On the Improvement of the Rotational Structure of the $^{13}CH_3D$ Ground Vibrational State

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The main goal of the present study was to improve the already published rotational structure analysis of the ground vibrational state of the $^{13}CH_3D$ molecule. To realize that, we recorded high-resolution spectra of a set of the strongly interacting vibrational bands, $2\nu_3(A_1)$, $2\nu_6(A_1)$, $2\nu_6(E)$, $\nu_2(A_1)$, $\nu_5+\nu_6(A_1)$, $\nu_5+\nu_6(A_2)$, and $\nu_3+\nu_6(E)$. From the analysis of the experimental data, more than 1900 ground state combination differences (GSCD) were determined with $J^{max}=18$, $\Delta J^{max}=2$ and $K^{max}=15$. The a_1/a_2 splittings of the states with quantum number $K=3$ were taken into account. The presence of numerous forbidden transitions allowed us to determine with high accuracy GSCD not only with $\Delta K=0$, but with $\Delta K=\pm1$, ±2 and ±3, as well. Spectroscopic parameters of the ground vibrational state were determined from the joint fit of the obtained GSCD (they are reproduced with $d_{rms}=0.00014$ cm^{-1}). The 21 highly accurate THz-region transitions which were also used as input data, are reproduced with $d_{rms}=47$ kHz.