HIGH RESOLUTION FTIR SPECTROSCOPY of the ClO RADICAL

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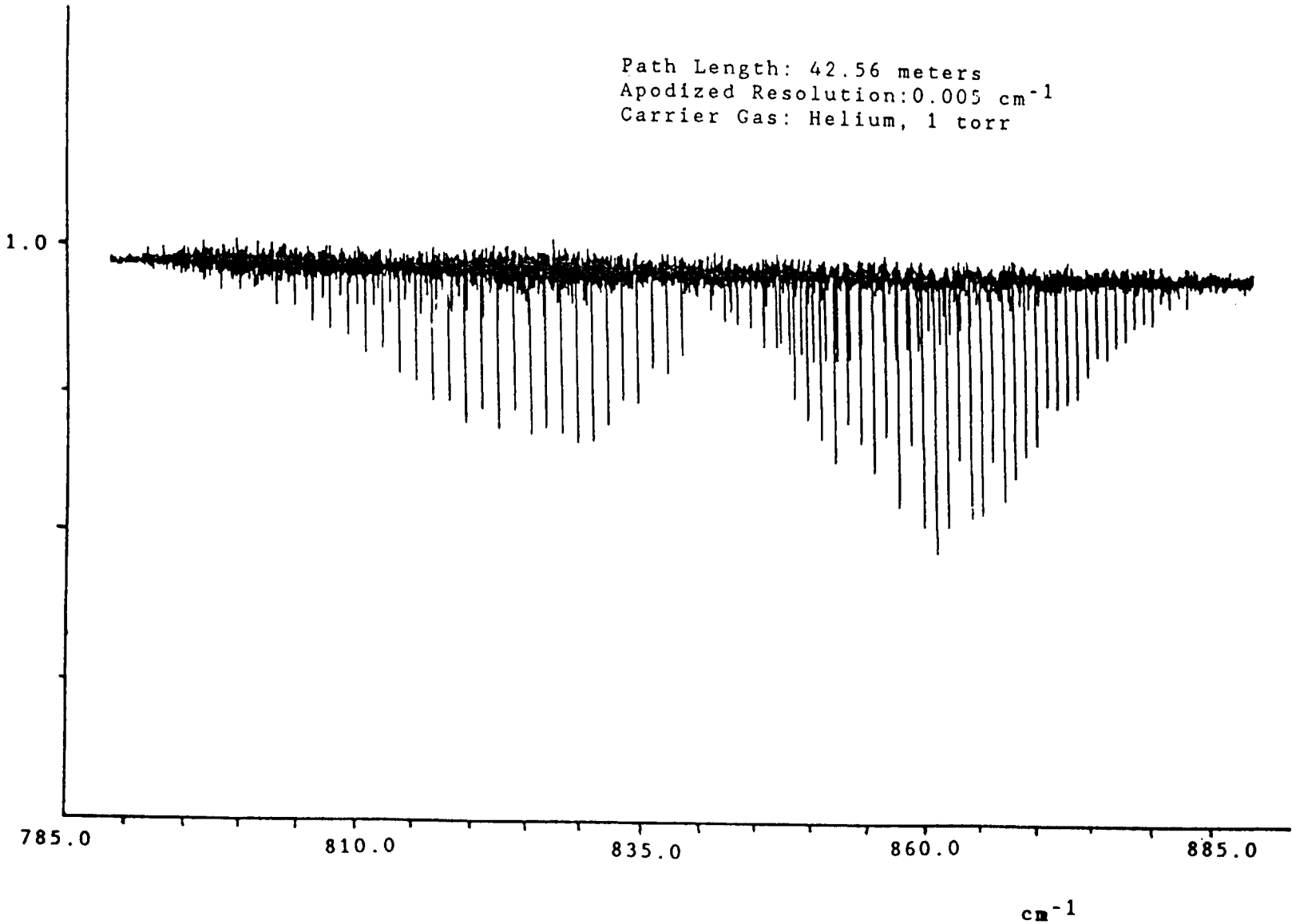
The chlorine monoxide radical, ClO, plays a significant role in the catalytic destruction of ozone in the Earth's stratosphere. Because of its atmospheric importance, ClO has been the subject of numerous observational attempts. In order to deduce ClO concentrations from stratospheric infrared measurements, the infrared spectroscopy of ClO must be well characterized.

FTIR spectra of the complete $X^2\Pi_{3/2}$ - $X^2\Pi_{3/2}$ and $X^2\Pi_{1/2}$- $X^2\Pi_{1/2}$ (1-0) fundamental vibrational-rotational bands of $^{35}Cl^{16}O$ and $^{37}Cl^{16}O$ have been obtained at 0.005 cm^{-1} apodized resolution. The short-lived radicals are produced in a discharge-flow chemical reactor which contains a White-type absorption cell. The typical infrared path length is 42 meters. During acquisition of the FTIR spectra, an optical multi-channel analyzer is used to monitor the ClO concentration by observing the $A^2\Pi_i$-$X^2\Pi_i$ electronic band in the uv region. Uv cross sections for ClO were obtained by titrating a known amount of OClO with excess Cl atoms and by titrating ClO with NO.

Approximately 830 individual lines were measured from ClO infrared spectra with the ClO concentration between 1 X 10^{13} and 6 X 10^{13} molecules/ cm^3. The lines were then averaged and fit to a function of m (where m = 0,-J or J+1 for the Q,P and R branches respectively) to obtain the band strength, S_v and the first Herman-Wallis coefficient, α. The total S_v for the two main isotopomers was 13.11 ± 1 cm^{-2} atm^{-1} while α was 0.00412 ± .00062.


FTIR SPECTRUM of the CLO RADICAL
Path Length: 42.56 meters
Apodized Resolution:0.005 cm-1
Carrier Gas: Helium, 1 torr
1.0
TRANSMITTANCE
785.0
810.0
835.0
860.0
885.0
cm-1

C.5