Optical Stark Spectroscopy of $CaCH_3$

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An intense pulsed supersonic molecular beam sample of $CaCH_3$ was produced using a laser ablation/reaction source. The high resolution (50 MHz FWHM) laser induced fluorescence spectrum of the (K'= 1 - K''= 0) $\tilde{A}^2$E-$\tilde{X}^2$A$_1$ band system (origin = 14743 cm^{-1}) was recorded and fitted to produce an improved set of spectroscopic parameters. The resultant parameters were in agreement with those obtained in a previous Doppler limited study[a]. A number of the transitions involving the lowest J levels were also recorded in the presence of variable static electric field. The Stark shifts and splittings were fitted to obtain dipole moments of 2.62(3) D and 1.69(1) D for the $\tilde{X}^2$A$_1$ and $\tilde{A}^2$E states, respectively. The dipole moments were predicted using an electrostatic polarizability model[b,c] that had successfully predicted the dipole moments of CaCCH [d]. The predicted values, 1.78 D $\tilde{X}^2$A$_1$ and 1.20 D $\tilde{A}^2$E, are in reasonable agreement with experiment.

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