

VIB-ROTATIONAL ANALYSIS ON $2\nu_1 + \nu_5$, $\nu_1 + \nu_2 + 3\nu_5$, and $2\nu_2 + 5\nu_5$ COMBINATION BANDS OF ACETYLENE USING A GaAs SEMICONDUCTOR LASER

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The vib-rotational spectrum of the $2\nu_1 + \nu_5^{l=1}$, $\nu_1 + \nu_2 + 3\nu_5^{l=1}$, and $2\nu_2 + 5\nu_5^{l=1}$ combination bands of acetylene was measured using a GaAs semiconductor laser (New Focus 6148) at the wavenumber region from 7400 to 7600 cm^{-1} and the P -, R - and Q -branches were assigned. The wavenumber measuring system with a wavelength meter (Anritsu MF9630A) and a confocal interferometer of 15 cm was calibrated against the H_2O lines.¹ The formulation describing the spectral line positions by a third order polynomial of $J(J+1)$ with the effective spectroscopic parameters of ν_0^{eff} , B_v^{eff} , D_v^{eff} , and H_v^{eff} was obtained using second order perturbation theory to take the l -type resonance effect into consideration. The spectroscopic constants and the l -type doubling constants were calculated from the effective rotational parameters determined using a least squares fitting procedure for the e - and f -levels by the aid of the molecular constants reported by ref. 2 and 3.

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