ANALYSIS OF COMPLEX INTEGRAL PHOTOELECTRON SPECTRA

by

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INTRODUCTORY SUMMARY

The major impetus for this thesis is the desire for accurate vibrational branching ratios in the photo-ionisation of diatomic molecules. These are a sensitive guide to the processes occurring in direct photoionisation and autoionisation. We have the equipment capable of giving low resolution integral photoelectron spectra in the form of steps of various heights. The relative 'heights' are the branching ratios but the shape of the steps change with energy in a fashion peculiar to our own instrumentation. Described within are the various changes and improvements in design and, in one particular area, the optimisation of techniques in the employment of this system presented more fully in Lindemans' Ph.D thesis (1981).

Considerable time was spent, in collaboration with others, on the upgrading of a continuum VUV source. The hoped-for increased intensity would be of great benefit in, generally, low count rate experiments. Though the work was not completed, recent results hold great promise.

With the assurance of increased flexibility and ease of handling, we naturally opted for greater computer control. Paralleling the development of the required inter-facing hardware has been the growth of an extensive,

though by no means complete, program library. The consequent increased pliancy of the system, hinted at herein, has yet to be fully realised in terms of experimental results.

The bulk of this work falls directly under the given title, the analysis being conducted on a spherical retarding potential photoelectron analyser. This has properties very dissimilar to deflective-type apparatus, most notably, the former having an integral stepped response with electron energy whilst the latter's is differential or peaked. However, like the deflective, there is a specific spectral profile for monoenergetic electrons. The variation of this profile with electron energy has been investigated with the aid of Inert gases and curve fitting. This is shown to be of great benefit in deciphering of partial cross-sections in the more complex molecular spectra, like that of oxygen.

STATEMENT

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university. To the best of the author's knowledge and belief, it contains no material previously published or written by any other person, except where due reference is made in the text.

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