Interpretation of Mass Spectra, Fourth Edition

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This textbook is a revised and updated version of the third edition, which was published in 1980. Since then many revolutionary developments have taken place in mass spectrometry as shown by the rise of Fourier transform ion cyclotron resonance, ion trap, and multisector mass spectrometry and new ionization techniques for the analysis of large biomolecules, such as matrix-assisted laser desorption and electrospray ionization. These developments are described only briefly, and the main theme of the book remains focused on the interpretation of mass spectra obtained by electron impact ionization. This ionization technique in combination with gas chromatography is probably still the most widely used mass spectrometry procedure. As stated in the preface, although automated computer-matching procedures of gas chromatography–mass spectrometry spectra (described in Chapter 10 of the book) are now sufficiently fast to keep up with their rate of production, these are still only an aid to, not a replacement for, the skilled interpreter.

As the previous edition, the book contains 10 chapters that, in a balanced way, describe the theoretical and practical background of electron impact mass spectrometry. This background is essential for learning how to interpret unknown mass spectra.

Beginning with the appearance of the mass spectrum, the reader is taken in the first five chapters through the process by which the elemental composition can be deduced, the molecular ion peak can be recognized, the basic mechanisms of ion fragmentation operate, and how all of this together can be used to postulate molecular structures.

In following chapters, a more advanced theory of unimolecular ion decompositions and more detailed mechanisms and ion fragmentation are presented. Compared with the previous edition, these chapters have been revised and expanded considerably in the sense that the ion dissociation mechanisms have been correlated much more with basic attributes, such as ionization energies, proton affinities, bond-dissociation energies, and potential energy surfaces.

New also is an appropriate list of general references that is given as a highly recommended suggestion to the more broadly interested reader. This is found at the end of five chapters.

Eight chapters contain unknown mass spectra with the invitation and challenge to interpret them, so as to learn the process of how to arrive at a molecular structure from the corresponding mass spectrum and to experience the fun of putting together the pieces of the mass spectrometry jigsaw puzzle, as the authors rightly state in the Preface.

Following the solutions to unknowns in Chapter 11, an extensive and up-to-date list of references (18 pages) to original research articles relevant to the subject of the book is given.

This nicely red-colored hardcover book is unique and excellent for learning how to interpret unknown mass spectra. It is, therefore, highly recommended as a basic mass spectrometry course textbook for students and for those in laboratories that deal with the interpretation of mass spectra.

Time-of-flight Mass Spectrometry and Its Applications

E. W. Schlag, Editor
Elsevier Science Publishers, B.V., Amsterdam
ix + 413 pp., ISBN #0-444-81975-8 (paperback,
US$122.75, Dfl. 215.00), 1994

Book review by Robert S. Brown
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This volume is a collection of papers originally published as a special issue of the *International Journal of Mass Spectrometry and Ion Processes* (Vol. 131, 1994). It consists of 21 contributions from researchers well known in the field of time-of-flight mass spectrometry. As the title indicates, the contributions discuss both instrument design theory and applications of time-of-flight mass spectrometry to problems that range from peptide sequencing to molecular cluster analysis. The volume's contributions are approximately equally divided between these two general areas. As might be expected from the recent resurgence of interest in laser-based ionization methods coupled with time-of-flight mass analysis, all but two of the applications involve some form of laser-induced surface desorption/ionization or gas-phase-based photon ionization. The two exceptions involve plasma desorption/ionization techniques. All of the contributions are of high quality, and the volume provides a good survey of many of the important areas of research and applications of this revitalized technique.

In the space permitted for this review, it is impossi-

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ble to discuss each contribution in detail. Several excellent reviews on the design theory of both linear and reflecting time-of-flight mass spectrometers will be an aid to researchers who wish to construct their own instruments. The present state of development of multiphoton-based ionization methods is well presented in several articles, and several new experimental arrangements are discussed. Surface-based laser ionization techniques such as matrix-assisted laser desorption/ionization (MALDI) probably deserve more attention than the four contributions in this area, given the high degree of current interest in these techniques. This being said, the four contributions are all of high quality and demonstrate some of the reasons for the enthusiasm surrounding this ionization technique. Particularly noteworthy is the extensive (35-page) contribution (P. Kaufmann et al.) on the sequencing of moderate size peptides by MALDI combined with post-source decay analysis in a reflecting time-of-flight mass spectrometer. This contribution is one of the most complete discussions available on this new technique that can provide significant amounts of structural information.