.593	54.706
2305.00	5.241	5.516	5.905	6.094	6.660	7.723	9.682	13.379	19.721	29.676	42.650	57.195
2300.00	5.621	5.893	6.236	6.484	7.027	8.165	10.165	13.933	20.465	30.719	43.956	59.540
2295.00	5.990	6.252	6.551	6.852	7.610	8.463	10.571	14.461	21.116	31.608	45.236	61.396
2290.00	6.322	6.581	6.990	7.262	7.762	8.956	10.960	14.896	21.662	32.368	46.318	62.925
2285.00	6.599	6.871	7.296	7.568	8.070	9.238	11.268	15.269	22.120	32.878	47.128	64.028
2280.00	6.831	7.125	7.537	7.780	8.323	9.506	11.560	15.559	22.444	33.362	47.664	64.727
2275.00	7.024	7.367	7.725	7.966	8.530	9.718	11.780	15.796	22.771	33.690	48.161	65.312
2270.00	7.154	7.564	7.661	8.116	8.693	9.887	11.956	15.977	22.968	33.976	48.551	65.938
2265.00	7.252	7.628	7.876	8.274	8.717	10.014	12.096	16.121	23.132	34.217	48.908	66.466
2260.00	7.352	7.730	8.071	8.335	8.916	10.119	12.216	16.252	23.262	34.429	49.262	[illegible]
2255.00	7.444	7.827	8.162	8.433	9.008	10.210	12.326	16.375	23.432	34.623	49.527	[illegible]
2250.00	7.536	7.974	8.253	8.531	9.105	10.306	12.447	16.481	23.559	34.792	49.796	[illegible]
2245.00	7.614	8.026	8.376	8.626	9.195	10.405	12.547	16.563	23.667	34.975	49.995	68.036
2240.00	7.679	8.104	8.427	8.721	9.275	10.493	12.629	16.670	23.750	35.060	50.136	68.217
2235.00	7.725	8.171	8.448	8.802	9.365	10.571	12.709	16.720	23.816	35.117	50.233	68.320
2230.00	7.754	8.218	8.476	8.875	9.397	10.631	12.770	16.771	23.840	35.156	50.296	68.364
2225.00	7.776	8.257	8.417	8.910	9.426	10.665	12.808	16.794	23.867	35.178	50.333	68.418
2220.00	7.791	8.274	8.487	8.911	9.433	10.675	12.823	16.804	23.896	35.182	50.348	68.432
2215.00	7.792	8.280	8.487	8.918	9.433	10.675	12.824	16.806	23.896	35.182	50.349	68.472
2210.00	7.792	8.250	8.487	8.917	9.437	10.675	12.826	16.806	23.896	35.182	50.349	68.432

