FOURIER TRANSFORM MILLIMETER-WAVE SPECTROSCOPY OF THE DEUTERATED VINYL RADICAL IN THE GROUND ELECTRONIC STATE

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The 1_{01} - 0_{00} rotational transition of the C_2D_3 radical in the ground electronic state has been detected for the first time with the Fourier transform millimeter-wave (FTMW) spectrometer. The C_2D_3 radical is produced by discharging the C_2D_3Br gas diluted in Ar. Thirty-two fine and hyperfine components of the 1_{01} - 0_{00} transition are observed in the frequency region around 44.4 GHz. We determined the rotational constant, the spin-rotation interaction constant, and the hyperfine interaction constants accurately for the s and a states caused by the tunneling motion in the CCD_α rocking mode. From the nuclear quadrupole interaction constant χ_{aa} of the α deuteron determined in the present study, the angle between the C-D_α bond and the a-axis is estimated to be 148.5°. Furthermore, the lower limit of the energy difference between the s and a states is estimated to be 0.01 cm^{-1} on the basis of the hyperfine interaction, indicating that the tunneling motion is significant even for C_2D_3.