THE OPTICAL SPECTRUM OF SrOH RE-VISITED: ZEEMAN EFFECT, HIGH-RESOLUTION SPECTROSCOPY AND FRANCK-CONDON FACTORS.

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Motivated by a diverse range of applications in physics and chemistry, currently there is great interest in the cooling of molecules to very low temperatures ($\leq$1 mK). Direct laser cooling has been previously demonstrated for the diatomic radicals SrF[b,c], YO[d,e], and CaF[f], and most recently a three-dimensional magneto-optical trap (MOT) of SrF molecules was achieved[g,h]. To determine the possibility of laser cooling for polyatomic molecules containing three or more atoms, detailed information is required about their Franck-Condon factors (FCFs) for emission from the excited states of interest. Here we report on the high-resolution laser excitation spectra, recorded field-free and in the presence of a static magnetic field, and on the dispersed fluorescence (DF) spectra for the $A^2\Pi_{1/2} \leftarrow X^2\Sigma^+$ and $B^2\Sigma^+ \leftarrow X^2\Sigma^+$ electronic transitions of SrOH. The DF spectra were analyzed to precisely determine FCFs and compared with values predicted using a normal coordinate GF matrix approach. The recorded Zeeman spectra were analyzed to determine the magnetic moments. Implication for proposed laser cooling and trapping experiments for SrOH will be presented.

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