

CONTENTS

	Page
Editor's Foreword	xvii
Welcoming Address A. JAUMOTTE	xix
In Memoriam—Paul Goldfinger J. DROWART	xxi
Opening Address J. DROWART and J. KISTEMAKER	xxv

PRECISE MASSES AND ISOTOPE STUDIES

Mass Spectrometers for Precise Mass Determinations H. MATSUDA	3
Mass Differences of the Doublets Including C, H, D, and ^{35}Cl and Preliminary Mass Values of H, D, and ^{35}Cl ITSUO KATAKUSE, HIROMITSU NAKABUSHI, AND KOREICHI OGATA	10
Mass Spectrometry and Measurement of Neutron Reaction Cross-sections for Power Nuclear Reactor Operation G. NIEF AND E. ROTH	14
Mass Spectrometric Study of the Rate Production of the Light Elements (Li, Be, B) and Applications to Astrophysics R. BERNAS	24

THEORY OF MASS SPECTRA

Potential Energy Surfaces of Molecular Ions J. C. LORQUET, A. J. LORQUET, J. C. LECLERC, AND C. CADET	43
A Ballistic Theory of Ion Breakdown P. F. KNEWSTUBB	48
Statistical Rate Theory for Systems of Morse Oscillators and its Application to the Theory of Mass Spectra Z. PRASIL	53
The Dynamic Theory of Field Ionization I. V. GOLDENFELD, E. N. KOROL, V. A. NAZARENKO, AND V. A. POKROVSKY	58
Second Differential Ionization Efficiencies and the Ionization and Frag- mentation of Olefins G. G. MEISELS and B. G. GIESSNER	
Charge Separation and Ion Pair Formation in Cations J. SEIBL	

- Monomolecular and Collision-Induced Pre-dissociation in the Mass Spectrum of N₂
J. MOMIGNY and H. WANKENNE

70

IONIZATION PROCESSES

- The Ionization Process
H. EHRHARDT
- New Results in the Field of Photo-ionization
BURKHARD BREHM
- Angular Distributions of Photo-electrons
R. MORGESTERN, A. NIEHAUS, AND M. W. RUF
- The Photo-electron Spectra of some Small Molecules
A. B. CORNFORD, D. C. FROST, C. A. McDOWELL, J. L. RAGLE, AND A. I. STENHOUSE
- Photo-electron Spectra and Chemical Bonding of Mercury II Compounds
J. H. D. ELAND
- Photo-ionization Studies of F₂, HF, DF, and the Xenon Fluorides
J. BERKOWITZ, W. A. CHUPKA, P. M. GUYON, J. HOLLOWAY, AND R. SPOHR

81

90

100

105

108

112

- Comparison of Penning-Ionization and Photo-ionization of Simple Molecules
H. HOTOP

116

- A Pulsed Mass Spectrometric Study of Penning-Ionization in Helium-Argon Mixtures
J. J. DECORPO AND F. W. LAMPE

121

- Mass and Phase Spectrometry of Heated SF₆ and CO₂
R. T. BRACKMANN, W. L. FITE, AND W. M. JACKSON

125

- Neutral Fragment Mass Spectrometry
K. O. DYSON

128

- Absolute Ionization Cross-section of Alkali Atoms by Electron Impact
R. JALIN, R. HAGEMANN, P. LOHEZ, AND R. BOTTER

133

- A New Method of Studying Molecules by Electron Impact Spectroscopy
F. W. E. KNOOP, H. H. BRONGERSMA, A. J. H. BOERBOOM, AND L. J. OOSTERHOFF

136

ATOMIC AND MOLECULAR COLLISIONS

- Excitation in Collisions Between Ions and Atoms Observed by Light Intensity Measurements
F. J. DE HEER

143

- Charge Exchange in Merging Beams
F. BROUILLARD

153

- Energy Distribution in the Products of Ionic Reactions
D. A. BAFUS, J. J. DECORPO, AND J. L. FRANKLIN

