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A NEW WAY TO LOOK AT PHOTOIONIZATION MASS SPECTROMETRY; AN ION RETARDING POTENTIAL DIFFERENCE METHOD

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Dissociative autoionization processes contribute to a large extend to the dissociative ionization events.

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

This work uses monochrometized synchrotron radiation (1 meter NIM-monochrorator, 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.

Typical results will be presented for the O^+ ion formation from O_2, chosen for the abundant autoionization structure present in its ionisation efficiency curve. This latter curve has been recorded in the 50-30 nm wavelength region. The retarding potential has been varied from -0.5 to 1,2 V with increments of 0.05 V. Each ionisation efficiency curve has been normalized to the retarding potential curve of O^+/O_2 recorded at 50 nm. The O_2^+/O_2 kinetic energy distribution is used to calibrate the ion KE scale.

These data clearly show the dependence of the autoionization structure upon the retarding potential. Even more illustrative for this dependency is the "Ion Retarding Potential Difference" ionisation efficiency curve. This curve, obtained by plotting $i^+(V_R)$-i^+ $(V_R+\Delta V_R)$ versus the wavelength, represent the ionization efficiency curves of ions carrying translational energies in the range $V_R < KE < V_R+\Delta V_R$.