DOPPLER-FREE POLARIZATION LABELING SPECTROSCOPY OF NAPHTHALENE MOLECULE

M. H. KABIR, S. KASAHARA, Y. TATAMITANI and H. KATO, *Molecular Photoscience Research Center, Kobe University, Kobe 657-8501, Japan*; W. DEMTROEDER, *Fachbereich Physik, Universität Kaiserslautern, D-67663 Kaiserslautern, Germany*; M. BABA, *Faculty of Integrated Human Studies, Kyoto University, Kyoto 606-8501, Japan*.

Fully resolved rotational structure of the $\bar{8}_0^1$ vibronic bands of the $A^1B_{1u} \leftarrow X^1A_g$ electronic transition of naphthalene have been investigated in the 32444-32458 cm^{-1} region with the techniques of Doppler-free laser polarization (DFLP) spectroscopy and optical-optical double resonance (OODR). For the first time Doppler-free polarisation labeling spectroscopy is successfully applied to a large polatomic molecule and it is demonstrated to be very efeective when combined with OODR. A typical linewidth of 12 MHz was observed, limited only by residual Doppler broadening. By exploiting Doppler-free optical-optical double resonance polarization (DFOOPL) spectroscopy, a combination of DFLP and OODR, both V-type and Λ-type transition were observed and thereby facilitates the unambiguous assignment of the observed lines. The wave numbers of these lines were recorded with an accuracy better than 0.0002 cm^{-1}. The assignments of the observed transitions, spectroscopic analysis and dynamics will be discussed.