LASER-INDUCED FLUORESCENCE STUDIES OF THE JET-COOLED ALUMINUM ACETYLIDE RADICAL (AlCCH/AlCCD)

MOHAMMED A. GHARAIBEH, DENNIS J. CLOUTHIER, *Department of Chemistry, University of Kentucky, Lexington, KY 40506-0055*.

Laser-induced fluorescence and single vibronic level (SVL) emission spectra of the $\tilde{A}^1\Pi$ - $\tilde{X}^1\Sigma$ system of aluminum acetylide (AlCCH) and its deuterated isotopologue (AlCCD) have been investigated in the region of 350-317 nm. The radicals were produced in a pulsed electric discharge jet using a precursor mixture of trimethyl aluminum or deuterated trimethyl aluminum in high pressure argon. High resolution spectra of the 0_0^0 and 3_0^1 bands of AlCCH have been recorded and the rotational constants determined for both electronic states. SVL emission spectra from several excited state levels were also recorded and the ground state energy levels have been assigned and fitted. The excited state is complicated by a double Renner-Teller effect involving the ν_4 (CCH) and ν_5 (AlCC) bending modes. Our $ab\ initio$ calculations predict $\mid \epsilon_4 \mid$ = 0.833 and $\mid \epsilon_5 \mid$ = 0.432 indicating substantial splittings of the bending levels. Progress in assigning the complex vibronic structure in the LIF spectra and fitting it using a Renner-Teller model including both bending modes and the AlC stretching mode will be discussed.