HIGH-RESOLUTION INFRARED AND CARS SPECTRA OF CYCLOPROPANE

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Cyclopropane is the simplest, yet most highly strained small-ring cyclic hydrocarbon. We have been engaged in a comprehensive investigation of the lower energy (< 1500 cm^{-1}) vibrational levels of cyclopropane using both infrared and coherent Raman (CARS) methods. Of the ten fundamental vibrational modes that lie in the region of interest, only four are accessible in the infrared as direct transitions from the ground vibrational state. Further complicating matters, all four of those modes are perturbed by some form of Coriolis, rotational or Fermi type of interaction. In order to fully account for these perturbations, and to elucidate the rovibrational parameters for many other dark and infrared-inactive vibrational states, difference band spectra were recorded and analyzed. CARS spectra were used to facilitate identification of the difference bands that accessed both the ν_2 and $2\nu_{14}(l{=}0)$ states. These states, in combination with the $2\nu_{14}(l{=}2)$ state, are involved in a complicated Fermi resonance triad with the ν_9 vibrational state. In addition, the ν_3 and ν_{13} vibrational states were found to couple to one another through a strong Coriolis coupling interaction.