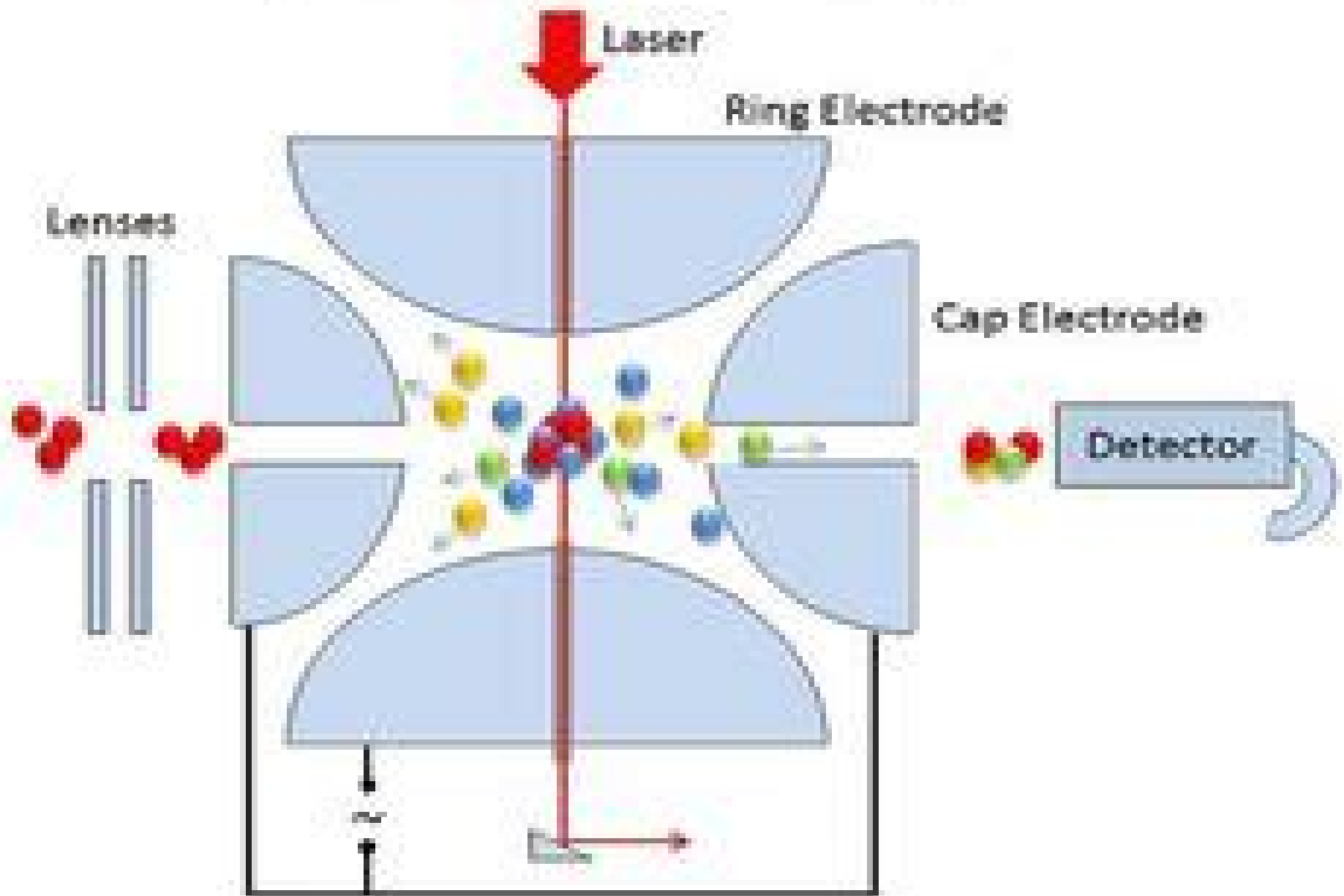


Quadrupole Ion Trap



Quadrupole Ion Trap Mass Spectrometry

Peter H. Dawson



Quadrupole Ion Trap Mass Spectrometry:

