

Isotopes Principles And Applications

A new edition of a very well regarded textbook on isotope geochemistry, this text covers both radiogenic & stable isotopes, & offers up-to-date coverage of the U-Pb methods, Helium & Tritium methods, the petrogenesis of metamorphic rocks, carbon-14 dating methods & much else.

Accessibly written by a team of international authors, the Encyclopedia of Environmental Change provides a gateway to the complex facts, concepts, techniques, methodology and philosophy of environmental change. This three-volume set illustrates and examines topics within this dynamic and rapidly changing interdisciplinary field.

The encyclopedia includes all of the following aspects of environmental change:

Diverse evidence of environmental change, including climate change and changes on land and in the oceans
Underlying natural and anthropogenic causes and mechanisms

Wide-ranging local, regional and global impacts from the polar regions to the tropics

Responses of geo-ecosystems and human-environmental systems in the face of past, present and future environmental change
Approaches, methodologies and techniques

used for reconstructing, dating, monitoring, modelling, projecting and predicting change
Social, economic and political dimensions of environmental issues, environmental

conservation and management and environmental policy
Over 4,000 entries explore the following key themes and more: Conservation Demographic change Environmental

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management Environmental policy Environmental security Food security Glaciation Green Revolution Human impact on environment Industrialization Landuse change Military impacts on environment Mining and mining impacts Nuclear energy Pollution Renewable resources Solar energy Sustainability Tourism Trade Water resources Water security Wildlife conservation The comprehensive coverage of terminology includes layers of entries ranging from one-line definitions to short essays, making this an invaluable companion for any student of physical geography, environmental geography or environmental sciences.

The first edition of Inductively Coupled Plasma Spectrometry and its Applications was written as a handbook for users who wanted a better understanding of the theory augmented by a practical insight of how best to approach a range of applications, and to provide a useful starting point for users trying an approach or technique new to them. These objectives have been retained in the second edition but a slight shift in emphasis gives the volume an overall perspective that is more forward looking. Structured into 11 chapters, the current edition is a thorough revision of the original, covering the principles of inductively coupled plasmas, instrumentation, methodology and applications within environmental analysis, earth science, food science and clinical medicine. Each chapter, written by internationally recognised leaders in their specific subject areas, provides enough detail to be useful to both the new and experienced users. Full account is taken of recent developments, such as high resolution instruments, novel detection systems

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and electrospray techniques. Written for all analytical scientists but particularly those involved in atomic spectroscopy and in environmental, geochemical, clinical or food analysis, this timely and informative book will be an essential reference in their use of inductively coupled plasma to achieve their own scientific goals.

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The book presents an overview of recent advances in knowledge related to the assessment and management of groundwater resources, giving special attention to the uncertainties related to climate change and variability. While proposing strategies of groundwater management as adaptation, alternative and resilience under the changing environments, this book also discusses new directions and initiatives of hydrological study, in particular on the groundwater. Groundwater is a major source of water across much of the world, and acts as a component of the global water cycle on the Earth. Groundwater has the capacity to balance large swings in precipitation and has the potential to supplement surface-water resources when they are close to the limits of sustainability such as during drought. Although groundwater is pivotal to sustain water supplies, these important resources are vulnerable to increased human activities and the uncertain consequences of climate change. This book presents that groundwater with longer resident time of water circulation can be an alternative water resources and environment in changing climate. Assessments of groundwater services and benefit as

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well as risk are important for sustainable groundwater uses under the climate change. Groundwater which is one of the leys of adaptation to climate change should be treated as common resources and environment beyond the tragedy of the commons and dilemma of the boundaries. While providing a comprehensive description of hydrogeological characteristics of groundwater systems, the present volume also covers important aspects of legal and institutional contexts required for groundwater resources management as well as social and economic considerations. This publication may contribute to an improved understanding of the impacts of climate change and human activity on groundwater resources, provides useful guidance for policy makers and planners to include groundwater into climate change adaptation schemes and strategies.

It is interesting to consider that biopolymers are by no means new to this world. It is only because of our fascination with petrochemical products that these wonderful materials have been neglected for so long. Today we face a different challenge. Environmental pressure is pushing away from synthetic or petro-chemically derived products, while economic factors are pulling back from often more expensive "green" options. This book presents two aspects of biopolymers; potential products and some applications of biopolymers covering the current relevance of biopolymers.

