MILLIMETERWAVE SPECTRUM OF ETHYLENE

GEORGES WLODARCZAK, JEAN DEMAISON, LAURENT MARGULES, BILAL BAKRI, and FRANCOIS HERLEMONT , *Laboratoire de Physique des Lasers, Atomes et Molécules, UMR CNRS 8523, Université de Lille 1, F-59655 Villeneuve d'Ascq, France* ; ANDRE FAYT , *Molecular Spectroscopy Laboratory, Université Catholique de Louvain, Chemin du Cyclotron 2, B-1348 Louvain-La-Neuve, Belgium*.

The rotational spectra of deuterated isotopomers of ethylene, $H_2C{=}CH_2$, have already been measured [a]. The parent species in its ground vibrational state, as far as it is concerned, has no rotational spectrum because it has no permanent dipole moment. However, the vibrational states $v_7 = 1$ and $v_8 = 1$ are close in energy (at 948.77 and 939.86 cm^{-1}, respectively) and some allowed transitions between these two states lie in the millimeterwave range. The ν_7 state is known with an accuracy better than 10^{-6} cm^{-1} thanks to CO_2 laser sideband spectra [b]. The ν_8 state has been estimated with an accuracy of the order of 10^{-3} cm^{-1} by combining the $\nu_7 + \nu_8$ band with the hot band $\nu_7 \,!+\, \nu_8 - \nu_8$, both analysed in F.T. spectra (unpublished results). The spectrum has been measured from 180 to 500 GHz and more than 30 transitions have been assigned without ambiguity to ethylene, with a systematic deviation of about -27 MHz from the predictions. A new analysis of the ν_8 state has been performed, including the a-type Coriolis interaction with the ν_6 state, and a good agreement has been obtained.

[a] E. Hirota, Y. Endo, S. Saito, K. Yoshida, I. Yamaguchi, and K. Machida, J. Mol. Spectrosc. 89 (1981) 223.

[b] E. Rusinek, H. Fichoux, M. Khelkhal, F. Herlemont, J. Legrand, and A. Fayt, J. Mol. Spectrosc. 189, 64-73 (1998).