HIGH PRECISION LIF MEASUREMENTS OF THE ROTATIONALLY RESOLVED UV SPECTRA OF 2-CHLORONAPHTHALENE

D. F. PLUSQUELLIC, *Optical Technology Division, National Institute of Standards and Technology, Gaithersburg, MD 20899*.

The rotationally resolved $S_1 \leftarrow S_0$ spectrum of 2-chloronaphthalene is obtained using a newly-constructed high-resolution UV-laser/molecular-beam spectrometer. The spectrum which spans approximately 4 cm^{-1}, consists of two distinct **a,b**-hybrid subspectra from the ^{35}Cl and ^{37}Cl isotopes and has more than 1000 well-resolved rotational lines. The observed linewidth of 8 MHz includes contributions from the lifetime of the S_1 state ($\sim$4 MHz), the Doppler width of the instrument ($\sim$3 MHz) and the unresolved hyperfine structure of Cl atom. Complete calibration of these spectra have made use of actively stabilized reference cavity[a] coupled with an AOM sideband tuning system[b] for direct feedback control of the dye laser fundamental. Scan linearity in the UV is evaluated based on comparison of theoretical and experimental frequencies throughout these spectra and is typically better than the digital accuracy (500 kHz) of the data. As determined from additional tests on 1-fluoronaphthalene ($\delta\nu < 4$ MHz)[c], the stabilization system also provides absolute frequency control of the UV to better than 250 kHz over a period of hours. This property will be particularly useful in upcoming double resonance experiments that make use of a second tunable microwave or infrared photon. These spectra and molecular constants are made available as reference standards for calibration of other UV laser spectrometers.

[a] E. Riedle, S.H. Ashworth, J.T. Farrell, Jr., and D.J. Nesbitt, *Rev. Sci. Instrum.*, **65**, 42 (1994)
[b] D.F. Plusquellic, O. Votava, D.J. Nesbitt, *Appl. Opt.*, **35**, 1464 (1996)
[c] W.A. Majewski, D.F. Plusquellic, D.W. Pratt, *J. Chem. Phys.*, **90**, 1362 (1989)