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DISSOCIATIVE IONIZATION OF N_2 BY ELECTRON IMPACT

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In the recent years much attention has been paid to the N_2^+ molecular ion. In most experiments, one has studied the radiative transitions in N_2^+ or the translational spectroscopy of N^+ fragments of N_2^+ spontaneously dissociated or collision induced. Nevertheless there still remain questions regarding the concerned electronic states of N_2^+. In order to extend the available information, we have studied the kinetic energy distributions of the N^+ fragments from the dissociative ionization of N_2 by electron impact.

In an ion-source, N_2 is excited by an electron beam of energies ranging from 0 eV to 80 ev:

$$N_2 + e^- \longrightarrow N_2^{+(*)} + 2\,e^- \longrightarrow N^+ + N^{(**)} + 2\,e^- \qquad (1)$$

less probable

$$N_2 + e^- \longrightarrow N_2^{2+(*)} + 3\,e^- \longrightarrow N^{+(*)} + N^+ + 3\,e^- \qquad (2)$$

The kinetic energy of the charged fragments,analyzed with a quadrupole mass spectrometer, can be studied at 90 degrees with respect to the electron beam by means of a retarding grid. Using a retarding lens with a reasonable energy resolution (the FWHM of the N_2^+ peak is 80 mV)new information could be obtained.

Fig.l shows an example of the measured kinetic energy distributions. The kinetic energy values corresponding to the observed maxima are given in Table I. For each maximum the appearance potentials have been measured.

Fig.l : *Kinetic energy distribution of the N^+ fragments at an acceleration voltage of 1.4 v.*

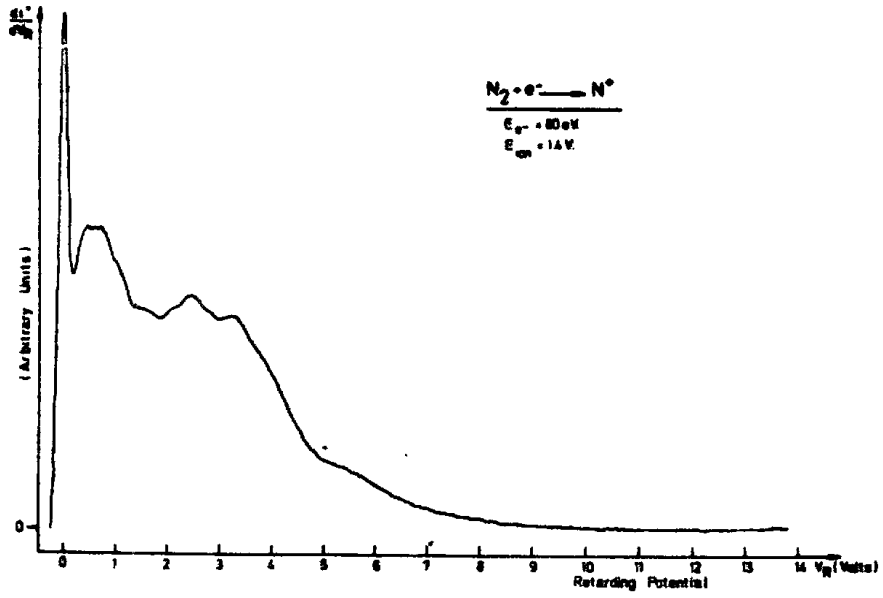

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Table I *Kinetic energies corresponding to the maxima in the energy distribution of N^+ from N_2 at an electron energy of 60 eV.*

Band or peak maxima (eV)			
0.75 (0.27 - l.0l)	2.29	3.32	5.55
1.15 (1.12 - 1.49)	2.57	3.67	8.28
1.92 (1.65 - 2.02)	2.75	4.03	

in brackets: substructure.

The analysis of the retarding curves suggests the existence of vibrational structures which could not yet be completely resolved. From these results it is likely that the maxima(0.27-1·01 eV) correspond to a predissociation of N_2^+ to the first dissociation limit (1-4).The structure observed in several other peaks indicate that there might be more predissociating processes involved.