TRANSITION DIPOLE MOMENT AND LINE STRENGTHS FOR THE ν_2 FUNDAMENTAL BAND OF THE METHYL RADICAL

G. D. STANCU AND J. RÖPCKE, *INP-Greifswald, 17489 Greifswald, Germany*; P. B. DAVIES, *Department of Chemistry, University of Cambridge, Cambridge, U.K.*.

The determination of methyl radical concentrations in terrestrial and astronomical sources using infrared spectroscopy relies on the availability of accurate line strengths and transition dipole moments. The ν_2 fundamental of CH_3 near 606 cm^{-1} is particularly useful for this purpose but the current value of its transition dipole moment is uncertain by at least 20 %. We have measured the line strength of 9 Q-branch lines of the 2_0^1 band of CH_3 from Q(1,1) to Q(12,12) using diode laser absorption spectroscopy. The method is based on following the recombination rate of methyl radicals in a pulsed discharge in tertiary butyl peroxide heavily diluted in argon[a]. The translational, rotational and vibrational temperatures of the radical were precisely determined from line widths and relative line intensities in both the ν_2 fundamental and hot bands. The new value of the transition dipole moment is 0.22±0.02 D which is compatible with most previous measurements and calculations, and with the transition dipole moment of the ν_3 band.

[a] C.Yamada and E. Hirota, J.Chem. Phys. 78, (2) 669 (1983).