SPECTROSCOPIC STUDY OF SELF- AND AIR-BROADENED METHANE IN THE 4100-4300 cm^{-1} REGION

ADRIANA PREDOI-CROSS[a], *Department of Physics and Astronomy, University of Lethbridge, Lethbridge, Canada*; V. MALATHY DEVI, *Department of Physics, College of William and Mary, Williamsburg, VA, USA*; KEEYOON SUNG, *Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA*; ANDREI V. NIKITIN, *Atmospheric Spectroscopy Div., Institute of Atmospheric Optics, Tomsk, Russia*; MARY ANN H. SMITH, *Science Directorate, NASA Langley Research Center, Hampton, VA, USA*.

The line parameters of self- and air-broadened methane in the $\nu_1 + \nu_4$ and $\nu_3 + \nu_4$ bands are determined using a nonlinear least-squares multispectrum fitting technique. We have analyzed a set of 14 laboratory spectra of pure methane and lean mixtures of methane in air which were recorded using a high-resolution Fourier Transform Spectrometer (FTS) at the Jet Propulsion Laboratory, California, employing a coolable sample cell with optical path length 20.38 cm. The line parameters determined in this analysis include line positions, intensities, self- and air-broadened line widths and pressure-induced shifts along with their temperature dependences, assuming a Speed-Dependent Voigt Profile (SDVP). The line mixing coefficients are quantified via the off-diagonal relaxation matrix element formalism. The broadening and shift parameters show good agreement with literature values and spectroscopic database entries. The observed line positions and intensities also agree fairly well with theoretically calculated results and values found in the spectroscopic databases. Spectroscopic parameters are also determined for some transitions of the $\nu_2 + 2\nu_4$, $2\nu_2 + \nu_4$ and $3\nu_4$ bands of methane in the spectral range 4100-4300 cm^{-1}.[b]

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[a]Current address: 512 Silkstone Crescent West, Lethbridge AB T1J4C1 Canada.

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