Archaeological chemistry is a subject of great importance to the study and methodology of archaeology. This comprehensive text covers the subject with a full range of case studies,

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materials, and research methods. With twenty years of experience teaching the subject, the authors offer straightforward coverage of archaeological chemistry, a subject that can be intimidating for many archaeologists who do not already have a background in the hard sciences. With clear explanations and informative illustrations, the authors have created a highly approachable text, which will help readers overcome that intimidation. Topics covered included: Materials (rock, pottery, bone, charcoal, soils, metals, and others), Instruments (microscopes, NAA, spectrometers, mass spectrometers, GC/MS, XRF & XRD, Case Studies (Provenience, Sediments, Diet Reconstruction, Past Human Movement, Organic Residues). The detailed coverage and clear language will make this useful as an introduction to the study of archaeological chemistry, as well as a useful resource for years after that introduction. For all artifacts that are to serve as archaeological evidence, the study of the provenance, production technology, and trade of raw materials must be based on archaeometry. Currently, these questions are addressed by the use of radiogenic isotope analysis. The book captures the state of the art in this rapidly advancing field. It includes methodological papers on isotope analysis, innovative applications of several isotope systems to current questions in glass and glaze research, and advances in the knowledge of the economy of vitreous materials. Geochemical kinetics as a topic is now of importance to a wide range of geochemists in academia, industry, and government, and all geochemists need a rudimentary knowledge of the field. This book summarizes the fundamentals of geochemical kinetics with examples drawn especially from mineral dissolution and precipitation. It also encompasses discussion of high temperature processes and global geochemical cycle modeling. Analysis of textures of rocks, sediments, and mineral surfaces are incorporated throughout and provide a sub-theme

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of the book.

Providing an exhaustive review of this topic, *Inorganic Mass Spectrometry: Principles and Applications* provides details on all aspects of inorganic mass spectrometry, from a historical overview of the topic to the principles and functions of mass separation and ion detection systems. Offering a comprehensive treatment of inorganic mass spectrometry, topics covered include: Recent developments in instrumentation Developing analytical techniques for measurements of trace and ultratrace impurities in different materials This broad textbook in inorganic mass spectrometry, presents the most important mass spectrometric techniques used in all fields of analytical chemistry. By covering recent developments and advances in all fields of inorganic mass spectrometry, this text provides researchers and students with information to answer any questions on this topic as well as providing the basic fundamentals for understanding this potentially complex, but increasingly relevant subject.

The international trade in plants is growing steadily as the worldwide demand for natural and botanical raw materials increases. Customers value natural products and botanicals as "green" alternatives—safer ingredients for their families which also represent an environmentally and socially responsible choice for the planet. In order to build assurance into the sourcing of natural ingredients, R&D organizations must have valid scientific matrices to authenticate the quality of those ingredients, provide traceability, and minimize risk. An assemblage of insight from expert contributors, *Botanicals: Methods and Techniques for Quality & Authenticity* compiles a range of methods and techniques that can be used to help guide quality and authenticity determinations. Topics include: Metabolic profiling, authentication of botanicals by morphology, and genetic methods of botanical authentication Tools for building models for the

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authentication of materials How multivariate statistics can play a role in determining botanical quality and authenticity Radiocarbon and stable isotope ratio analysis and emerging stable isotope tools NMR (nuclear magnetic resonance) spectroscopy, NIR (near-infrared), and HPTLC (high-performance thin-layer chromatography) methods for analysis The use of electronic sensing instruments and applications for analysis The contributors also discuss the challenge of identifying a botanical extract or preparation on the basis of its chemical content and discuss quality issues faced by botanicals used as cosmetic ingredients. The book provides you with a range of traditional, taxonomic, and newer analytical tools to assure the quality, authenticity, and traceability of botanical raw materials for dietary supplements, cosmetics, and natural products research.

This title provides the latest information on nuclear physics. Based on a course entitled Applications of Nuclear Physics. Written from an experimental point of view this text is broadly divided into two parts, firstly a general introduction to Nuclear Physics and secondly its applications. * Includes chapters on practical examples and problems * Contains hints to solving problems which are included in the appendix * Avoids complex and extensive mathematical treatments * A modern approach to nuclear physics, covering the basic theory, but emphasising the many and important applications

This textbook details basic principles of planetary science that help to unify the study of the solar system. It is organized in a hierarchical manner so that every chapter builds upon preceding ones. Starting with historical perspectives on space exploration and the development of the scientific method, the book leads the reader through the solar system. Coverage explains that the origin and subsequent evolution of planets and their satellites can

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be explained by applications of certain basic principles of physics, chemistry, and celestial mechanics and that surface features of the solid bodies can be interpreted by principles of geology.

"This volume covers many of the important advances in the geological sciences from 1963 to 2013. These advances include understanding plate tectonics, exploration of the Moon and Mars, development of new computing and analytical technologies, understanding of the role of microbiology in geologic processes, and many others"--Provided by publisher.

