THE MILLIMETER/SUBMILLIMETER SPECTRUM OF TiF^+ ($X^3\Phi_r$)

D. T. HALFEN and L. M. ZIURYS, *Department of Chemistry, Department of Astronomy, and Steward Observatory, University of Arizona, Tucson, AZ, 85721.*

The pure rotational spectrum of the molecular ion TiF^+ ($X^3\Phi_r$) has been measured using a combination of millimeter-wave direct absorption methods and velocity modulation techniques. TiF^+ was created in an AC glow discharge using a mixture of gas-phase $TiCl_4$, 10% F_2 in helium, and argon. In contrast to $TiCl^+$, the spectra of TiF^+ were weaker, a probable result of the synthesis method. Ten rotational transitions were measured in the frequency range of 327 to 542 GHz. All three spin-orbit components were observed, which were additionally split into doublets due to fluorine hyperfine interactions. The fine structure exhibited a regular case (a) pattern with minimal second-order spin-orbit effects. These data were fit with a case (a) Hamiltonian and rotational, fine structure, and hyperfine constants were determined. The calculated bond length of TiF^+ was found to be shorter than that of TiF, which is thought to be due to an increase in the effective nuclear charge of titanium.