Practical Aspects of Ion Trap Mass Spectrometry, Volume I Raymond E. March, John F.J Todd, 2024-11-01 Fundamentals of Ion Trap Mass Spectrometry presents an account of the development and theory of the quadrupole ion trap and its utilization as an ion storage device a reactor for ion molecular reactions and a mass spectrometer It also expands the appreciation of ion traps from that of a unique arrangement of electrodes of hyperbolic form and having a pure quadrupole field to a series of ion traps having fields with hexapole and octopole components and introduces the practical ion trapping device in which electrode spacing has been increased The fundamentals of ion trap are covered in four chapters beginning with the origin of the ion trap its development and operating principles and improvements in performance The second part focuses on the environment within the ion trap the movement of ions within the trap and how this movement is modified by repeated collisions of the ions with buffer gas atoms of helium and on the collisions of ions with molecules that lead to chemical change The critical role of collisions in focusing the ion cloud for subsequent operations is emphasized This important reference presents a coherent picture of the present status of research in the ion trapping field to facilitate the entree of potential ion trappers and provide a backdrop for ion trap research and development in the future *Quadrupole Ion Trap Mass Spectrometry* Raymond E. March, John F. Todd, 2005-09-01 A definitive reference completely updated Published in 1989 the First Edition of this book originally entitled Quadrupole Storage Mass Spectrometry quickly became the definitive reference in analytical laboratories worldwide Revised to reflect scientific and technological advances and new applications in the field the Second Edition includes new chapters covering New ion trap instruments of high sensitivity Peptide analysis by liquid chromatography ion trap tandem mass spectrometry Analytical aspects of ion trap mass spectrometry combined with gas chromatography Simulation of ion trajectories in the ion trap One additional chapter discusses the Rosetta mission a comet chaser that was sent on a ten year journey in 2004 to study the comet Churyumov Gerasimenko using among other instruments a GC MS system incorporating a specially designed ion trap mass spectrometer This comprehensive reference also includes discussions of the history of the quadrupole ion trap the theory of quadrupole mass spectrometry the dynamics of ion trapping chemistry in the quadrupole ion trap the cylindrical ion trap miniature traps and linear ion traps Complete with conclusions and references this primer effectively encapsulates the body of knowledge on quadrupole ion trap mass spectrometry With its concise descriptions of the theory of ion motion and the principles of operation Quadrupole Ion Trap Mass Spectrometry Second Edition is ideal for new users of quadrupole devices as well as for scientists researchers and graduate and post doctoral students working in analytical laboratories *Practical Aspects of Trapped Ion Mass Spectrometry* Raymond E. March, John F.J. Todd, 2010-05-25 Reflecting the substantial increase in popularity of quadrupole ion traps and Fourier transform ion cyclotron resonance FT ICR mass spectrometers Practical Aspects of Trapped Ion Mass Spectrometry Volume IV Theory and Instrumentation explores the historical origins of the latest

advances in this expanding field It covers new methods for trapping ions such as the Orbitrap™ the digital ion trap DIT the rectilinear ion trap RIT and the toroidal ion trap the development and application of the quadrupole ion trap QIT and the quadrupole linear ion trap LIT and the introduction of high field asymmetric waveform ion mobility spectrometry FAIMS After a combined appreciation and historical survey of mass spectrometry and a discussion of how improved capabilities for microfabrication have led to interest in arrays of ion traps the book examines the theory and practice of the Orbitrap mass analyzer the rectangular waveform driven DIT mass spectrometer FAIMS and ion traps with circular geometries It next discusses ion accumulation for increasing sensitivity in FT ICR spectrometry a radio frequency only mode event for Penning traps in FT MS and an FT operating mode applied to a 3D QIT The text then presents three behavioral aspects of quadrupole rod sets before illustrating the development of the 3D QIT in recent years The final chapters explore photodissociation in ion traps and the chemical and photochemical studies of metal dication complexes in a 3D QIT In this volume that spans twenty one chapters a stellar panel of leading experts and up and coming researchers presents a cohesive global and up to date view of the practical aspects of using trapped ion devices A companion to Volume V Applications of Ion Trapping Devices the book authoritatively covers the theory involved as well as the instrumentation currently used in this dynamic field

Practical Aspects of Ion Trap Mass Spectrometry Raymond E. March, John F. J. Todd, 1995-09-18

Fundamentals of Ion Trap Mass Spectrometry presents an account of the development and theory of the quadrupole ion trap and its utilization as an ion storage device a reactor for ion molecular reactions and a mass spectrometer It also expands the appreciation of ion traps from that of a unique arrangement of electrodes of hyperbolic form and having a pure quadrupole field to a series of ion traps having fields with hexapole and octopole components and introduces the practical ion trapping device in which electrode spacing has been increased The fundamentals of ion trap are covered in four chapters beginning with the origin of the ion trap its development and operating principles and improvements in performance The second part focuses on the environment within the ion trap the movement of ions within the trap and how this movement is modified by repeated collisions of the ions with buffer gas atoms of helium and on the collisions of ions with molecules that lead to chemical change The critical role of collisions in focusing the ion cloud for subsequent operations is emphasized This important reference presents a coherent picture of the present status of research in the ion trapping field to facilitate the entree of potential ion trappers and provide a backdrop for ion trap research and development in the future