Edited by two very well-known and respected scientists in the field, this excellent practical guide is the first to cover the fundamentals and a wide range of applications, as well as showing readers how to efficiently use this increasingly important technique. From the contents: * The Isotopic Composition of the Elements * Single-Collector ICP-MS * Multi-Collector ICP-MS * Advances in Laser Ablation - Multi-Collector ICP-MS * Correction for Instrumental Mass Discrimination in Isotope Ratio Determination with Multi-Collector ICP-MS * Reference Materials in Isotopic Analysis * Quality Control in Isotope Ratio Applications * Determination of Trace Elements and Elemental Species Using Isotope Dilution ICP-MS * Geochronological Dating * Application of Multi-Collector ICP-MS to Isotopic Analysis in Cosmochemistry * Establishing the Basis for Using Stable Isotope Ratios of Metals as Paleoredox Proxies * Isotopes as Tracers of Elements Across the Geosphere-Biosphere Interface * Archaeometric Applications * Forensics Applications * Nuclear Applications * The Use of Stable Isotope Techniques for Studying Mineral and Trace Element Metabolism in Humans * Isotopic Analysis via Multi-Collector ICP-MS in Elemental Speciation A must-have for newcomers as well as established scientists seeking an overview of isotopic analysis via

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ICP-MS.

Environmental isotope and nuclear techniques provide unmatched insights into the processes governing the water cycle and its variability. This monograph presents state of the art applications and new developments of isotopes in hydrology, environmental disciplines and climate change studies. Coverage ranges from the assessment of groundwater resources in terms of recharge and flow regime to studies of the past and present global environmental and climate changes.

This book is intended to serve as a text for an introductory course in geochemistry for undergraduate/graduate students with at least an elementary-level background in earth sciences, chemistry, and mathematics. The text, containing 83 tables and 181 figures, covers a wide variety of topics — ranging from atomic structure to chemical and isotopic equilibria to modern biogeochemical cycles — which are divided into four interrelated parts: Crystal Chemistry; Chemical Reactions (and biochemical reactions involving bacteria); Isotope Geochemistry (radiogenic and stable isotopes); and The Earth Supersystem, which includes discussions pertinent to the evolution of the solid Earth, the atmosphere, and the hydrosphere. In keeping with the modern trend in the field of geochemistry, the book emphasizes computational techniques by developing appropriate mathematical relations, solving a variety of problems to illustrate application of the mathematical relations, and leaving a set of questions at the end of each chapter to be solved by students. However, so as not to interrupt the flow of the text, involved chemical concepts and mathematical derivations are separated in the form of boxes. Supplementary materials are packaged into ten appendixes that include a standard-state (298.15 K, 1 bar) thermodynamic data table and a listing of answers to selected

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chapter–end questions. Additional resources for this book can be found at:
www.wiley.com/go/misra/geochemistry.

HYDROGEOLOGY Hydrogeology: Principles and Practice provides a comprehensive introduction to the study of hydrogeology to enable the reader to appreciate the significance of groundwater in meeting current and future environmental and sustainable water resource challenges. This new edition has been thoroughly updated to reflect advances in the field since 2014 and includes over 350 new references. The book presents a systematic approach to understanding groundwater starting with new insights into the distribution of groundwater in the Earth's upper continental crust and the role of groundwater as an agent of global material and elemental fluxes. Following chapters explain the fundamental physical and chemical principles of hydrogeology, and later chapters feature groundwater field investigation techniques in the context of catchment processes, as well as chapters on groundwater quality and contaminant hydrogeology, including a section on emerging contamination from microplastic pollution. Unique features of the book are chapters on the application of environmental isotopes and noble gases in the interpretation of aquifer evolution, and a discussion of regional characteristics such as topography, compaction and variable fluid density on geological processes affecting past, present and future groundwater flow regimes. The last chapter discusses future challenges for groundwater governance and management for the long-term sustainability of groundwater resources, including the role of managed aquifer recharge, and examines the linkages between groundwater and climate change, including impacts on cold-region hydrogeology. Given the drive to net-zero carbon emissions by 2050, the interaction of groundwater in the exploitation of energy resources, including renewable resources and shale

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gas, is reviewed. Throughout the text, boxes and a set of colour plates drawn from the authors' teaching and research experience are used to explain special topics and to illustrate international case studies ranging from transboundary aquifers and submarine groundwater discharge to the hydrogeochemical factors that have influenced the history of malting and brewing in Europe. The appendices provide conversion tables and useful reference material, and include review questions and exercises, with answers, to help develop the reader's knowledge and problem-solving skills in hydrogeology. This highly informative and accessible textbook is essential reading for undergraduate and graduate students primarily in earth sciences, environmental sciences and physical geography with an interest in hydrogeology or groundwater topics. The book will also find use among practitioners in hydrogeology, soil science, civil engineering and landscape planning who are involved in environmental and resource protection issues requiring an understanding of groundwater.

