MEASUREMENTS AND MODELING OF SELF-BROADENING COEFFICIENTS FOR THE ν_2/ν_4 BANDS OF SiH_4

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Silane (SiH_4) is naturally present in the interstellar medium. It is also largely used in semi-conductor industry to perform silicon deposits and silicon nanostructures. Molecular cloud studies as well as industrial applications require an extensive and accurate modeling of its infrared absorption spectrum. However, although this molecule has received some attention many years ago[1,2,3,4,5,6,7], its high-resolution spectrum is still insufficiently characterized and need some modern reinvestigation. Silane in a natural isotopic composition produces complex infrared spectra, not least as three stable isotopologues exist in proper abundances with mass numbers of 28 (92.23%), 29 (4.68%), and 30 (3.09%). The present work is dedicated to measurements self-broadening coefficients for transitions of the ν_2/ν_4 bands, based on a set of spectra recorded with the Bruker IF125HR Fourier transform spectrometer located at the LISA facility in Créteil, using an absorption path length of 5 cm and pressures up to 16 hPa. The results were obtained by analyzing nine high-resolution room temperature absorption spectra with a multi-spectrum non-linear least squares fitting of Voigt profiles. 589 transitions have been studied to model the J-rotational quantum number dependence of the self-broadening coefficients. The accuracy of the retained self-broadening coefficients was estimated to be better than 10%.

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p-number: p129 **Submitted on Wed, 14 Jun 2023 12:33:00 +0200**