LASER INDUCED FLUORESCENCE SPECTROSCOPY OF JET-COOLED MgOH

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We have measured the laser induced fluorescence (LIF) spectrum of the $\tilde{A}^2\Pi - \tilde{X}^2\Sigma^+$ transition of MgOH under the supersonic free expansion condition. The radicals were generated in the Ar jets using the usual laser ablation technique. The observed spectrum consists of five vibronic bands. Rotationally resolved LIF excitation spectra of these five bands have been recorded. Three bands clearly show a $^2\Pi - ^2\Sigma$ rotational structure, typical of a linear molecule, and are assigned to the $\tilde{A}^2\Pi(0n^10) - \tilde{X}^2\Sigma^+(00^00)$, $n = 0$, 2, and 4, vibronic bands[a]. It is reported that the $\tilde{A}$ state is bent structure[b]. The observed rotational structure suggests a very low value of < 125 cm^{-1} for $\tilde{A}$ state barrier of the bending potential. The other two vibronic bands exist between the $(02^10) - (00^00)$ and $(04^10) - (00^00)$ bands, and precise analysis of these bands is now underway. No vibronic bands are observed in the energy region above the $(04^10) - (00^00)$ vibronic band: a manifestation of a predissociation for this energy region. Very recent theoretical results[c] predict the dissociation process from the $\tilde{A}$ state to Mg(^{1}S) + OH($^2\Pi$) to possess a barrier of about 1700 - 1800 cm^{-1} from the bottom of the $\tilde{A}$ state.

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[a] ν_1 : the Mg−OH stretching, ν_2 : the Mg−O−H bending, and ν_3 : the O−H stretching vibrational modes.
[b] Y. Ni, Ph. D. Thesis, University of California, Santa Barbara (1986).
[c] Giannoula Theodorakopoulos, Ioannis D. Petsalakis, and Ian P. Hamilton, J. Chem. Phys. 111, 10484 (1999).