HIGH RESOLUTION INFRARED SPECTRUM OF ETHYLENE ($^{12}C_2H_4$) IN THE SPECTRAL REGION 1820 TO 2300 CM^{-1}

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While the fundamental bands of ethylene have been studied at high resolution, most of the combination bands have not been recorded. In this study, we have recorded the $^{12}C_2H_4$ bands in the 1820 to 2300 cm^{-1} region which consists of a myriad of weak combination bands. Over 10,000 lines were measured. The strongest of these bands are the A-type band, $\nu_7+\nu_8$, centered at 1889 cm^{-1}, the A-type band, $\nu_6+\nu_{10}$, at 2048 cm^{-1}, and the B-type band, $\nu_3+\nu_{10}$, at 2173 cm^{-1}. In addition, there are numerous lines from much weaker bands. All the bands observed are perturbed by Coriolis interactions, and, at this point, we are attempting to fit all the lines to within experimental error using an Hamiltonian matrix including eigth vibrational states among which four are dark states . The most striking resonance is that of the $\nu_7+\nu_8$ band whose energy levels are crossed by the very much weaker $\nu_4+\nu_8$ band where the intensities of the K=7 lines are enhanced due to mixing with the stronger band.