THE O$^+$ AND N$^+$ FORMATION BY LOW-ENERGY ELECTRON IMPACT ON NITROUS OXIDE

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In an earlier paper we extensively discussed the NO$^+$ and N$_2^+$ production by dissociative electroionization of N$_2$O[1] . We recently completed the dissociative electroionization study of this system by examining the appearance of O$^+$ and N$^+$.

The experimental set-up used in this experiment has been described earlier[2] . Kinetic energy (K.E.) distributions and onset energies (A.P.) are measured for the two mass selected ions. K.E. - versus - A.P. diagrams are obtained and shown in fig. 1 and fig. 2 for O$^+$ and N$^+$ respectively.

For the O$^+$ ions, thresholds are measured at 15.27 eV, 15.83 eV and 19.6 eV. Autoionization maxima are observed at 17.5 eV and around 23.4 eV. From the diagram in fig. 1, two salient features are observed below 21 eV :

(i) two dissociation limits are concerned, i.e.

$$N_2O + e^- \rightarrow O^+(^4S) + N_2(X^1\Sigma_g^+, v = 0)$$
$$\rightarrow O^+(^2D) + N_2(X^1\Sigma_g^+, v = 0)$$
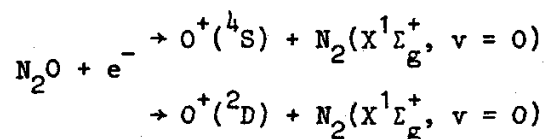
calculated at 15.29 eV and 18.61 eV. Mostly the N$_2$(X$^1\Sigma_g^+$) appears vibrationally excited.

(ii) the main O$^+$ producing mechanism is the predissociation of the successive ionized states of N$_2$O by the repulsive N$_2$O$^+$ ($^4\Sigma^-$) and ($^2\Pi$) states. Behind 21 eV, doubly excited states of N$_2$O are shown to dissociate by the same mechanism.

For the N$^+$ ions, onset energies are measured at 20.26 eV, 21.36 eV, 27.4 eV, 31.9 eV and 38.9 eV. The N$^+$ ions production mainly occurs in the energy range of doubly excited states of N$_2$O known by He(II) photo-electron[3] and dipole (e, 2e) spectroscopy[4]. Only the onset at 20.36 eV is ascribed to the predissociation of the N$_2$O$^+(\tilde{C}^2\Sigma^+)$ state producing N$^+(^3P)$ + NO(X$^2\Pi$, v = 4). At higher energies the NO(X$^2\Pi$) fragment is vibrationally excited upto v = 8.

A second dissociation limit is populated, i.e., N$^+$ (^{1}D) + NO(X$^2\Pi$, v = O), calculated at 21.36 eV, through the predissociation of two doubly states of N$_2$O$^+$.

These mechanisms will be discussed in detail at the meeting and a comparison will be made with previous experiments[5] .

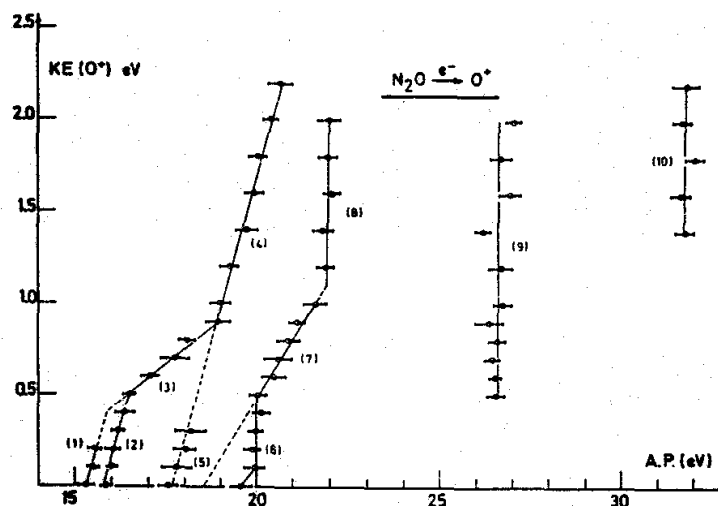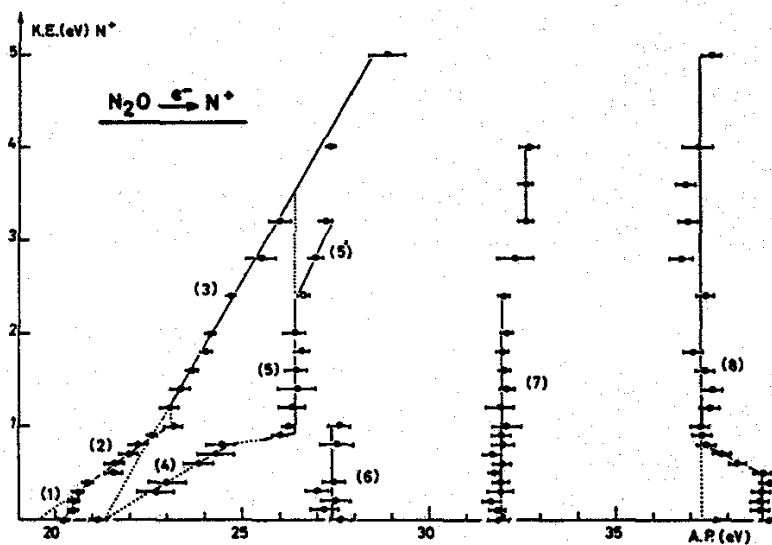***Fig. 1*** *: K.E. - versus - A.P. diagram for O /N$_2$O.*

Fig. 2 : *K.E. - versus - A.P. diagram for N /N$_2$O.*

Acknowledgements

References

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