HIGH-RESOLUTION LASER SPECTROSCOPY OF THE $S_1 \leftarrow S_0$ TRANSITION OF ACETALDEHYDE

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Acetaldehyde is one of a prototype molecule to study large amplitude motion. In the ground state, the energy level structure were well understood by considering the methyl torsional motion (ν_{15} mode). [a] On the other hand, in the S_1 state, it is necessary to consider the aldehyde-hydrogen inversion mortion (ν_{14} mode) [b] [c] in addition to the methyl torsion. Rotationally-resolved spectrum of the $S_1 \leftarrow S_0$ transition were observed by using a pulsed amplified CW laser, and obtained effective rotational constants. [d] [e] In this work, rotationally-resolved high-resolution fluorescence excitation spectra of the $S_1 \leftarrow S_0$ transition of acetaldehyde have been observed. Sub-Doppler excitation spectra were measured by crossing a single-mode UV laser beam perpendicular to a collimated molecular beam. The typical linewidth of observed spectra was about 40 MHz. The absolute wavenumber was calibrated with accuracy 0.0002 cm^{-1} by measurement of the Doppler-free saturation spectrum of iodine molecule and fringe pattern of the stabilized etalon. The observed spectra around 30118 cm^{-1} and 30375 cm^{-1} correspond to $14_0^{0-}15_0^2$ and $14_0^{0+}15_0^4$ band, respectively. We are trying to analyze the rotational structure including the interaction with the large amplitude motions and then determine the parameters of the S_1 state.

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