# 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 $\nu_0^{eff}$, $B_v^{eff}$, $D_v^{eff}$, 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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