COLOR-CENTER LASER SPECTROSCOPY OF THE ν_{12} BAND OF BENZENE OBSERVED WITH THE PULSED SUPERSONIC-JET EXPANSION

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The rotationally resolved high-resolution spectra will be essential to understand the intramolecular vibrational redistribution (IVR) of aromatic molecules especially in the highly excited CH-stretch vibrations. We developed a color-center laser spectrometer combined with a pulsed supersonic-jet expansion technique and applied it to observe the absorption spectrum of the $\nu_{12}(e_{1u})$ band of benzene at 3047.9 cm^{-1}. Although the Q-branch lines were still overapped, the P- and R-branch lines near the band origin, with J and K quantum numbers up to 15, were obseved well resolved, thanks to the rotational cooling in the jet. The rotational temperature in the jet was estimated to be 4-9 K from the observed line intensities. The rotational temperature showed strong J-dependence, whereas those for the various K-stack were almost identical indicating the freezing between K-stacks screcely occur in the present experimental condition. The molecular constants derived are consistent with the more accurate result by cotinuos molecular beam experiment with bolometer detection [a].

[a] J. L. Domenech, M-L. Junttila, and A. S. Pine J. Mol. Spectrosc. 149, 391 (1991)