ULTRAHIGH-RESOLUTION SPECTROSCOPY OF NAPHTHALENE $S_1 \leftarrow S_0$ TRANSITION

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Several Doppler-free spectroscopic technique were applied to measure the rotational resolved high-resolution absorption and excitation spectra of the $S_1\ ^1B_{1u} \leftarrow S_0\ ^1A_g$ electronic transition. Sub-Doppler excitation spectra and the Zeeman effects of the 0-0 [a] and several vibronic bands up to the excess energy around 2410 cm^{-1} were measured by crossing a laser beam perpendicular to a collimated molecular beam, and the Doppler-free absorption spectra of the bands of excess energy 435 cm^{-1} [b] and 1423 cm^{-1} were also measured by Doppler-free laser polarization labeling spectroscopy at room temperature. The molecular constants of the observed several vibrational states of the $S_1\ ^1B_{1u}(v')$ and $S_0\ ^1A_g(v=0)$ state were determined. The local energy shifts were found in the bands higher than 1423 cm^{-1} band, and identified as originating from the Colliolis interaction with other vibrational levels. The Zeeman splittings were found for all observed bands. The J, K-dependences of the observed splittings were studied. As a result, the observed Zeeman effects could be explained to be originating from the magnetic moment of the $S_1\ ^1B_{1u}$ state induced by mixing with $S_2\ ^1B_{3u}$ state by J-L coupling. [c]

[a] D. L. Joo, R. Takahashi, J. O'Reilly, H. Katô, and M. Baba, *J. Mol. Spectrosc.*, **215**, 155 (2002).
[b] M. H. Kabir, S. Kasahara, W. Demtröder, Y. Tatamitani, A. Doi, H. Katô, and M. Baba, *J. Chem. Phys.*, **119**, 3691 (2003).
[c] M. Okubo, J. Wang, M. Baba, M. Misono, S. Kasahara, and H. Katô, *J. Chem. Phys.*, **122**, 144303 (2005).