Run No.	89	90	91	92	93	94	95	96	97	98	99	100
p(atm)	7.30 $\times 10^{-4}$	1.40 $\times 10^{-4}$	3.30 $\times 10^{-4}$	3.30 $\times 10^{-4}$	3.30 $\times 10^{-4}$	3.30 $\times 10^{-4}$	3.30 $\times 10^{-4}$	3.30 $\times 10^{-4}$	3.00 $\times 10^{-4}$	3.00 $\times 10^{-4}$	3.30 $\times 10^{-4}$	2.30 $\times 10^{-4}$
p_e(atm)	5.40 $\times 10^{-6}$	2.10 $\times 10^{-6}$	8.30 $\times 10^{-6}$	8.10 $\times 10^{-6}$	1.60 $\times 10^{-4}$	1.87 $\times 10^{-4}$	9.01 $\times 10^{-4}$	2.48 $\times 10^{-6}$	8.92 $\times 10^{-6}$	3.81 $\times 10^{-4}$	3.13 $\times 10^{-6}$	1.31 $\times 10^{-1}$
x(atm cm) STP	3.10 $\times 10^{-1}$	3.50 $\times 10^{-1}$	2.70 $\times 10^{-1}$	3.70 $\times 10^{-1}$	3.70 $\times 10^{-1}$	3.70 $\times 10^{-1}$	7.76 $\times 10^{-1}$	3.70 $\times 10^{-1}$	3.70 $\times 10^{-1}$	3.70 $\times 10^{-1}$	3.70 $\times 10^{-1}$	2.76 $\times 10^{-1}$
ν (cm^{-1})	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2427 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2425 cm^{-1}
2425.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2420.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2415.00	0.	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2410.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2405.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2400.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2395.00	0.	0.000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2390.00	0.004	0.014	0.005	0.002	0.003	0.009	0.013	0.017	0.006	0.011	0.007	0.018
2385.00	0.045	0.059	0.056	0.040	0.042	0.047	0.071	0.077	0.063	0.089	0.134	0.176
2380.00	0.114	0.129	0.134	0.114	0.107	0.166	0.167	0.200	0.222	0.366	0.465	0.818
2375.00	0.192	0.195	0.275	0.212	0.161	0.258	0.370	0.661	0.573	0.961	1.407	2.280
2370.00	0.311	0.265	0.412	0.346	0.330	0.460	0.636	0.909	1.198	1.966	2.976	4.731
2365.00	0.470	0.454	0.678	0.578	0.549	0.762	1.066	1.526	2.105	3.683	6.176	8.016
2360.00	0.674	0.676	0.713	0.797	0.832	1.138	1.576	2.260	3.211	5.266	7.789	11.762
2355.00	0.960	0.956	0.997	1.124	1.176	1.580	2.146	3.072	4.418	7.155	10.514	15.612
2350.00	1.298	1.297	1.344	1.490	1.553	2.042	2.702	3.814	5.520	8.850	12.997	19.131
2345.00	1.558	1.643	1.711	1.865	1.936	2.500	3.241	4.571	6.687	10.365	15.005	22.149
2340.00	1.943	1.999	2.077	2.260	2.365	3.002	3.867	5.351	7.662	12.106	17.569	25.661
2335.00	2.157	2.427	2.555	2.761	2.839	3.580	4.590	6.273	8.853	13.911	20.098	29.226
2330.00	2.717	2.801	2.952	3.176	3.274	4.075	5.163	7.016	9.951	15.616	22.534	32.663
2325.00	3.022	3.121	3.294	3.510	3.666	4.506	5.672	7.712	11.004	17.144	24.753	35.867
2320.00	3.366	3.457	3.667	3.901	4.054	4.877	6.102	8.386	11.972	18.693	26.890	38.817
2315.00	3.655	3.761	3.974	4.241	4.396	5.326	6.649	8.966	12.815	19.825	28.616	41.326
2310.00	3.906	4.101	4.115	4.600	4.761	5.703	7.083	9.503	13.551	20.619	30.218	43.824
2305.00	4.310	4.410	4.641	4.963	5.076	6.066	7.471	9.963	14.364	21.866	31.597	45.883
2300.00	4.611	4.720	4.963	5.270	5.701	6.400	7.620	10.375	14.716	22.602	32.670	47.482
2295.00	4.866	5.018	5.258	5.578	5.676	6.711	8.161	10.736	15.176	23.206	33.588	48.820
2290.00	5.388	5.300	5.521	5.860	5.661	6.995	8.667	11.071	15.666	23.778	34.335	49.915
2285.00	5.422	5.455	5.750	6.104	6.177	7.263	8.666	11.316	15.873	24.196	34.884	50.717
2280.00	5.602	5.729	5.930	6.305	6.383	7.479	8.890	11.540	16.082	24.402	35.226	51.205
2275.00	5.762	5.878	6.090	6.464	6.502	7.595	9.057	11.766	16.271	[illegible]	35.552	51.626
2270.00	5.867	5.976	6.189	6.577	6.600	7.708	9.161	11.825	16.407	24.930	35.795	52.035
2265.00	5.935	6.053	6.278	6.659	6.682	7.763	9.245	11.927	16.518	25.105	36.038	52.405
2260.00	6.028	6.130	6.357	6.722	6.757	7.870	9.330	12.015	16.615	25.266	36.263	52.766
2255.00	6.117	6.192	6.471	6.781	6.829	7.948	9.418	12.105	16.715	25.406	36.451	53.067
2250.00	6.196	6.238	6.493	6.835	6.895	7.996	9.490	12.188	16.806	25.536	36.609	53.267
2245.00	6.266	6.286	6.545	6.890	6.960	8.049	9.552	12.266	16.881	25.630	36.735	53.465
2240.00	6.323	6.327	6.597	6.943	7.018	8.096	9.601	12.322	16.962	25.699	36.826	[illegible]
2235.00	6.367	6.348	6.675	6.961	7.061	8.126	9.644	12.366	16.969	25.739	36.880	53.665
2230.00	6.401	6.357	6.657	7.001	7.086	8.170	9.677	12.390	17.011	25.765	36.917	53.729
2225.00	6.425	6.357	6.670	7.004	7.089	8.193	9.700	12.399	17.016	25.777	36.932	53.756
2220.00	6.437	6.357	6.680	7.004	7.089	8.193	9.701	12.399	17.019	25.776	36.932	53.760
2215.00	6.439	6.357	6.680	7.004	7.088	8.193	9.701	12.399	17.018	25.778	36.932	53.760
2210.00	6.439	6.357	6.680	7.004	7.089	8.193	9.701	12.399	17.018	25.778	36.932	53.760

