

SELECTIVE AND TIME-RESOLVED FOURIER TRANSFORM ION SPECTRA.

NATHALIE PICQUÉ, and GUY GUELACHVILI, *Laboratoire de Photophysique Moléculaire*⁽¹⁾, *Unité Propre du CNRS, Université de Paris-Sud, Bâtiment 350, 91405 Orsay-Cedex, France.* (email: *nathalie.picque@ppm.u-psud.fr* *guy.guelachvili@ppm.u-psud.fr*)

(1) Associé à l'Université de Paris-Sud.

This paper illustrates some aspects of the work begun at LPPM in the field of Fourier Transform Ion Spectroscopy. Double-modulation and time-resolved emission FT spectra of molecular ions, created in glow discharges, are presented. The processing of first derivative-type selective lineshapes^a is discussed. Results aiming at characterizing the transport properties and the abundance of ions in plasmas are reported.

As an illustration, the quantum dependence of the average mobility of ArH⁺ in an Ar/He mixture in an inhomogeneous electric field has been investigated from Doppler-shifts measurements^b. This first demonstration extends to wide-band spectroscopy the measurements pioneered by Haese, Pan, and Oka^c with diode-lasers, in similar source conditions. Spectroscopic means can now provide high quality state-resolved plasma characterization, as proven with lasers, in homogeneous electric fields, for instance in Leone's group^d.

The determination of the rovibrational intensities of the $\Delta v=1$ sequence of ArH⁺ has been undertaken. First attempts to observe ionic species in C, N, H containing electrical discharges are also reported.

^aJ.W. Farley, Theory of the resonance line shape in velocity-modulation spectroscopy, *J. Chem. Phys.* **95**, 5590-5602, 1991

N. Picqué, G. Guelachvili, High resolution multi-modulation Fourier transform spectroscopy, *Applied Optics* **38**, 1999 (in press).

^bN. Picqué, Spectroscopic investigation of the state-to-state dependence of ArH⁺ ion mobility in a Ar/He plasma, *Chemical Physics Letters*, 1999 (submitted).

^cN.N. Haese, F-S. Pan, and T. Oka, "Doppler shift and ion mobility measurements of ArH⁺ in a He dc glow discharge by infrared laser spectroscopy", *Physical Review Letters* **50**, 1575-1578, 1983.

^dC.P. Lauenstein, M.J. Bastian, V.M. Bierbaum, S.M. Penn, and S.R. Leone, "Laser-induced fluorescence measurements of rotationally resolved velocity distributions for CO⁺ drifted in He", *Journal of Chemical Physics* **94** 7810-7818, 1991.

E.B. Anthony, "Laser probing of transport properties and rotational alignment of N₂⁺ drifted in He", Ph.D. Thesis, The University of Colorado, 1998.