DISPERSED LASER INDUCED FLUORESCENCE OF METALLIC MOLECULAR IONS. IDENTIFICATION OF NEW LOW-LYING ELECTRONIC STATES OF $TiCl^+$ AND TiF^+

C. FOCSA[1] and B. PINCHEMEL, *Laboratoire de Physique des Lasers, Atomes et Molécules, UMR CNRS 8523, Centre d'Etudes et de Recherches Lasers et Applications, Université des Sciences et Technologies de Lille, 59655 Villeneuve d'Ascq, France*

[1] *Present address: Department of Chemistry, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1.*

The dispersed laser-induced fluorescence technique has been applied for the first time to metallic molecular ions. The $TiCl^+$ and TiF^+ ions were produced by a high-voltage discharge in helium with traces of $TiCl_4$ or TiF_4, respectively. A c.w. dye-laser and a grating spectrometer were used to record low-resolution spectra of these species in the visible region. This led to the the observation of new low-lying electronic states of these ions: the $C^3\Pi$ ($\sim$1535 cm^{-1}) state of $TiCl^+$, the $B^3\Delta$ ($\sim$2040 cm^{-1}) and $C^3\Pi$ ($\sim$2200 cm^{-1}) states of TiF^+. The identification of these new states contributes to a better characterization of the first 3000 cm^{-1} of the energy level diagram of these molecules. The experimental position of the $C^3\Pi$ state of $TiCl^+$ is in good agreement with theoretical predictions given by a Ligand Field Theory model.[a] We have extended these calculations to the TiF^+ isovalent ion, taking advantage of the new experimental data. Both experimental and theoretical new results presented here are expected to help future high-resolution investigations on these species.

[a] C. Focsa, M. Bencheikh, and L. G. M. Pettersson, *J. Phys. B: At. Mol. Opt. Phys.* **31**, 2857-2869 (1998).