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AN ION RETARDING POTENTIAL DIFFERENCE METHOD APPLIED TO DISSOCIATIVE PHOTOIONIZATION MASS SPECTROMETRY.

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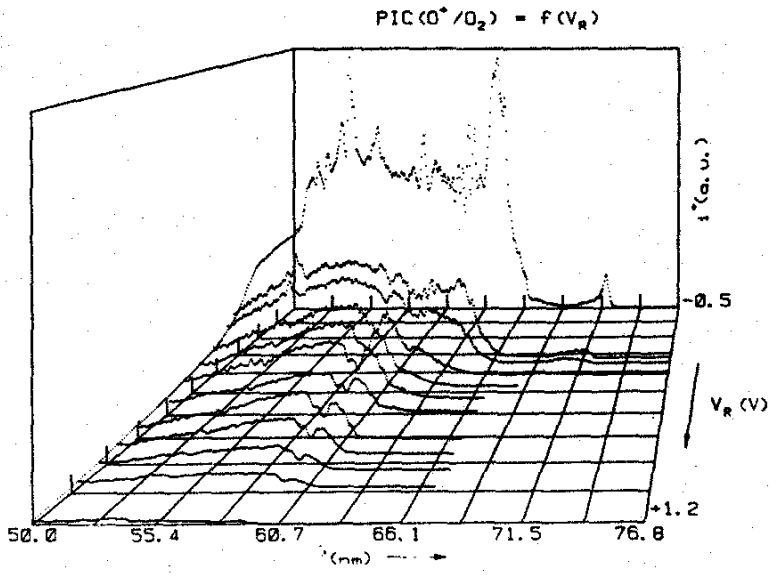
Whereas a lot of attention has been paid to direct dissociative photoionization, investigated by almost all techniques available today, less work has been devoted to dissociative autoionization. However this process contributes to a large extend to the dissociative ionization events.

In this contribution a mass spectrometric dissociative photoionization work is reported, using ion energy analysis. Special attention is focussed on autoionization.

This work uses monochromatized synchrotron radiation (1 meter NIM-monochromator, 0.2 nm resolution) from the Berlin storage ring BESSY. A quadrupole mass filter is equipped with a photoion source and an ion kinetic energy-analysing retarding lens. This setup allowed to measure KE distributions at any desired wavelength and to record the ionization efficiency curves for energy preselected photoions.

Fig.1 shows a typical result for the 0^+ ion formation from 0_2 ,chosen for the abundant autoionization structure present in its ionization efficiency curve. This latter curve has been recorded in the 50-80 nm wavelength region. The retarding potential has been varied from -0.5 to 1.2 V with increments of 0.05 V. Each ionization efficiency curve has been normalized to the retarding potential curve of $0^+/0_2$ recorded at 50 nm (see fig.1). The $0_2^+/0_2$ kinetic energy distribution is used to calibrate the ion KE scale.

Fig.1. *Photoionization efficiency curves of $0^+/0_2$ at different V_R settings.*



This figure clearly shows the dependence of the autoionization structure upon the retarding potential. Even more illustrative for this dependency is the diagram shown in fig.2. In this figure the "Ion Retarding Potential Difference" ionization efficiency curves are plotted together with the $0^+/0_2$ ion energy distribution observed at 50 nm. These curves, obtained by plottinq $i^+(V_R)$-$i^+(V_R + \Delta V_R)$ versus the wavelength represent the ionization efficiency curves of ions carrying translational energies in the range $V_R < KE < V_R + \Delta V_R$

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The same kind of data where obtained for NO^+ and 0^+ produced by the photoionization of nitrous oxide.

By this way dissociative ionization processes could be discussed in detail, including the ions translational energy. Furthermore this treatment of the photoionization data enables to identify dissociative ionization processes evidenced earlier only by other methods.

Fig.2. *The Ion Retarding Potential Difference ionization efficiency curves of $0^+/0_2$.*