Quadrupole Ion Trap Mass Spectrometry of Peptides Karen Rae Jonscher, California Institute of Technology. Division of Engineering and Applied Science, 1997

Quadrupole Mass Spectrometry and Its Applications Peter H. Dawson, 2013-10-22

Quadrupole Mass Spectrometry and Its Applications provides a comprehensive discussion of quadrupoles and their applications It proceeds from a general explanation of the action of radiofrequency quadrupole fields to the description of their utilization in mass analyzers such as the quadrupole mass filter the monopole the three dimensional quadrupole ion trap and various time of flight spectrometers

and finally to the characteristic applications of quadrupoles A multi author format has been adopted to provide broader than usual viewpoint in the book The book begins by explaining the principles of operation of quadrupole devices These include ion trajectories and computer simulations of performance analytical theory numerical methods of calculation of performance including the recently developed application of phase space dynamics and fringing fields and other field imperfections Subsequent chapters provide design and performance evaluations of the mass filter the monopole ion traps and time of flight instruments and describe areas of application where quadrupole devices have made the greatest impact because of their particular advantages and disadvantages

Practical Aspects of Trapped Ion Mass Spectrometry Raymond E. March, John F.J Todd, 2009-11-11 Widely used in medical research pharmaceutical and fine chemicals industries biological and physical sciences and security and environmental agencies mass spectrometry techniques are continually under development In *Practical Aspects of Trapped Ion Mass Spectrometry Volume V Applications of Ion Trapping Devices* an international panel of authors presents a world wide view of the practical aspects of recent progress using trapped ion devices In contrast to previous texts which have concentrated generally on a single or limited range of ion trapping techniques a key feature of this compilation of contributions is its coverage of all the ion trapping techniques currently in use Spanning sixteen chapters the text examines Ion neutral and ion ion reactions Structural characterization of proteins and peptides using quadrupole ion trap mass spectrometry Fourier transform ion cyclotron resonance FT ICR mass spectrometry and traveling wave ion mobility mass spectrometry Ion spectroscopy and electron diffraction Conformational analysis of protein isobaric charge states Practical examples of trapped ion technology that reflect the wide diversity of applications of trapped ion devices This text is the first detailed account of the application of new and established mass spectrometric techniques utilizing trapped or confined ions for prolonged investigation and increased sensitivity Each chapter contains complete references and utilizes a consistent format and writing style with all terms acronyms procedures and equations thoroughly explained The strong editorial input to the diverse sections enables readers to readily appreciate the commonalities of topics ranging from theory of instrument operation to proteins flavonoids atomic clocks and single ion mass spectrometry

