SUBMILLIMETER-WAVE SPECTROSCOPY OF THIOFORMALDEHYDE, H_2CS, IN ITS GROUND STATE

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Although several pure rotational studies of H_2CS (thioformaldehyde) have already been undertaken at microwave and millimeter-wave frequencies and even in the far-infrared region, new astronomical observations using submillimeter-wave telescopes require high-resolution laboratory measurements at sufficiently high frequencies and accuracies to confirm the astronomical identifications. Recently, some intersteller lines in the frequency range 487−549 GHz were detected with the Odin satellite towards the hot-core sources in Orion KL. Based on extrapolations from lower frequency data, these lines were assigned to H_2CS in its ground vibrational state. In order to judge the assignments, pure rotational transitions of H_2CS in the ground vibrational state have been measured covering to date a large fraction of the 120−670 GHz region by means of the Ohio State FASSST spectrometer and the phase-locked Cologne Terahertz Spectrometer. Previous microwave and far-infrared pure rotational transitions were then fitted together with the present data to Watson's S-reduced Hamiltonian with appropriate weighting. Transition frequencies were predicted based on the improved molecular parameters derived from the fit. Comparison between the new predictions and some astronomical observations of H_2CS will be discussed in this talk.

In addition to the normal species, the isotopic species $H_2C^{34}S$, $H_2C^{33}S$, and $H_2{}^{13}CS$ in their ground vibrational states have been measured with intensities comparable with natural abundance ratios and least-square analyzed together with previous data. Based on the molecular parameters obtained and on *ab initio* calculations performed, a mixed experimental / *ab initio* equilibrium molecular structure of H_2CS has been determined.