VIBRONIC SPECTROSCOPY OF $MgCH_3$ $\tilde{A}\ ^2E \leftarrow \tilde{X}\ ^2A_1$ TRANSITION

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We report the laser excitation and dispersed fluorescence spectra of the $MgCH_3$ $\tilde{A}\ ^2E \leftarrow \tilde{X}\ ^2A_1$ transition. Improvements to the experiment have allowed the observation of important vibronic features not previously observed. The radical was produced in a free jet expansion from the simultaneous photolysis of $Hg(CH_3)_2$ and the laser vaporization of solid Mg. The use of $Hg(CH_3)_2$ as a precursor substancially improves production of the radical. A 0.1 cm^{-1}-resolution laser was used to obtain the partially rotationally resolved LIF spectra of the 6^1_0, and 2^1_0 transitions. Analysis of these spectra, along with the previously reported[a] 0^0_0 band yield structural parameters which provide information about the radical's $\tilde{A}\ ^2E$ state. Besides the usual rotational constants, we have obtained information about the Jahn-Teller effect, which is dynamic and relatively weak. We have also obtained the values of the Coriolis coupling and the spin-orbit coupling constants. The fluorescence lifetime was found to be 60(7) ns for the vibrationless level of the $\tilde{A}$ state and less than 15 ns for transitions involving vibrational excitation. The dispersed fluorescence spectra of the jet-cooled $MgCH_3$ was analyzed, and all observed $^2A_1$ state vibrational features were assigned.

[a] R. Rubino, J. Williamson, and T. A. Miller, J. Chem. Phys. 103(14 (1995).