159

- Angular Distribution of H₂S in Collision-Induced Dissociation of H₂⁺
D. H. JAECKS, D. H. CRANDALL, AND R. H. MCKNIGHT

164

- The Angular Dependence of the He⁺ Dissociation Fragments of (HeH)⁺
J. SCHOPMAN, J. LOS, AND J. MAAS

168

- Multiple Ionization of Ar by 10 keV Electrons as a Function of the Energy Loss
M. J. VAN DER WIEL AND F. J. DE HEER

172

- Fragmentation of Propane by Dissociative Charge Transfer. Studies by Translational Energy Ion Spectroscopy and by Time-resolved Ion Spectroscopy
ROY S. LEHRLE, JOHN E. PARKER, AND JAMES C. ROBB

174

- Mass Spectrometric Study of Ionization and Fragmentation of Simple Molecular Gases by 5-45 keV Helium Atoms
R. BROWNING, C. J. LATIMER, AND H. B. GILBODY

179

- Dissociation of Molecule-Ions Formed by Charge Exchange Collisions in an In-line Tandem Mass Spectrometer
THOMAS O. TIERNAN AND CHAVA LIFSHITZ

184

- Reactions of Alkali Atoms with Atmosphere Ions
P. K. ROL

189

ION-MOLECULE REACTIONS

- Ion Cyclotron Resonance Mass Spectrometry
GILLIAN C. GOODE, REBECCA M. O'MALLEY, A. J. FERRER-CORREIA, AND K. R. JENNINGS

195

- Ion-Molecule Reactions of Small Molecules by Ion Cyclotron Resonance Mass Spectroscopy
J. H. FUTRELL, D. SMITH, AND R. CLOW

202

- The Study of Ion-Neutral Collision Processes with a Pulsed Tandem Mass Spectrometer
A. J. MASSON, P. F. FENNELLY, AND M. J. HENCHMAN

207

- Beam Studies of Several Elementary Ion Molecule Reactions
J. KRENOS, P. HIERL, J. TULLY, Z. HERMAN, AND R. WOLFGANG

213

- Negative Ion-Neutral Molecule Interactions by Pulse Methods
I. PLATZNER, G. LEVIN, AND F. S. KLEIN

217

- On the Reaction Mechanism of Some Negative Ion Molecule Reactions at Low Energies (Some eV-200 eV)
D. VOGT

222

- Studies of Gaseous Ionic Equilibria in the Methane-Water and Propane-Water Systems
F. H. FIELD AND D. P. BEGGS

226

- Clustering Reactions of the Hydronium Ion
C. E. YOUNG, D. EDELSON, AND W. E. FALCONER

229

- Studies in Chemical Ionization Mass Spectrometry
JOHN MICHNOWICZ AND BURNABY MUNSON

