

BOOK REVIEW

Advances in Gas Phase Ion Chemistry, Vols. 1 and 2

N. G. Adams and L. M. Babcock, Editors
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Book review by Alex G. Harrison
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In this new series, the editors have invited the authors of individual chapters to review recent work from their laboratory. The editors have successfully attempted to achieve a balance between experiment, theory, and applications, as is evident from the range of topics considered. Volume 1 contains reports on Flow Tube Studies of Small Isomeric Ions (McEwan), Anion-Molecule Experiments: Reactive Intermediates and Mechanistic Organic Chemistry (Grabowski), Thermochemical Measurements by Guided Ion Beam Mass Spectrometry (Armentrout), Photoelectron Spectroscopy of Molecular Anions (Ervin and Lineberger), Ion Chemistry at Extremely Low Temperatures: A Free Jet Expansion Approach (Smith and Hawley), Theoretical Studies of Hypervalent Silicon Anions (Gordon, Davis, and Burggraf), Chemistry Initiated by Atomic Silicon Ions (Bohme), and Spectroscopic Determination of the Products of Electron-Ion Recombination (Adams). Volume 2 contains seven chapters: Effect of

Molecular Orientation on Electron Transfer and Electron Impact Ionization (Brooks and Harland), Experimental Approaches to the Unimolecular Dissociation of Gaseous Cluster Ions (McMahon), New Approaches to Ion Thermochemistry via Dissociation and Association (Dunbar), Alkyl Cation-Dihydrogen Complexes; Silonium and Germonium Cations: Theoretical Considerations (Schreiner, Schaeffer, and Schleyer), Symmetry-Induced Isotope Effects in Ion-Molecule Reactions (Gellene), Ion-Molecule Chemistry: The Roles of Intrinsic Structure, Solvation and Counterions (Bartmess), and Gas Phase Ion Chemistry Under Conditions of Very High Pressure (Knighton and Grimsrud).

The authors represent an impressive array of (often younger) experts in the field. Each has contributed a detailed account of recent advances in gas-phase ion chemistry that originates, in large part, from their laboratory. Each chapter is a complete and up-to-date story at the time of writing. Furthermore, the writing and the editing clearly have been done in a timely fashion. Copious references in each chapter will guide the interested reader to the original literature.

Given the range of topics covered, not every chapter in either volume will be of interest to the individual reader. However, this series does provide an excellent survey of recent advances in gas-phase ion chemistry and should be found on the shelves of any laboratory with a serious interest in the field. Future volumes are eagerly awaited.

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Mass Spectrometry for Biotechnology

Gary Siuzdak
Academic Press, Inc., 525 B Street, Suite 1900
San Diego, CA 92101
1996, \$29.95, 161 pp.

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During the last decade, mass spectrometry has come to play an important role in biomolecular research. The book entitled *Mass Spectrometry for Biotechnology* is aimed at first year graduate students, industrial chemists, or senior undergraduates who wish to learn about this role but have not been exposed to mass spectrometric methods. The book starts with a table that contains historical events in mass spectrometry from 1912–1993. A brief introduction that follows the table explains mass spectrometry. The remainder of the book is divided into six chapters. In the first chapter, Gary Siuzdak summarizes ion sources and sample introduction methods. In this chapter, background information and advantages and limitations of ionization techniques, such as electron ionization (EI) fast-atom bombardment (FAB), matrix-assisted laser desorption ionization (MALDI), and electrospray ionization (ESI), are presented. In addition, topics such as mass calibration and ionization mechanisms are also covered.

Chapter 2, which is entitled Mass Analyzers and Ion Detectors, includes instrumentation, limitations, and advantages of quadrupole, ion trap, magnetic sector, time-of-flight, and Fourier transform mass analyzers. Although separate books that concentrate on each of these mass analyzers are available, this chapter primarily focuses on introducing the nonexpert to the wide array of analyzers and detectors. The section on tandem mass spectrometry explains the necessity of tandem mass spectrometry with the new "soft" ionization methods.

In Chapter 3, the basics of biomolecular mass spectrometry are discussed with an emphasis on the acronym FFAST-MS (fast, functional groups, amount, solubility, tidy, matrix, and salt). Other topics that are

addressed include calculating molecular weight, quantitation techniques, and liquid chromatography–mass spectrometry. One of the most useful aspects of this chapter is a tabulation of common questions asked about mass spectrometry and biomolecular applications.

Chapter 4 is devoted to peptide and protein analysis by FAB, MALDI, and ESI. Sample preparation and peptide and protein sequencing are covered. Application of the above-mentioned techniques for the analysis of carbohydrates, oligonucleotides, and small molecules is discussed in Chapter 5. Chapter 6, entitled Specific Applications, explains how mass spectrometry is applied to real biochemical problems. Especially valuable are the references provided at the end of each section.

A unique feature of the book is the terms and definitions section, which, although incomplete, could serve as a starting point for the nonexpert. The book ends with an Appendix, which includes tables of (1) atomic masses of the elements based on the carbon-12 standard, (2) amino acids and their masses organized in alphabetical order, (3) amino acids and their masses organized according to molecular weight, (4) FAB matrix ions observed with NBA, NBA/NaI, and NBA/CsI matrix systems, (5) comparison of the common features in EI, FAB, MALDI, and ESI, and (6) comparison of ESI and MALDI.

One could quibble about the exclusion of some of the ionization techniques (e.g., plasma desorption, field desorption, laser desorption, and chemical ionization) and limited number of references. Because the excluded techniques are not routine for biomolecules, their omission may be justified. Although fewer than 50 references were used throughout this book, the references are all post-1990, and the reader can benefit from new and current information. A small shortcoming of this book, however, is the use of gender-specific terms such as "daughter" and "granddaughter" in an attempt to provide an explanation of tandem mass spectrometry results.

In summary, this book is an excellent, although incomplete, source of information on the fundamental aspects of mass spectrometry for the nonexpert, who wishes to use mass spectrometry. It also makes some contribution to an experienced mass spectrometrists' collection.