SPECTROSCOPIC CHARATERIZATION 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^+[a] 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 cm^{-1}. Details of the experiments and spectroscopic constants for ThF and ThF^+ will be reported.

[a]E. R. Meyer and J. L. Bohn, Phys. Rev. A At., Mol., Opt. Phys. 78, 010502/1 (2008). *"Prospects for an electron electric-dipole moment search in metastable ThO and ThF+"*