Microwave spectroscopy of CH_2Cl_2

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Dichloromethane (CH_2Cl_2) is a known organic solvent and atmospheric molecule. In recent studies, there are two astronomy-related reports of CH_2Cl_2. In 2008, it was reported that the Phoenix Mars lander collected three soil samples and confirmed the presence of CH_2Cl_2[1]. In 2010, Navarro-González *et al*. found CH_2Cl_2 in Martian soil which had been previously considered to be terrestrial contaminant.[2].

So far, studies have been conducted to obtain laboratory molecular data on CH_2Cl_2. For example, in 1952, Myers and Gwinn measured the microwave spectra of seven isotopic species of CH_2Cl_2 and determined the dipole moment-and the chlorine nuclear quadrupole coupling constants [3]. In 1981, Gerry measured microwave spectrum of CH_2Cl_2 up to J = 80 to get centrifugal distortion constants [4]. Later, Tullini measured far-infrared spectra in the region between 10 and 75 cm^{-1}, and assigned rotational transitions [5].

However, the current available data do not possess sufficient accuracy. Therefore, we performed measurement and analysis to provide sufficiently accurate rest frequencies. In this study, we used microwave spectroscopy to measure and analyze the spectrum of CH_2Cl_2 to improve the data. The frequency region from 50 to 750 GHz was measured with a measurement error of 50 kHz at the University of Toyama and at the University of Wisconsin-Madison. More than 7000 transition frequencies were assigned up to J = 99 and K = 5. As a result, the parameters that were determined in this study were the rotational constant and centrifugal distortion constants. We plan to extend the range of K values.

References

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