

Diode-laser spectroscopy : N₂-broadening coefficients for hot bands of CO₂ near 650 cm⁻¹

M. Dhyne^a, P. Kongolo^b, and M. Lepère^a.

^a, Laboratoire Lasers et Spectroscopies, PMR, University of Namur, 61 rue de Bruxelles, 5000 Namur, Belgium, Tel. +32 81 72 45 84, Fax. +32 81 72 45 45, muriel.lepere@unamur.be

^bDépartement de Physique, Université de Kinshasa, Kinshasa Mont-Amba XI, R.D. Congo

Carbon dioxide (CO₂) molecule is among the major component of some planetary atmospheres. It has an important role in the greenhouse effect and global Earth warming.

Accurate measurements of line parameters, like the N₂-broadening coefficient, in the telluric infrared windows are needed to interpret the remote sensing data or remote sensing applications.

Using a high resolution tunable diode-laser spectrometer [1] and for the first time, N₂-broadening coefficients are measured for lines in hot bands of CO₂ at room temperature. The lines are ranging from 650 to 680 cm⁻¹.

For each line, we have recorded spectra at 4 pressures of the perturber. The collisional half-widths of line at each pressure are obtained by fitting on the experimental profile, the Voigt [2] lineshape, but also the models developed by Rautian and Sobel'man [3] and by Galatry [4] which take into account a supplementary physical effect (molecular confinement : Dicke effect [5]). From these results, we have deduced the collisional broadening coefficient of each line which corresponds to the slope of the best straight line obtained from a linear regression.

Finally our collisional broadening coefficients are compared with those which have been previously published for other vibrational bands [6-9].

[1] L. Fissiaux, G. Blanquet, M. Lepère, *J. Quant. Spectrosc. Radiat. Transfer* **2012**, 113(11), 1233.

[2] B.-H. Armstrong, *J. Quant. Spectrosc. Radiat. Transfer* **1967**, 7, 61.

[3] S.G. Rautian, I.I. Sobel'man, *Sov. Phys. Usp. Engl. Trans.* **1967**, 9, 701.

[4] L. Galatry, *Phys. Rev.* **1960**, 122, 1218.

[5] R.H. Dicke, *Phys. Rev.* **1953**, 89, 472.

[6] V. Malathy Devi, D. Chris Benner, M.A.H. Smith, L.R. Brown, M. Dulick, *J. Quant. Spectrosc. Radiat. Transfer* **2003**, 76, 411.

[7] V. Malathy Devi, D. Chris Benner, M.A.H. Smith, C.P. Rinsland, *J. Quant. Spectrosc. Radiat. Transfer* **2003**, 76, 289.

[8] T. Hikida, K.M.T. Yamada, *J. Mol. Spectrosc.* **2006**, 239, 154.

[9] J.S. Li, K. Liu, W.J. Zhang, W.D. Chen, X.M. Gao, *J. Mol. Spectrosc.* **2008**, 252, 9.