THE ν_5 AND $2\nu_9$ BANDS OF THE ^{15}N ISOTOPIC SPECIES OF NITRIC ACID ($H^{15}NO_3$): LINE POSITIONS AND INTENSITIES

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We present the first high resolution Fourier transform analysis of the 11 μm bands for $H^{15}NO_3$ which is the second most abundant isotopomer of nitric acid (a=0.00365). In this way the analysis of the ν_5 and $2\nu_9$ cold bands centered at 871.095 and 893.452 cm^{-1} was performed. As for $H^{14}NO_3$, these bands are significantly perturbed since rather strong resonances couple the 5^1 and 9^2 rotational levels. The theoretical model that we used to compute the line positions and line intensities is directly issued from the one which we used recently for $H^{14}NO_3$ [a]. Actually for the $H^{15}NO_3$ line positions, the Hamiltonian matrix accounts for the rather strong Fermi and the weaker Coriolis interactions linking the v=5^1 and v=9^2 rotational energy levels. Using this model which describes correctly the strong mixing of the 5^1 and 9^2 upper state energy levels, the ν_5 and $2\nu_9$ line intensities for $H^{15}NO_3$ were satisfactorily computed using the ν_5 and $2\nu_9$ transition moment operators achieved previously for the ^{14}N (main) isotopic species. In this way, the transfer of intensities from the ν_5 fundamental (and presumably strong) band to the $2\nu_9$ overtone (and presumably weak) band could be explained for $H^{15}NO_3$ as it was done previously for the ^{14}N (main) isotopic species.

[a] A.Perrin, J.Orphal, J.-M.Flaud, S.Klee, G.Mellau, H.Maeder, D.Walbrodt, and M.Winnewisser, (2004), J. Mol. Spectrosc. 228, 375-391