Temperature and Quantum Number Dependence of Broadening Coefficients in the ν_3 Band of SO_2

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Systematic investigations concerning the dependence of the self-broadening coefficient $\gamma_{SO_2-SO_2}$ on the quantum number J'' and K_a'' are presented for 23 lines with $8 \leq J'' \leq 33$ and $1 \leq K_a'' \leq 16$ at room temperature applying a diode laser spectrometer. We found that $\gamma_{SO_2-SO_2}$ shows a typical decrease with increasing K_a'' whereas the J'' dependence is not typical as in the case of the ν_1 band. For the same lines collisions with air and hydrogen were studied. As in the case of self-broadening we found a similar behavior in the quantum number dependence. To complete our studies we measured the temperature dependence of the line broadening coefficients in the range between 250K and 360K with the perturbers air, helium, neon, argon, krypton, and xenon. For three lines with $J'' = 8$ and $K_a'' = 1$, 2, 3 the noble gas broadening was studied whereas seven lines with $8 \leq J'' \leq 30$ and $1 \leq K_a'' \leq 9$ were measured in the case of air broadening. The temperature coefficient n ranges between 0.56 and 0.89 for the noble gases and between 0.72 and 0.99 for air. For the noble gases one can suppose a weak decrease of n with rising atomic weight of the perturber although the experimental uncertainties are relatively large due to the restricted temperature range.

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