

## LASER AND FOURIER TRANSFORM EMISSION SPECTROSCOPY OF THE $G^4\Phi - X^4\Phi$ SYSTEM OF TITANIUM MONOFLUORIDE.

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The emission spectrum of the  $G^4\Phi - X^4\Phi$  transition of TiF has been observed in the 13500 - 16000  $\text{cm}^{-1}$  region using a Fourier transform spectrometer (FTS), as well as by laser excitation spectroscopy. In the FTS experiments, the bands were excited in a carbon tube furnace by the reaction of titanium metal vapor with  $\text{CF}_4$  at a temperature of about 2300 °C. In the laser experiments, the TiF molecules were produced by laser vaporization of a Ti rod followed by reaction with  $\text{SF}_6$  using a pulsed supersonic jet source. Three groups of bands with high wavenumber sub-band heads at 14388  $\text{cm}^{-1}$ , 15033  $\text{cm}^{-1}$ , and 15576  $\text{cm}^{-1}$  have been assigned as 0-1, 0-0, and 1-0 vibrational bands of the  $G^4\Phi - X^4\Phi$  transition, respectively. Each vibrational band consists of four sub-bands assigned as  $^4\Phi_{3/2} - ^4\Phi_{3/2}$ ,  $^4\Phi_{5/2} - ^4\Phi_{5/2}$ ,  $^4\Phi_{7/2} - ^4\Phi_{7/2}$ , and  $^4\Phi_{9/2} - ^4\Phi_{9/2}$ . A rotational analysis has been performed and molecular constants for the ground and excited states have been extracted using the combined FTS and laser excitation measurements. The assignment of a  $^4\Phi$  state as the lower state is consistent with recent theoretical predictions and with expectations based on the spectrum of TiH. The similarity between the electronic states of TiF, TiH, and  $\text{Ti}^+$  will be discussed.