INFRARED SPECTROSCOPY OF PHOSGENE, A SPECIES OF INTEREST TO THE EARTH’S ATMOSPHERE

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Phosgene (Cl₂CO) is relatively more abundant in the stratosphere, but is also present in the troposphere in spite of a shorter lifetime (seventy days). Monitoring its concentration by remote sounding of the upper atmosphere is of importance, since the ν₅ band of phosgene occurring in the 11.8 μm atmospheric window, hinder the correct retrieval of Freon-11 concentration profiles [1].

Therefore, Doppler-limited resolution spectra of phosgene have been recorded at 169 K in the 11.75 and 5.47 μm spectral regions using a Fourier transform spectrometer on the AILES Beamline at SOLEIL, leading to the observation of the ν₅ and ν₁ vibrational bands. The corresponding upper state ro-vibrational levels were fitted using Watson-type Hamiltonians and resonance effects when necessary. Very accurate band centers, rotational, centrifugal distortion and coupling constants have thus been determined [2].

Phosgene presents four fundamentals in the far infrared region below 600 cm⁻¹, with the lowest (ν₃) near 285 cm⁻¹. These are responsible for hot bands, of great importance for the correct retrieval of Freon-11 atmospheric absorption profiles. The analysis of these far infrared bands allows the determination of spectroscopic parameters of the low-lying vibrational states [3].

As far as the quantitative spectroscopy is concerned, integrated band intensities and absorption cross-sections of phosgene have been measured at 199, 250 and 300 K to support remote sensing applications [4].