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Quadrupole Ion Trap Mass Spectrometry John F. J. Todd, Raymond E. March, 1999 Fundamental Studies in Quadrupole Ion Trap Mass Spectrometry Randall Ernest Pedder, 1992 *Practical Aspects of Trapped Ion Mass Spectrometry, Volume V* Raymond E. March, John F.J Todd, 2016-04-19 Widely used in medical research pharmaceutical and fine chemicals industries biological and physical sciences and security and environmental agencies mass spectrometry techniques are continually under development In *Practical Aspects of Trapped Ion Mass Spectrometry Volume V Applications of Ion Trapping Devices* an international panel of aut Practical Aspects of Ion Trap Mass Spectrometry, Volume II Raymond E. March, John F.J Todd, 2024-11-01 By delivering concentrated information in three different volumes the editors of the *Practical Aspects of Ion Trap Mass Spectrometry* mini series present in depth reviews on mainstream developments in each active and popular area Contributing authors provide concise reports illustrating successful approaches to difficult analytical problems across the basic scientific disciplines Ion Trap Instrumentation the second volume in the series conveys an appreciation of the ion trap as a versatile instrument which is used successfully in research and in applications often in tandem with other instruments or components such as external ion sources and lasers The book begins with a discussion of high resolution mass spectrometry and mass measurement accuracy It then demonstrates that trajectories of high kinetic energy ions can be controlled so that such ions are confined It provides applications of lasers to the study of trapped ions the laser photodissociation of gaseous ions confined within the ion trap The book concludes with physics applications of the ion trap in particular the Penning trap and the Paul trap New Approaches to Tandem Mass Spectrometry on a Quadrupole Ion Trap Kenneth Langston Ray, 2000 **Practical Aspects of Trapped Ion Mass Spectrometry, Volume IV** Raymond E. March, John F.J. Todd, 2010-05-25 Reflecting the substantial increase in popularity of quadrupole ion traps and Fourier transform ion cyclotron resonance FT ICR mass spectrometers *Practical Aspects of Trapped Ion Mass Spectrometry Volume IV Theory and Instrumentation* explores the historical origins of the latest advances in this expanding field It covers new methods for trapping **Electrospray-quadrupole Ion Trap Mass Spectrometry for the Direct Characterization of Synthetic Polymers** Sara Catherine McGrath, 2003 **Electrospray and MALDI Mass Spectrometry** Richard B. Cole, 2011-09-26 Discover how advances in mass spectrometry are fueling new discoveries across a broad range of research areas *Electrospray and MALDI Mass Spectrometry* brings both veteran practitioners and beginning scientists up to date with the most recent trends and findings in electrospray ionization and matrix assisted laser desorption ionization MALDI mass spectrometry In particular this Second Edition highlights how advances in electrospray and MALDI mass spectrometry are supporting important discoveries in new and emerging fields

such as proteomics and metabolomics as well as in traditional areas of chemistry and physics research Electrospray AND MALDI Mass Spectrometry SECOND EDITION is divided into five parts Part A Fundamentals of ES explains the fundamental phenomena underlying the electrospray process including selectivity in ionization and inherent electrochemistry and concludes with a chapter offering a comparative inventory of source hardware Part B Fundamentals of MALDI confronts ionization mechanisms instrument development and matrix selection and includes a final chapter that explores the special application of MALDI to obtain two dimensional images of spatial distributions of compounds on surfaces Part C ES and MALDI Coupling to Mass Spectrometry Instrumentation examines the coupling of these ionization techniques to various mass analyzers including quadrupole ion trap time of flight Fourier transform ion cyclotron resonance and ion mobility mass spectrometers Part D Practical Aspects of ES and MALDI investigates analytical issues including quantification charge state distributions noncovalent interactions in solution that are preserved as gas phase ions and various means of ion excitation in preparation for tandem mass spectrometry and offers a guide to the interpretation of even electron mass spectra Part E Biological Applications of ES and MALDI examines the role of mass spectrometry in such areas as peptide and protein characterization carbohydrate analysis lipid analysis and drug discovery Written by a team of leading experts the book not only provides a critical review of the literature but also presents key concepts in tutorial fashion to help readers take full advantage of the latest technological breakthroughs and applications As a result Electrospray and MALDI Mass Spectrometry will help researchers fully leverage the power of electrospray and MALDI mass spectrometry The judicious compartmentalization of chapters and the pedagogic presentation style throughout render the book highly suitable for use as a text for graduate level courses in advanced mass spectrometry

Mass Spectrometry in Drug Discovery David T. Rossi, Michael Sinz, 2001-11-07 Mass Spectrometry in Drug Discovery summarizes the theory instrumentation techniques and application of mass spectrometry and atmospheric pressure ionization to screening evaluating and improving the performance and quality of drug candidates It provides time and cost efficient approaches for the generation and analysis of effective pharmaceuticals covers advances in combinatorial chemistry molecular biology bioanalysis automation and computing and demonstrates the use of mass spectrometry in the assessment of disease states drug targets and potential drug agents

Fundamentals and Applications of Electrospray Ionization-quadrupole Ion Trap Mass Spectrometry for the Analysis of Explosives Joseph Edward McClellan, 2000

Tandem Mass Spectrometry Using a Quadrupole Ion Trap for High Performance Analysis of Fatty Acids and Alpha-tocopherol Colleen Kay Van Pelt, 1999 Tandem mass spectrometry is one of the most powerful methods for quantitative and qualitative analysis Recently low cost tabletop quadrupole ion trap mass spectrometers with tandem mass spectrometry capabilities have become available offering high performance analyses previously available only in dedicated mass spectrometry laboratories This dissertation explores the advanced features of ion traps as quantitative and qualitative analytical tools

The Encyclopedia of Mass Spectrometry, 2015-12-04 Volume 9

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