The pace of revolution in analytical chemistry in the field of Geosciences has been dramatic over the recent decades and includes fundamental developments that have become common place in many related and unrelated disciplines. The analytical tools (nano to macro-scale from stable to radioactive isotopes to synchrotron imaging) used have been applied to wide-ranging applications from inorganic to organic geochemistry, biodiversity and chronological tools, to build an understanding of how the Earth system evolved to its present state. This book will provide an essential guide to exploring the earth's natural resources and changing climate by detection science. Individual chapters bring together expertise from across the globe to present a comprehensive

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outlook on the analytical technologies available to the geoscientist today. Experienced researchers will appreciate the broad treatment of the subject as a valuable reference, while students and those new to the field will quickly gain an appreciation of both the techniques at hand, and the importance of constructing, and analysing, the complex data sets they can generate.

This two-volume reference serves as a handbook containing a wealth of information for all isotope chemists working in a wide range of disciplines including anthropology to ecology; drug detection methodology to toxicology; nutrition to food science; and the atmospheric sciences to geochemistry. Complementing the first volume, Volume II includes matters that are not strictly confined to the analytical techniques themselves, but relate to analysis of stable isotopes, such as the views on the development of mass spectrometers, isotopic scales, standards and references, and directives for setting up a laboratory. ALSO AVAILABLE: Volume I: Dec. 2004, 0444511148/9780444511140, \$176.00 Volume I and II (set): Oct. 2007, 0444511164/9780444511164, \$205.00 *

Presents an encyclopedic overview of stable isotope analytical techniques in an objective way * Includes descriptions of methods and diagrams of analytical devices * Addresses how older techniques formed the basis for present-day techniques, which can be useful in constructing modern analytical systems * Complements Volume I of the set

The aim of this book is to unlock the power of the freeware R language to advanced

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university students and researchers dealing with whole-rock geochemistry of (meta-) igneous rocks. The first part covers data input/output, calculation of commonly used indexes and plotting in R. The core of the book then focusses on the presentation and practical implementations of modelling techniques used for fingerprinting processes such as partial melting, fractional crystallization, binary mixing or AFC using major-, trace-element and radiogenic isotope data. The reader will be given a firm theoretical basis for forward/reverse modelling, followed by exercises dealing with typical problems likely to be encountered in real life, and their solutions using R. The concluding sections demonstrate, using practical examples, how a researcher can proceed in developing a realistic model simulating natural systems. The appendices outline the fundamentals of the R language and provide a quick introduction to the open-source R-package GCDkit for interpretation of whole-rock geochemical data from igneous and metamorphic rocks. This book is a marked departure from typical introductory geochemistry books available: It provides a simple, straightforward, applied, and down-to-earth no-nonsense introduction to geochemistry. It is for the undergraduate students who are introduced to the subject for the first time, but also for practicing geologists who do not need the heavy-duty theory, but some clear, simple, and useful practical tips and pointers. This book, written from the point of view of a practicing geologist, introduces the fundamental and most relevant principles of geochemistry, explaining them whenever possible in plain terms. Crucially, this textbook covers in a single volume! practical and

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useful topics that other introductory geochemistry books ignore, such as sampling and sample treatment, analytical geochemistry, data treatment and geostatistics, classification and discrimination diagrams, geochemical exploration, and environmental geochemistry. The main strengths of this book are the breadth of useful and practical topics, the straightforward and approachable way in which it is written, the numerous real-world and specific geological examples, and the exercises and review questions (using real-world data and providing on-line answers). It is therefore easily understood by the beginner geochemist or any geologist who desires to use geochemistry in their daily work.

This book provides an overview of the fundamentals and reference values for Ca stable isotope research, as well as current analytical methodologies including detailed instructions for sample preparation and isotope analysis. As such, it introduces readers to the different fields of application, including low-temperature mineral precipitation and biomineralisation, Earth surface processes and global cycling, high-temperature processes and cosmochemistry, and lastly human studies and biomedical applications. The current state of the art in these major areas is discussed, and open questions and possible future directions are identified. In terms of its depth and coverage, the current work extends and complements the previous reviews of Ca stable isotope geochemistry, addressing the needs of graduate students and advanced researchers who want to familiarize themselves with Ca stable isotope research.

