

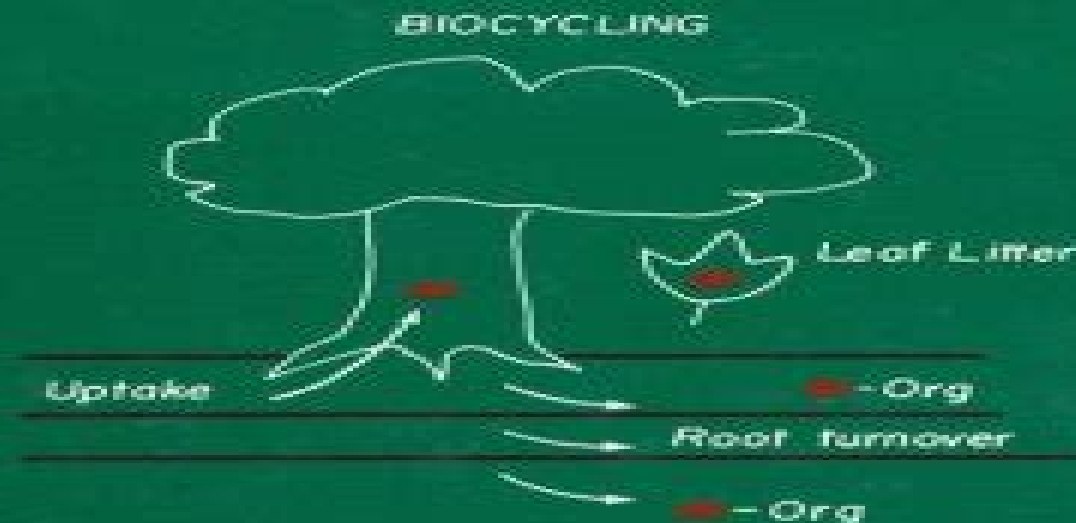
# *metal ions in biological systems*

volume 24

*aluminum and its role in biology*

edited by

**Helmut Sigel**  
with Astrid Sigel



# **Metal Ions In Biological Systems Vol 24 Aluminum And Its Role In Biology**

**Astrid Sigel, Helmut Sigel, Roland K.O.  
Sigel**



## **Metal Ions In Biological Systems Vol 24 Aluminum And Its Role In Biology:**

**Metal Ions in Biological Systems** Helmut Sigel, Astrid Sigel, 1988-08-24 Volume 44 devoted solely to the vital research areas concerning the biogeochemistry of metals and their transport in the environment and availability to living systems offers 9 timely and authoritative chapters on these fascinating topics by 19 internationally recognized experts

**Metal Ions in Biological Systems** Astrid Sigel, Helmut Sigel, 1998-01-09 Volume 35 covers the biological cycling of iron in oceans the transport of iron in microorganisms fungi and plants the roles and properties of siderophores the regulation of iron transport and uptake in animals plants and microorganisms and more

**Metal Ions In Biological Systems, Volume 44** Helmut Sigel, Roland Sigel, 2005-03-01 Volume 44 devoted solely to the vital research areas concerning the biogeochemistry of metals and their transport in the environment and availability to living systems offers 9 timely and authoritative chapters on these fascinating topics by 19 internationally recognized experts

*Metal Ions in Biological Systems, Volume 43 - Biogeochemical Cycles of Elements* Helmut Sigel, Roland Sigel, 2005-02-28 Metal Ions in Biological Systems is devoted to increasing our understanding of the relationship between the chemistry of metals and life processes The volumes reflect the interdisciplinary nature of bioinorganic chemistry and coordinate the efforts of researchers in the fields of biochemistry inorganic chemistry coordination chemistry

**Metal Ions in Biological Systems** Helmut Sigel, 2003-03-27 Many may know lanthanides under the homier name of rare earth elements but that is less used scientifically because they are in fact not at all rare Highlighting fast moving research on lanthanides and their interrelations with biosystems this book emphasizes the recent impact of these metals in biochemical biological and medical research including in magnetic resonance imaging MRI The first two chapters outline their abundance and distribution chemical properties such as oxidation states and ionic radii and their mobilization through microorganisms like bacteria and fungi It is written by 38 internationally recognized experts and enriched with nearly 200 illustrations and 1900 references

*Interplay between Metal Ions and Nucleic Acids* Astrid Sigel, Helmut Sigel, Roland KO Sigel, 2012-01-02 Interplay between Metal Ions and Nucleic Acids provides in an authoritative and timely manner in 12 stimulating chapters written by 24 internationally recognized experts from 8 nations and supported by nearly 1500 references about 20 tables and 125 illustrations many in color a most up to date view on metal ion nucleic acid interactions the characterization of which is covered in solution and in the solid state The volume concentrates on modern developments encompassing topics in the wide range from G quadruplexes via DNazymes catalysis at the DNA scaffold and metal mediated base pairs to peptide nucleic acids PNAs being thus of relevance e g for chemistry and nanotechnology but also for molecular biology and genetic diagnostics

**Metals Ions in Biological System** Astrid Sigel, Helmut Sigel, 2002-03-06 Volume 39 Molybdenum and Tungsten Their Roles in Biological Processes is devoted solely to the vital research area on molybdenum and tungsten and their role in biology It offers a comprehensive and timely account of this fascinating topic by 40 distinguished international authorities Topics include transport homeostasis regulation and

binding of molybdate and tungstate to proteins crystallographic characterization coordination of complexes and biosynthesis

