SPECTROSCOPIC CHARACTERIZATION OF ThF AND THE LOW-LYING STATES OF ThF⁺

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Theoretical calculations predict that internal electric fields as high as 90 GV/cm can be attained by polarizing the \( ^3\Delta_1 \) state of ThF⁺. Consequently, this ion is of interest for investigation of the dipole moment of the electron. However, spectroscopic data have not been reported previously for ThF or ThF⁺. We have used laser induced fluorescence and resonantly enhanced two-photon ionization to examine ThF. Multiple electronic transitions were observed in the 19530-21300 cm⁻¹ range. Rotationally resolved data have been obtained, and the ground state is shown to be \( X^2\Delta_{3/2} \). Pulsed field ionization - zero electron kinetic energy spectra have been recorded for the ThF⁺ cation. Vibronic progressions of the \( X^1\Sigma^+ \) and excited \( ^3\Delta \) states have been identified. The term energy for the \( ^3\Delta_1 \) state was found to be \( T_0=330 \text{ cm}^{-1} \). Details of the experiments and spectroscopic constants for ThF and ThF⁺ will be reported.