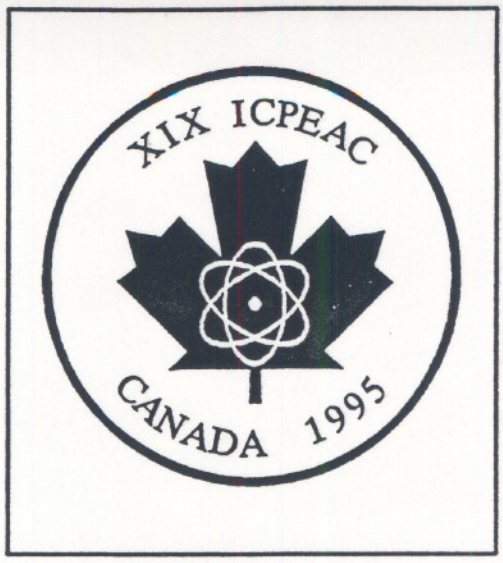

NINETEENTH INTERNATIONAL CONFERENCE ON THE PHYSICS OF ELECTRONIC AND ATOMIC COLLISIONS

SCIENTIFIC PROGRAM AND ABSTRACTS OF CONTRIBUTED PAPERS

WHISTLER, BRITISH COLUMBIA
CANADA

26 JULY - 1 AUGUST 1995

EDITED BY

J.B.A. MITCHELL, J.W. McCONKEY, C.E. BRION

KINETIC ENERGY DISTRIBUTION OF IONS PRODUCED FROM TOWNSEND DISCHARGES IN NEON AND ARGON

M. V. V. S. Rao, S. B. Radovanov*, R. J. Van Brunt, and J. K. Olthoff
National Institute of Standards and Technology
Gaithersburg, MD 20899, USA

Study of the kinetic energy distribution (KED) of various ions produced in the breakdown of a gas under the influence of a uniform dc electric field at various electric field to gas density (E/N) ratios provides important information on the relative role of elastic and inelastic collision processes which occur in transporting ions within the discharge sheath region. In this paper we present our results on the measurements of KEDs of Ne^+ in Ne and Ar^+ in Ar in a low current diffuse Townsend discharges. As shown in the Fig.1 the discharges are generated between two plane and circular parallel plates. The discharge cell is coupled to a cylindrical mirror analyzer (CMA) in conjunction with a quadrupole mass spectrometer (QMS). The ions sampled through a 0.1 mm orifice at the center of the discharge are energy analyzed by the CMA and subsequently separated according to their mass to charge ratio (m/z) by the QMS. More details on the apparatus and data acquisition system have been discussed elsewhere[1].

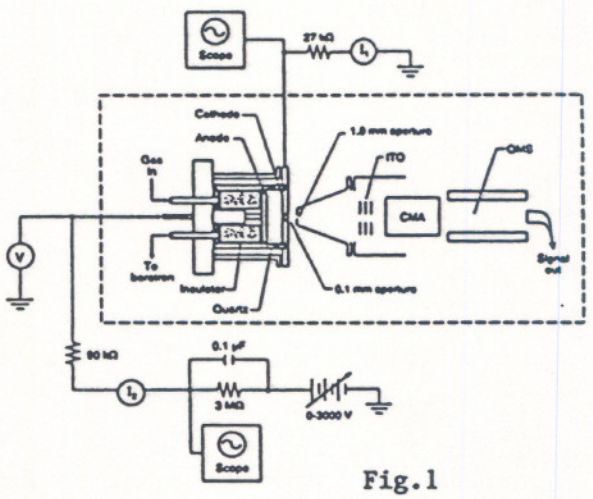

Fig.1

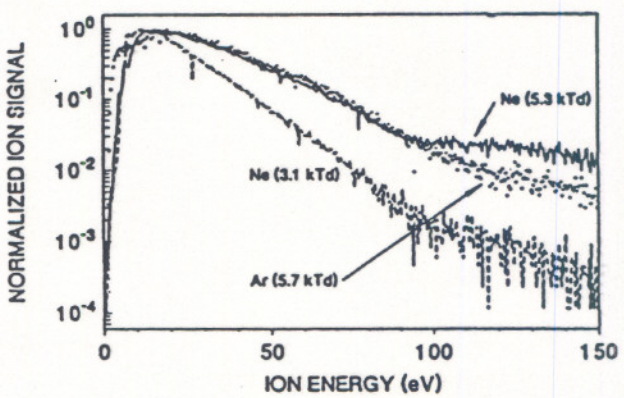

Fig.2

A typical measured KED spectra for Ne^+ in Ne and Ar^+ in Ar are shown in Fig.2 at different E/N values. A close look at the higher energy tails of the curves for Ne^+ indicates a distribution of ions with increasing non-Maxwellian behaviour as the E/N increases from 3.1 to 5.3 kTd (1 kTd = $1\text{x}10^{-18}$ Vm^2). The mean ion energies determined from the measured KEDs of Ne^+ in Ne and Ar^+ in Ar are compared with mean ion energies predicted from solutions of the Boltzmann transport equation based on the assumption that symmetric resonant charge transfer is the dominant ion-neutral interaction[1]. Details about the results will be discussed in the conference.

References

* Present address: University of New Mexico, Department of Chemical and Nuclear Engineering, Albuquerque, NM 87131, USA

1. S.B. Radovanov, R.J. Van Brunt, and J.K. Olthoff, Phys. Rev. E, 1995 (in press)