SUBMILLIMETER-WAVE SPECTRUM OF THE FCO RADICAL

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The FCO radical is one of the key molecules in understanding photochemistry of fluorine containing hydrocarbons in the earth's atmosphere and the reactivity of fluorine containing plasmas. Fluorine containing plasmas are often utilized to clean CVD process chambers in semiconductor industries. Therefore the accurate microwave transition frequencies would be needed to monitor FCO in such processes or in the earth's atmosphere in future. High resolution infrared spectrum[a] and Fourier transform millimeter-wave spectrum[b] of FCO have been only the gas phase investigations so far. In these studies, a part of the hyperfine and spin-rotation constants have been obtained, and the submillimeter-wave spectrum of FCO has not been observed so far, presumably due to high reactivity and small dipole moment of this radical.

We observed the submillimeter-wave spectrum of FCO in the discharge plasma of F_2CO and Ar or He. It was essential to use the F_2CO sample to produce FCO abundantly. The a-type R-branch lines in the 355–467 GHz region with the K_a values from zero to five have been measured, using a BWO-based source modulation spectrometer. Some preliminary analyses were carried out, and 22 molecular constants including hyperfine terms and spin-rotation interaction terms were determined from the 73 measured frequencies.

[a] K. Nagai, C. Yamada, Y. Endo, and E. Hirota, *J. Mol. Spectrosc.* **90**, 249 (1981).

[b] H. Habara and S. Yamamoto, *J. Mol. Spectrosc.* **207**, 238 (2001)