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While environmental catastrophes can be naturally occurring, often they are the result of criminal intent or malfeasance. Sorting out the details when the land itself is the only witness requires a special set of investigative skills. For accountability to be established, investigators must be able to answer these questions with a measure of scientific certainty: How and when did the contamination occur? Who caused the contamination? What are the consequences and extent of liability? Offering investigators a complete field manual, *Methods in Environmental Forensics* organizes the work of leading international experts who demonstrate the most effective techniques for determining the source of environmental contaminations. The book begins with the presentation of a case and follows the tasks of an active investigator from the case's inception up through the delivery of expert court testimony. The text then reviews those scientific methods that have been used with success in environmental forensic investigations. Detailed information is provided on chemical fingerprinting techniques as they apply to ground water, soils, sediments, and air. Lastly, the scientific methods presented are examined from a legal perspective with an emphasis on the admissibility and presentation of evidence and the delivery of expert testimony. This unique and comprehensive volume gives forensic chemists, investigators and attorneys the tools needed to solve mysteries of toxic devastation and build cases that will establish the accountability of those responsible. Its editor, Stephen M. Mudge, has been conducting environmental forensic investigations for many years.

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He has served as an expert witness in several environmental contamination cases, and he continues to research new methods for the quantification and source apportionment of chemicals around the world.

The book presents isotope-geochemical investigations of the world's largest reserves of copper, nickel, and platinum-group elements in the Norilsk ore region. Ever since its discovery, generations of geologists have been fascinated by the geology of these deposits, described as a 250 Ma magmatic formation with mafic and ultramafic layered intrusions, disseminated ore and continuous copper-nickel ore bed. The book includes the results of more than 5,000 analyses of eleven isotopic systems, performed at the Russian Research Geological Institute's Center of Isotopic Research between 2005 and 2014. The book is intended for specialists in isotope geology, metallogeny, ore geology and students of geology.

Chemical principles are fundamental to the Earth sciences, and geoscience students increasingly require a firm grasp of basic chemistry to succeed in their studies. The enlarged third edition of this highly regarded textbook introduces the student to such 'geo-relevant' chemistry, presented in the same lucid and accessible style as earlier editions, but the new edition has been strengthened in its coverage of environmental geoscience and incorporates a new chapter introducing isotope geochemistry. The book comprises three broad sections. The first (Chapters 1–4) deals with the basic physical chemistry of geological processes. The second (Chapters 5–8) introduces the wave-mechanical view of the atom and explains the various types of chemical bonding that give Earth materials their diverse and distinctive properties. The final chapters (9–11) survey the geologically relevant elements and isotopes, and explain their formation and their abundances in the cosmos and the Earth. The book

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concludes with an extensive glossary of terms; appendices cover basic maths, explain basic solution chemistry, and list the chemical elements and the symbols, units and constants used in the book.

The state of migration research has undergone rapid change since methods of analysis involving stable and radiogen isotopes and molecular genetics have started to be applied. At a conference held in Berlin in March 2010, groups whose research looks at population dynamics in pre and early, or in more recent history presented their insights about methodological approaches, research results and perspectives. The aim of this volume is to conduct a dialogue between archaeologists, geneticists and archaeometrists for the purpose of a reconstruction of (pre)historic population history.

The International Hydrological Decade (which ended in 1975) led to a revival of hydrological sciences to a degree which, seen in retrospect, is quite spectacular. This research programme had strong government support, no doubt due to an increased awareness of the role of water for prosperous development. Since water quality is an essential ingredient in almost all water use, there was also a considerable interest in hydrochemistry during the Decade. As many concepts in classical hydrology had to be revised during and after the Decade there was also a need for revising hydrochemistry to align it with modern hydrology. A considerable input of fresh knowledge was also made in the recent past by chemists, particularly geochemists, invaluable for understanding the processes of mineralization of natural waters. With all this in mind it seems natural to try to assemble all the present knowledge of hydrochemistry into a book and integrate it with modern hydrology as far as possible, emphasizing the dynamic features of dissolved substances in natural waters. Considering the role of water in nature for

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transfer of substances, this integration is essential for proper understanding of processes in all related earth sciences. The arrangement of subjects in the book is as follows. After a short introductory chapter comes a chapter on elementary chemical principles of particular use in hydrochemistry.

This book provides straightforward and practical information on isotopes applied to a variety of natural sciences. It covers the basics of isotopes and includes detailed examples from a range of natural sciences: ecology, biology, human health, environment and climate, geography, and geology, highlighting their applicability in these fields. It is a must-read for all advanced-undergraduate and graduate students working with isotopes, regardless of the area, and is a very useful one-stop resource for scientists starting in isotope research.

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