233

Charge-Exchange Spectra of Some Substituted Benzophenones and N-Substituted Phenyl Benzamides ROBERT H. SHAPIRO AND JONATHAN TURK	238
Photo-ionization-Induced Ion-Molecule Reactions in Nitric Oxide and Nitrogen Dioxide J. YINON AND F. S. KLEIN	241
 INSTRUMENTATION	
Selected Topics in Instrumentation—A Review RICHARD E. HONIG	249
Application of Matrix Calculation in Ion Optics A. J. H. BOERBOOM	269
The Spiratron J. M. B. BAKKER	278
High-Intensity Mass Spectrometers S. B. KARMOHAPATRO	283
Matsuda Type Virtual Image Double-Focusing Mass Spectrometer JMS-06 M. ISHIBASHI, M. NOJIRI, AND E. WATANABE	286
An Inhomogeneous Oscillatory Electric Field Time-of-Flight Mass Spectrometer J. P. CARRICO, L. D. FERGUSON, AND R. K. MUELLER	292
Split-Screen Storage Oscilloscope for GLC/MS Peak Monitoring H. H. BOVEE AND L. E. MONTEITH	295
Some New Ways of Studying Metastable Ion Decompositions R. M. CAPRIOLI, J. H. BEYNON, W. E. BAITINGER, AND J. W. AMY	297
A New Method of Examining Metastable Ions Formed by Electron Impact Ionization of Organic Molecules N. R. DALY, A. MCCORMICK, AND R. E. POWELL	300
 DATA PROCESSING	
Progress of the Mass Spectrometry Data Centre, 1966–70 R. G. RIDLEY	307
The Application of Artificial Intelligence in the Interpretation of Low-Resolution Mass Spectra ARMAND BUCHS, ALLAN B. DELFINO, CARL DJERASSI, A. M. DUFFIELD, B. G. BUCHANAN, E. A. FEIGENBAUM, J. LEDERBERG, GUSTAV SCHROLL, AND G. L. SUTHERLAND	314
An Approach to Quantitative Mass Spectral Analysis THOMAS R. EDWARDS	319
Automatic Evaluation of Photo-plates in Spark-Source Mass Spectrometry J. FRANZEN, W. SCHÖNFELD, AND D. STÜWER	322

On-line Data Acquisition and Interpretation of Spark-Source Mass Spectra R. A. BINGHAM, R. BROWN, AND P. POWERS	326
Mass Spectrometric Data Acquisition and Handling—a Modular, Low-cost, High-Performance System A. CARRICK	330
On-line Computer Methods Used in Conjunction with the Measurement of Ionization and Appearance Potentials R. A. W. JOHNSTONE, F. A. MELLON, AND S. D. WARD	334
Data Processing of Isotopic Mass Spectra R. BIR	339
Digital Techniques in Connection with Isotopic Mass Spectrometry. 1. Gas and Solid High Isotopic Ratios J. P. BOULLAUD, C. JONNET, J. MARAGNON, AND P. TAUVERON	344
 INORGANIC AND HIGH-TEMPERATURE CHEMISTRY	
Mass Spectrometric Studies in High-Temperature Chemistry L. N. GOROKHOV AND G. A. SEMENOV	349
The Determination of Thermodynamic Activities in High-Temperature Solutions by Mass Spectrometry G. R. BELTON	359
The Use of a Highly Sensitive Mass Spectrometer for Thermodynamic and Phase Relationship Studies in Carbide Systems EDMUND STORMS	369
High-Temperature Mass Spectrometric Studies of Some Rare-Earth-Carbon and Transition Metal-Carbon Systems CARL A. STEARNS AND FRED J. KOHL	371
Thermodynamics of the Titanium Oxides PAUL W. GILLES AND PETER J. HAMPSON	374
Mass Spectrometry of Anhydrous Metal Nitrate Vapours I. LAUDER, C. TOWLER, AND T. WUTH	379
Thermodynamic Activities in the Ternary System Cr–Fe–Ni at 1600°C by Mass Spectrometry SIGURD WAGNER AND GEORGE R. ST. PIERRE	388
Mass Spectrometric Investigation of Two-Component Systems of Complex Vapour Composition by the Isothermal Evaporation Method L. N. SIDOROV, V. I. BELOUSOV, AND V. B. SCHOLTZ	394
Study of the Ionization Processes of Metal Vapours by Means of a Fox Source Coupled with a Knudsen Cell B. CABAUD, R. UZAN, AND P. NOUNOU	399
Field Ion Mass Spectra of Selenium HORST SAURE AND JOCHEN BLOCK	404
Relative Ionization Cross-sections of Transition Metals using Time-of-Flight Mass Spectrometry EDMUND J. ROLINSKI, CHARLES J. OBLINGER, AND MICHAEL HOCH	408

Systematic Study of the Decomposition of Very Small Quantities of Lanthanide Oxides in the Presence of Heated Metallic Rhenium
NGUYEN-LONG-DEN AND M. DE SAINT SIMON

413

SECONDARY ION EMISSION AND SURFACE PHENOMENA

Secondary Ion Emission from Solid Surfaces
R. CASTAING AND J.-F. HENNEQUIN

419

The Atom-Probe Field Ion Microscope
ERWIN W. MÜLLER

427

A Combined Ion and Electron Microprobe
H. LIEBL

433

Analytical Applications of an Ion Microprobe Mass Spectrometer—
Negative Ion Spectroscopy
CHARLES A. EVANS, Jr.

