Line intensities and pressure broadening coefficients in the ν_1 band of N_2O molecule using IR spectroscopy : N_2, O_2 and Ar bath gas effect

Et. Es-sebbar[1,2], M. Deli[1], and A. Farooq[1]

[1] *Chemical Kinetics Laser Sensors Laboratory, Clean Combustion Research Center, Division of Physical Sciences and Engineering , King Abdullah University of Science and Technology (KAUST), Thuwal 23955- 6900, Saudi Arabia*

Presenting Author: Ettouhami.Essebbar@kaust.edu.sa

Nitrous oxide molecule (N_2O), considered a potent greenhouse gas, is an important trace atmospheric constituent with high abundance. In higher altitudes, N_2O plays a crucial role in the chemistry of troposphere and stratosphere involving ultraviolet solar photon absorption.Accurate knowledge of the spectroscopic parameters of N_2O including line intensities, foreign– broadening coefficients is needed for monitoring its abundance in Earth's atmosphere.The current study deals with precise measurements of absolute intensities and collisional broadening coefficients in the ν_1 band of N_2O molecule in the presence of N_2, O_2 and Ar as foreign gases. Moreover, collisional broadening coefficients of air may also be derived from the N_2– and O_2–broadening contributions by considering an ideal atmospheric composition. Studies are performed at room temperature for ten rotational transitions accessible to our laser system near 4.5 μm (i.e. 2186 – 2202 cm-1 spectral range) using infrared absorption spectroscopy. To retrieve the spectroscopic parameters for each individual transition, the measured absorption line shape was simulated using Voigt and Galatry profiles. The obtained results were compared with previous experimental data available in the literature. Our data agree well with existing values, the discrepancies being less than 5 % for most of the probed transitions. The spectroscopic data are very useful for the design of diagnostic sensor used to monitor the abundance of N_2O in the atmosphere.