Table 4-6 $\int_{\nu}^{\nu'} A(\nu)\, d\nu$

Sam. No.	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116
p(atm)	7.20 $\times 10^{-4}$	1.60 $\times 10^{-4}$	1.60 $\times 10^{-4}$	1.60 $\times 10^{-4}$	1.60 $\times 10^{-4}$	1.60 $\times 10^{-4}$	1.60 $\times 10^{-4}$	1.60 $\times 10^{-4}$	1.30 $\times 10^{-4}$	7.20 $\times 10^{-4}$	7.20 $\times 10^{-4}$	7.20 $\times 10^{-4}$	7.20 $\times 10^{-4}$	7.20 $\times 10^{-4}$	7.20 $\times 10^{-4}$	7.20 $\times 10^{-4}$
P_x(atm)	9.40 $\times 10^{-6}$	2.10 $\times 10^{-5}$	1.11 $\times 10^{-4}$	3.10 $\times 10^{-4}$	1.58 $\times 10^{-3}$	4.56 $\times 10^{-3}$	1.34 $\times 10^{-2}$	4.28 $\times 10^{-2}$	1.31 $\times 10^{-1}$	9.40 $\times 10^{-6}$	2.61 $\times 10^{-4}$	7.82 $\times 10^{-4}$	2.69 $\times 10^{-3}$	1.13 $\times 10^{-2}$	3.88 $\times 10^{-2}$	1.34 $\times 10^{-1}$
u(atm cm) STP	1.40 $\times 10^{-1}$	1.80 $\times 10^{-1}$	1.80 $\times 10^{-1}$	1.80 $\times 10^{-1}$	1.80 $\times 10^{-1}$	1.80 $\times 10^{-1}$	1.80 $\times 10^{-1}$	1.80 $\times 10^{-1}$	1.80 $\times 10^{-1}$	8.10 $\times 10^{-2}$	8.10 $\times 10^{-3}$	8.20 $\times 10^{-2}$	8.10 $\times 10^{-2}$	8.10 $\times 10^{-2}$	8.10 $\times 10^{-2}$	8.10 $\times 10^{-2}$
ν (cm^{-1})	ν' = 2423 cm^{-1}	ν' = 2125 cm^{-1}	ν' = 2613 cm^{-1}	ν' = 3415 cm^{-1}	ν' = 2422 cm^{-1}	ν' = 3423 cm^{-1}	ν' = 2-23 cm^{-1}	ν' = 2423 cm^{-1}	ν' = 2423 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2423 cm^{-1}	ν' = 2423 cm^{-1}	ν' = 2425 cm^{-1}	ν' = 2423 cm^{-1}	ν' = 2423 cm^{-1}	ν' = 2425 cm^{-1}
2425.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2420.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2415.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2410.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2405.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2400.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2395.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2390.00	0.002	0.019	0.008	0.012	0.008	0.006	0.005	0.007	0.011	0.000	0.000	0.001	0.002	0.000	0.008	0.003
2385.00	0.038	0.079	0.041	0.069	0.045	0.049	0.049	0.067	0.119	0.015	0.018	0.026	0.041	0.035	0.053	0.056
2380.00	0.101	0.162	0.115	0.158	0.112	0.158	0.200	0.364	0.666	0.051	0.062	0.090	0.130	0.140	0.226	0.341
2375.00	0.167	0.252	0.201	0.214	0.228	0.390	0.541	1.032	1.841	0.102	0.121	0.180	0.261	0.360	0.620	1.063
2370.00	0.261	0.356	0.324	0.435	0.441	0.788	1.160	2.111	3.770	0.111	0.200	0.117	0.462	0.730	1.214	2.287
2365.00	0.171	0.505	0.496	0.681	0.765	1.350	2.041	1.566	6.313	0.274	0.328	0.518	0.757	1.248	2.184	3.994
2360.00	0.529	0.700	0.730	0.968	1.174	2.019	1.089	5.328	9.368	0.404	0.504	0.773	1.124	1.887	3.291	6.057
2355.00	0.742	0.942	1.014	1.318	1.645	2.743	4.198	7.119	12.410	0.568	0.712	1.049	1.525	2.568	4.465	8.213
2350.00	1.014	1.232	1.145	1.714	2.095	3.197	5.158	8.611	15.046	0.757	0.954	1.131	1.829	3.162	5.441	10.071