436

Analysis of Thin Films by Ion Microprobe Mass Analyser
H. TAMURA, T. KONDO, AND H. DOR

441

Mass Spectrometric Analysis of Monomolecular Layers of Solids by
Secondary Ion Emission
A. BENNINGHOVEN

444

Mass Spectrometric Measurements of the Secondary Ion Emission of
Alloys as an Analytical Tool
V. CHEREPIN

448

REACTION KINETICS, ETC.

Mass Spectrometric Studies of Atomic and Free Radical Reactions
JOHN T. HERRON

453

Molecular Beam-Surface Interactions
RICHARD P. BURNS AND HOWARD L. BLAZ

462

Development of a Time-of-Flight Mass Spectrometer to Monitor Fast
Reactions
S. E. APPLEBY, S. B. HOWARTH, P. HEALD, J. H. LIPPIATT, J. D.
MADELEY, P. MYERS, W. J. ORVILLE-THOMAS, D. PRICE, AND
G. B. WARD

465

Kinetics by Mass Spectrometry: Molecular-Beam Sampling Applied to
Pyrolysis of Hydrogen Peroxide
A. TESSIER AND W. FORST

471

Comparative Mass Spectrometric Study of the Same Heterogeneous
Reaction in a Stationary Flow Reactor and a Molecular-Beam Apparatus
R. DUCROS, H. G. LINTZ, A. PENTENERO, AND P. LE GOFF

475

Direct Mass Spectrometric Measurements of the Rates of Association
Reactions of Borane in the Gas Phase
G. W. MAPPES, S. A. FRIDMANN, AND T. P. FEHLNER

478

Contribution to Hot-Atom Reaction Studies: Formation of Organic
Iodides in Solid Butane Irradiated by I⁺ Ions
J. CH. ABBE, J. M. PAULUS, J. CAILLERET, G. LAGARDE, J. MEYER,
AND R. IGERSHEIM

481

Mass Spectrometric Method for the Evaluation of Diffusion Characteristics
of Rare Gases in Solids
H. BAUR, U. FRICK, H. FUNK, L. SCHULTZ, AND P. SIGNER

483

NEGATIVE IONS: MAGNETIC MOMENTS

The Sampling of Negative Ion Populations in Townsend Discharges
P. R. KINSMAN, J. McGEEHAN, A. N. PRASAD, AND J. A. REES

489

Ionization by Electron Impact of Some Inorganic Fluorides
P. W. HARLAND AND J. C. J. THYNNE

493

Mass Spectrometric Identification of the Paramagnetic Component of
a Molecular Beam
V. L. TAL'ROSE, A. F. DODONOV, I. O. LEIPUNSKII, AND I. I. MOROSOV

497

Magnetic Moments of the Diatomic Molecules of the Transition Elements
ARTHUR KANT AND FRANCIS McCAFFREY

500

APPLICATIONS TO SPACE STUDIES

Mass Spectrometry Applied to Lunar Materials
O. A. SCHAEFFER

505

Upper Atmosphere Studies by Mass Spectrometry
N. W. SPENCER

509

Analysis of Lunar Materials by Spark-Source Mass Spectrometry
G. H. MORRISON, A. T. KASHUBA, AND A. M. ROTHENBERG

520

SPARK-SOURCE AND ANALYTICAL MASS SPECTROMETRY

Improvements in Spark-Source Mass Spectrography Analysis by Use of
Cryopumping
FRANCIS DEGREVE

