THE FIRST APPLICATION OF DOPPLER-FREE LASER POLARIZATION AND OPTICAL-OPTICAL DOUBLE RESONANCE POLARIZATION LABELING SPECTROSCOPIES TO A LARGE MOLECULE

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For the first time Doppler-free laser polarization (DFLP) spectroscopy is successfully applied to a large polyatomic molecule. Rotationally resolved spectra of the 33_0^1 vibronic bands of the $\tilde{A}\ ^1B_{1u} \leftarrow \tilde{X}\ ^1A_g$ electronic transition of gas phase naphthalene at room temperature have been measured with the techniques of DFLP spectroscopy. The typical width of the observed spectral lines was 15 MHz, and the absolute wave numbers were measured with an accuracy of better than ± 0.0002 cm^{-1}. In order to assign the dense and complicated parts of the spectra, the technique of Doppler-free optical-optical double resonance polarization labeling (DFOOPL) spectroscopy was used. Both V-type and Λ-type transitions were observed, and these signals were found to be very useful for the unambiguous assignment of the complicated lines of DFLP spectrum. The rotational constants A, B, and C, the symmetric-top centrifugal distortion constants $Delta_J$, Δ_{JK}, and Δ_K and two asymmetric-top distortion constants δ_J and δ_K were determined by a least-squares fitting of over 4000 spectral lines in the range $J = 9 - 150$ and $K_a = 0 - 37$ with a standard deviation of 0.0002 cm^{-1}.