

HIGH RESOLUTION SPECTROSCOPY OF THE $[18.2]1.5 - X^2\Delta_{3/2}$ TRANSITION OF THORIUM MONOCHLORIDE, ThCl^a.

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A systematic experimental and theoretical studies of simple Ac and Ln containing molecules is one avenue for garnering insight into element-specific ligation^b. Here we report on the high resolution (~ 30 MHz) laser induced fluorescence (LIF) spectra of supersonic cooled molecular beam of ThCl produces in the reaction of laser ablated Th with an Ar/CCl₄ mixture. The present work builds on the recent LIF, dispersed fluorescence, and REMPI study of the Heaven and Peterson groups^c. Analysis of a band near 550 nm has been assigned as the $[18.2]1.5-X^2\Pi_{3/2}$ transition. Observed doubling the lines has shown to be caused Ω -doubling in the upper state. No ³⁵Cl(I=3/2) hyperfine splitting was observed. Progress on recording the electric dipole moments and magnetic g-factors will be reported. Interpretation of the spectrum is based, in part, upon previously published electronic structure prediction and a simple molecular orbital correlation diagram.

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^bHeaven, M. C.; Barker, B. J.; Antonov, I. O., Spectroscopy and Structure of the Simplest Actinide Bonds. *J. Phys. Chem. A* 2014, 118 (46), 10867-10881.

^cVan Gundy, R. A.; Bartlett, J. H.; Heaven, M. C.; Battey, S. R.; Peterson, K. A., Spectroscopic and theoretical studies of ThCl and ThCl⁺. *J. Chem. Phys.* 2017, 146 (5), 054307/1-054307/8.