529

Trace Analysis with the Matrix as Internal Standard
A. M. ANDREANI, B. BLANCHARD, J. C. BRUN, J. P. MERMOUD,
J. PELLET, AND R. STEFANI

534

Analysis of Curium and Californium by Single-Exposure Spark-Source
Mass Spectrometry
P. CHASTAGNER AND B. TIFFANY

539

Reactor Coolant Sodium Studies Using a Spark-Source Mass Spectrometer
EDGAR BERKEY AND WILLIAM M. HICKAM

543

Determination of Trace Amounts of Oxygen, Carbon, and Nitrogen in
Metals by Spark-Source Mass Spectrography
F. KONISHI AND N. NAKAMURA

547

Continuous Analysis of Metallic Vapours by Mass Spectrometry PH. TYOU	551
Dating of Geological Samples by K-Ar Method. Quantitative Dosing of the Three Isotopes of Argon by Mass Spectrometry H. BELLON AND J. CL. PHILIPPE	554
Applications of the Integrated Ion Current Technique to the Determination of Metal Chelates, Polycyclic Hydrocarbons, and Phenolic Amines, and to the Detection of Isomerism in Organic Compounds J. R. MAJER AND M. J. A. READE	560
Mass Spectrometric Thermal Analysis of Organic Polymers HAROLD W. GOLDSTEIN	563
 ORGANIC COMPOUNDS	
Mass Spectrometry of Organic Compounds—a Review DUDLEY H. WILLIAMS	569
Utilization of Mass Spectral Information for Molecular Structure Determination F. W. McLAFFERTY	589
The State and Future Development of GC-MS Methods and Techniques D. HENNEBERG AND G. SCHOMBURG	605
Applications of a New Technique to the Analysis of GC Eluents M. BARBER, J. R. CHAPMAN, B. N. GREEN, AND T. O. MERREN	615
Direct Coupling of a Gas Chromatographic Capillary Column and a Mass Spectrometer NICOLE SELLIER AND GEORGES GUIOCHON	618
Polymerization of Organic Substances by High Electric Fields H. D. BECKEY, M. D. MIGAHED, AND F. W. RÖLLGEN	622
High- and Low-Resolution Field Desorption Mass Spectra of Organic Molecules H. D. BECKEY, G. HOFFMANN, K. H. MAURER, AND H. U. WINKLER	626
The Use of Electron Attachment Mass Spectrography in the Analysis of Petroleum Hydrocarbons CZESLAW KAJDAS	632
Ring Contraction in Molecular Ions of Acylated Alicyclic Amines as a Function of Ring Size W. J. RICHTER, J. M. TESAREK, AND A. L. BURLINGAME	635
Electron-Impact Induced Fragmentation of ϵ -Diketones J. KOSSANYI	639
Mass Spectrometry of Aralkyl Compounds with a Functional Group. Part XI: On the Symmetrization of the Molecular Ions from 2-Phenoxyethyl Halides C. B. THEISSLING, N. M. M. NIBBERING, AND TH. J. DE BOER	642
The Fragmentation of Aminobenzophenones W. BENZ	651