2345.00	1.301	1.537	1.685	2.089	2.546	4.014	6.086	10.054	17.383	0.969	1.198	1.611	2.253	3.707	6.329	11.604
2340.00	1.594	1.850	2.040	2.499	3.054	4.777	7.149	11.110	20.145	1.225	1.454	1.930	2.614	4.374	7.415	13.481
2335.00	1.923	2.214	2.455	2.948	3.613	5.544	8.221	11.355	22.666	1.481	1.744	2.280	3.097	5.044	8.462	15.318
2330.00	2.218	2.518	2.804	3.342	4.091	6.224	9.204	14.912	25.487	1.766	1.984	2.561	3.463	5.657	9.434	17.163
2325.00	2.464	2.773	3.102	3.686	4.514	6.823	10.075	16.294	27.859	1.887	2.189	2.804	3.808	6.187	10.323	18.752
2320.00	2.729	3.049	3.408	4.029	4.928	7.397	10.914	17.616	30.115	2.066	2.410	3.056	4.124	6.698	11.156	20.290
2315.00	3.004	3.320	3.702	4.351	5.302	7.901	11.636	18.706	31.980	2.261	2.625	3.309	4.423	7.150	11.862	21.549
2310.00	3.291	3.611	4.008	4.669	5.653	8.364	12.282	19.694	33.628	2.458	2.838	3.549	4.703	7.535	12.406	22.597
2305.00	3.565	3.892	4.301	4.966	5.966	6.712	12.028	20.513	35.034	2.652	3.037	3.782	4.952	7.865	12.769	23.460
2300.00	3.811	4.150	4.573	5.247	6.248	9.130	13.280	21.166	36.108	2.824	3.212	3.903	5.175	6.133	13.172	24.127
2295.00	4.028	4.196	4.819	5.503	6.496	9.432	11.658	21.697	34.977	2.912	3.363	4.159	5.371	8.351	13.696	24.640
2290.00	4.224	4.610	5.043	5.128	6.707	9.690	13.969	22.115	31.645	3.093	3.485	4.307	5.530	8.528	13.940	25.019
2285.00	4.393	4.790	5.236	5.918	6.818	9.888	14.200	22.417	38.089	3.185	3.574	4.421	3.651	8.454	14.106	25.261
2280.00	4.511	4.931	5.386	6.071	7.002	10.032	14.158	22.599	38.316	3.242	3.830	4.497	5.737	8.733	14.191	25.360
2275.00	4.634	5.041	5.496	6.153	7.096	10.149	14.482	27.752	38.547	3.290	1.671	4.569	5.803	8.813	14.272	25.514
2270.00	4.701	5.123	5.583	6.246	7.169	10.238	14.497	24.095	38.180	3.332	1.710	4.622	5.850	8.893	14.359	25.662
2265.00	4.149	5.189	5.654	6.334	7.223	10.318	14.685	23.012	39.005	3.355	3.735	4.645	5.900	8.960	14.441	25.834
2260.00	4.604	5.255	5.727	6.403	7.270	10.393	14.773	21.162	39.204	3.395	3.712	4.704	5.950	9.027	14.526	25.933
2255.00	4.866	5.322	5.799	6.411	7.320	10.457	14.849	21.211	39.371	3.415	3.802	4.754	6.063	9.088	14.608	26.042
2250.00	4.918	5.386	5.863	6.525	7.167	10.522	14.913	23.356	39.486	3.429	3.824	4.798	6.037	9.128	14.666	26.134
2245.00	4.968	5.444	5.931	6.571	1.404	10.513	14.953	23.420	39.557	3.443	3.840	4.831	6.065	9.148	14.710	26.199
2240.00	5.008	5.491	5.978	6.615	7.431	10.612	14.979	23.466	39.604	1.451	3.949	4.851	6.084	9.131	14.742	26.250
2235.00	5.012	5.521	6.005	6.636	7.444	10.613	14.997	21.493	39.620	1.453	3.852	4.858	6.091	3.151	14.764	26.263
2230.00	5.039	5.528	6.011	6.641	7.441	10.618	15.005	23.501	39.625	3.453	3.852	4.858	6.092	9.151	14.775	26.299
2225.00	5.019	5.528	6.011	6.641	7.447	10.638	15.006	23.501	39.625	3.433	3.652	4.858	6.092	9.151	14.776	26.301
2220.00	5.039	5.528	6.011	6.641	7.447	10.618	15.006	23.501	39.625	3.453	3.852	4.858	6.092	9.151	14.176	26.301

