THE ν_7 AND ν_9 BANDS OF TRANS FORMIC ACID STUDIED USING FOURIER TRANSFORM INFRARED SPECTRA AND SUBMILLIMETER WAVE MEASUREMENTS

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New high resolution Fourier transform absorption spectra of formic acid were recorded at Brussels in the 570- 800 cm^{-1} spectral range. Starting from the results of previous studies [a] a new and more extended analysis of the ν_7 and ν_9 bands of formic acid located at 626.166 and 640.725 cm^{-1} respectively has been performed. In this way, more than 11000 lines were assigned, leading to the identification of 7^1 and 9^1 energy levels up to J=61 and K_a=22. In addition the rotational spectrum of formic acid in the 7^1 and 9^1 excited vibrational states has been investigated in the millimeter and submillimeter spectral regions. The observed infrared energy levels and microwave transitions were satisfactorily reproduced using a theoretical model which takes into account the very strong A- and B-type Coriolis interactions linking the energy levels of the 7^1 and 9^1 vibrational states: more than 85 % of the infrared energy levels are reproduced to within 0.001 cm^{-1}, indicating clearly the quality of the model. Acknowledgments: We thank Drs. G. Winnewisser (Cologne) and B.P.Winnewisser (OSU, Columbus) for communication of unpublished millimeter wave measurements performed at Cologne during the recording of the pure rotation spectrum of formic acid and for providing us with improved ground state constants prior to publication.

[a] E.Willemot, J. Mol. Spectrosc. 120, 246 (1986), J.C.Deroche, J.Kauppinen, and E.Kyro, J. Mol. Spectrosc. 78, 379 (1979)