HIGH RESOLUTION LASER EXCITATION SPECTROSCOPY OF $SrCH_3$, $CaBH_4$ AND $SrBH_4$

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High resolution laser excitation spectroscopy has been used to record the $\widetilde{A}\ ^2\mathrm{E} - \widetilde{X}\ ^2\mathrm{A}_1$ electronic transition of $SrCH_3$ in a laser ablation/molecular jet source. $SrCH_3$ was synthesized by the reaction of UV-ablated strontium atoms with a 1% mixture of tetramethyl tin in argon. Transitions arising from the K′=1 ← K″=0, K′=0 ← K″=1 and K′=2 ← K″=1 sub-bands have been observed and assigned. Rotational and fine structure parameters have been determined for the $\widetilde{A}\ ^2\mathrm{E}$ state. An analysis of the spin-orbit and spin-rotation constants indicates that the $\widetilde{A}\ ^2\mathrm{E}$ state does not arise entirely from an atomic orbital of *p* character. In addition, the Jahn-Teller coupling was found to be negligible in the zero-point vibrational level of the $\widetilde{A}\ ^2\mathrm{E}$ state. The rotational constants were used to estimate a structure for $SrCH_3$ in the $\widetilde{A}\ ^2\mathrm{E}$ state. The geometry changes observed between the $\widetilde{X}\ ^2\mathrm{A}_1$ and $\widetilde{A}\ ^2\mathrm{E}$ states of $SrCH_3$ are similar to those observed for $CaCH_3$. In addition, the $\widetilde{B}\ ^2\mathrm{E} - \widetilde{X}\ ^2\mathrm{A}_1$ transitions of $CaBH_4$ and $SrBH_4$ have been observed. The metal borohydrides were synthesized in a jet source by reaction of UV-ablated metal atoms with a 5% mixture of diborane in argon. A rotational analysis is currently in progress and a comparison of the spectroscopic and structural parameters for both molecules will be presented.