SECTION 5

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DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY *(Corporate author)*

Applied Research Laboratories
Aeronutronic Division
Philco-Ford Corporation

2a. REPORT SECURITY CLASSIFICATION

Unclassified

2b. GROUP

3. REPORT TITLE

Absorption by CO_2 Between 1800 and 2850 cm^{-1} (3.5-5.6 Microns)

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Scientific Report

5. AUTHOR(S) *(Last name, first name, initial)*

Gryvnak, David A.	Burch, Darrell E.
Patty, Richard R.	Miller, Earl E.

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
15 December 1966	40	9

8a. CONTRACT OR GRANT NO.

NOnr 3560(00)

b. PROJECT NO.

ARPA Order No. 237

c. Amendment #23/1-3-66

d.

9a. ORIGINATOR'S REPORT NUMBER(S)

U-3857

9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)*

None

10. AVAILABILITY/LIMITATION NOTICES

11. SUPPLEMENTARY NOTES

12. SPONSORING MILITARY ACTIVITY

13. ABSTRACT

Transmission spectra in the 1800-2850 cm^{-1} region have been obtained for more than 100 samples of CO_2 and CO_2 mixed with N_2 and A. The spectral resolution was 2.5 cm^{-1}. Sample pressures varied from 0.0055 to 742 torr with absorber thicknesses covering the range from 0.081 to 84,400 atm cm. Spectra of several samples at the lower pressures show the effect of Doppler broadening. Measurements in the 2400-2560 cm^{-1} region provide information about the absorption by the extreme wings of collision-broadened lines. Replotted transmission spectra and extensive tables of integrated absorptance for 116 samples are included.

DD FORM 1 JAN 64 **1473**

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
CO_2						
Infrared						
Absorption						
Doppler Broadening						
Collision Broadening						

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