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

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The 1_{01}-0_{00} rotational transition of the ethyl radical has been detected for the first time with the Fourier transform millimeter-wave (FTMW) spectrometer. The ethyl radical is produced by discharging the C_2H_5I gas diluted in Ar. We have observed 28 paramagnetic lines in the frequency region from 43680 MHz to 43780 MHz. These lines were observed by using C_2H_5Br, $CH_3CH_2COCH_2CH_3$, and C_2H_6 instead of C_2H_5I, although the line intensities were weaker than the C_2H_5I case. From this evidence, we concluded that the spectral lines observed are those of C_2H_5. The lines show a very complicated pattern of the fine and hyperfine structures of the doublet radical with the nuclear spins of five protons. Therefore measurements of the Zeeman effect were useful to assign the fine and hyperfine components. As a result, the most lines were ascribed to the transitions in the $A_2^{''}$ level. The rotational constant, the spin-rotation constant, and hyperfine constants are determined by the least-squares fit.