Intramolecular Substitution of Molecular Ions of Some Aromatic Compounds HANS-FRIEDRICH GRÜTZMACHER, HEINZ KUSCHEL, AND PETER ADAMIETZ	654
Localized Activation in Bond-Forming Reactions Under Electron Impact SEYMOUR MEYERSON AND L. C. LEITCH	659
Ionization Study and Electronic Configurations of an Aliphatic Enones Family M. MONTAGNÉ, P. ARNAUD, P. NOUNOU, AND B. CABAUD	662
Charge Location and Fragmentation under Electron Impact. III. Some Studies on Ethyl and Aryl Substituted Ureas and Related Compounds M. A. BALDWIN, P. C. CARDNELL, A. G. LOUDON, A. MACCOLL, AND K. S. WEBB	666
The Investigation of a Transmission of Electronic Influences Through the Chain of Conjugated Double Bonds by Mass Spectrometry B. M. ZOLOTAREV, L. A. YANOWSKAYA, B. UMIRZAKOV, O. S. CHIZHOV, AND V. F. KUCHEROV	670
Stereospecific Fragmentation of Isomeric Diesters A. MANDELBAUM, J. DEUTSCH, A. KARPATI, AND I. MERKSAMMER	672
The Mass Spectra of Some <i>bis</i> -Aziridinones: Consecutive Loss of Two CO Molecules from Separate Rings ISTVÁN LENGYEL, DAVID B. ULISS, AND ROBERT V. MARK	676
Mass Spectrometry of Unsaturated Alcohols DAVID G. I. KINGSTON AND HARVEY P. TANNENBAUM	681
New Fragmentation Reactions Observed in the Mass Spectra of Macrocyclic Spermidine Alkaloids H. J. VEITH AND M. HESSE	685
Some Stereospecific Fragmentations in the Mass Spectra of Steroids HANS-WOLFRAM FEHLHABER, DIETER LENOIR, AND PETER WELZEL	689
The Influence of the Central Metal Atom on the Fragmentation of Chromium- π -complexes J. MÜLLER AND K. FENDERL	693
Mass Spectrometric Study of Transition Metal Complexes with Ligands Having Nitrogen or Sulphur as Donor Atom G. DISTEFANO, A. FOFFANI, G. INNORTA AND S. PIGNATARO	696
Determination of Bond Energies of Organic Silicon Compounds on the Basis of Appearance Potentials J. BOROSAY AND L. SZEPES	700
Mass Spectrometric Examination of Methoxy- and Ethoxy-Methylsilanes J. TAMÁS, K. UJSZÁSZY, AND Gy. BUJTÁS	703
Ion Structures in Norbornyl Compounds J. L. HOLMES AND D. MCGILLIVRAY	706
Pyrolytic and Electron-Impact Reactions of Cyclic Sulphites and Carbonates of Aromatic Diols DON C. DEJONGH	709

BIOCHEMICAL APPLICATIONS		
The Role of Mass Spectrometry in Biochemistry and Related Fields JAMES A. McCLOSKEY	715	
A Quantitative Approach to Protein Sequencing Using Mass Spectrometry C. PERRINE, E. CANNON, C. CAVENDER, T. FAIRWELL, AND R. E. LOVINS	728	
Application of the Method of Photo-ionization to Mass Spectrometric Determination of Amino Acid Sequence in Short Peptides JA. M. VARSHAVSKY AND V. M. ORLOV	735	
Mass Spectrometry of Bile Pigments Structure of Phycocyanobilin B. L. SCHRAM	738	
The Quantitative High-Resolution Mass Spectrometry of Human Tissue Volatiles: the Determination of Certain Purines and Purine Analogues in the Skeletal Muscle of Gout Patients W. SNEDDEN, R. B. PARKER, AND R. W. E. WATTS	742	
Determination of ^{18}O in Compounds Isolated from Bacteria Growth on ^{18}O Labelled Hexoses R. B. JOHNSON, L. PONTICORVO, AND D. RITTENBERG	746	
Quantitative Determination of Trace Metals by Electron Impact Ionization Mass Spectrometry J. K. TERLOUW AND G. DIJKSTRA	748	
High-Resolution Mass Spectrometry of Ribonucleic Acid Hydrolysates A. M. LAWSON, W. A. KOENIG, L. C. SMITH, N. R. EARLE, AND JAMES A. McCLOSKEY	753	
Sequence Analysis of Tri- and Tetranucleotides by Mass Spectrometry J. L. WIEBERS	757	
Mass Spectrometric Sequence Determination of Permethylated Methionine- Containing Peptides P. ROEPSTORFF, K. NORRIS, S. SEVERINSEN, AND K. BRUNFELDT	761	