*Colloidal Silica* Horacio E. Bergna, William O. Roberts, 2005-12-19 In spite of the apparent simplicity of silica's composition and structure scientists are still investigating fundamental questions regarding the formation constitution and behavior of colloidal silica systems *Colloidal Silica Fundamentals and Applications* introduces new information on colloid science related to silica chemistry as well

*Essential Metals in Medicine: Therapeutic Use and Toxicity of Metal Ions in the Clinic* Peggy L. Carver, 2019-01-14 Volume 19 entitled *Essential Metals in Medicine Therapeutic Use and Toxicity of Metal Ions in the Clinic* of the series *Metal Ions in Life Sciences* centers on the role of metal ions in clinical medicine Metal ions are tightly regulated in human health while essential to life they can be toxic as well Following an introductory chapter briefly discussing several important metal related drugs and diseases and a chapter about drug development the focus is first on iron its essentiality for pathogens and humans as well as its toxicity Chelation therapy is addressed in the context of thalassemia its relationship to neurodegenerative diseases and also the risks connected with iron administration are pointed out A subject of intense debate is the essentiality of chromium and vanadium For example chromium III compounds are taken as a nutritional supplement by athletes and bodybuilders in contrast chromate Cr VI is toxic and a carcinogen for humans The beneficial and toxic effects of manganese cobalt and copper on humans are discussed The need for antiparasitic agents is emphasized as well as the clinical aspects of metal containing antidotes for cyanide poisoning In addition to the essential and possibly essential ones also other metal ions play important roles in human health causing harm like the metalloids arsenic lead or cadmium or being used in diagnosis or treatment of human diseases like gadolinium gallium lithium gold silver or platinum The impact of this vibrant research area on metals in the clinic is provided in 14 stimulating chapters written by internationally recognized experts from the Americas Europe and China and is manifested by approximately 2000 references and about 90 illustrations and tables *Essential Metals in Medicine Therapeutic Use and Toxicity of Metal Ions in the Clinic* is an essential resource for scientists working in the wide range from pharmacology enzymology material sciences analytical organic and inorganic biochemistry all the way through to medicine not forgetting that it also provides excellent information for teaching

*Structural and Catalytic Roles of Metal Ions in RNA* Astrid Sigel, Helmut Sigel, Roland K.O. Sigel, 2015-07-24 The discovery of ribozymes nearly 30 years ago triggered a huge interest in the chemistry and biology of RNAs Much of the recently made progress focusing on metal ions is addressed in MILS 9 This book written by 28 internationally recognized experts from 8 nations provides a most up to date view and is thus of special relevance for colleagues teaching courses in biological inorganic chemistry and for researchers dealing e.g. with nucleic acids gene expression and enzymology but also for those in analytical and bioinorganic chemistry or biophysics *Structural and Catalytic Roles of Metal Ions in RNA* describes in an authoritative and timely manner in 12 stimulating chapters supported by nearly 1600 references 13 tables and 75 illustrations mostly in color metal ion binding motifs methods to detect and characterize

metal ion binding sites and the role of metal ions in folding and catalysis It deals with diffuse metal ion binding RNA quadruplexes the regulation of riboswitches metal ions and ribozymes including artificial ribozymes The spliceosome the ribosome ribozymes involving redox cofactors as well as the binding of kinetically inert metal ions to RNA are also covered

*Plant Respiration* Hans Lambers, Univ. de les Illes Balears, 2006-03-30 Respiration in plants as in all living organisms is essential to provide metabolic energy and carbon skeletons for growth and maintenance As such respiration is an essential component of a plant's carbon budget Depending on species and environmental conditions it consumes 25-75% of all the carbohydrates produced in photosynthesis even more at extremely slow growth rates Respiration in plants can also proceed in a manner that produces neither metabolic energy nor carbon skeletons but heat This type of respiration involves the cyanide resistant alternative oxidase it is unique to plants and resides in the mitochondria The activity of this alternative pathway can be measured based on a difference in fractionation of oxygen isotopes between the cytochrome and the alternative oxidase Heat production is important in some flowers to attract pollinators however the alternative oxidase also plays a major role in leaves and roots of most plants A common thread throughout this volume is to link respiration including alternative oxidase activity to plant functioning in different environments [Handbook of Elemental Speciation II](#)

, 2005-09-01 Written by an internationally recognized group of editors and contributors Handbook of Elemental Speciation Volume 2 provides a comprehensive cross disciplinary presentation of the analytical techniques involved in speciation Comprehensive coverage of key elements and compounds in situ Addresses the analysis and impact of these elements and compounds e.g. arsenic lead copper iron halogens etc in food the environment clinical and occupational health Detailed methodology and data are reported as well as regulatory limits Includes general introduction on the impact in these key areas *Encyclopedia of Environmental Health*, 2019-08-22 Encyclopedia of Environmental Health Second Edition Six

Volume Set presents the newest release in this fundamental reference that updates and broadens the umbrella of environmental health especially social and environmental health for its readers There is ongoing revolution in governance policies and intervention strategies aimed at evolving changes in health disparities disease burden trans boundary transport and health hazards This new edition reflects these realities mapping new directions in the field that include how to minimize threats and develop new scientific paradigms that address emerging local national and global environmental concerns Represents a one stop resource for scientifically reliable information on environmental health Fills a critical gap with information on one of the most rapidly growing scientific fields of our time Provides comparative approaches to environmental health practice and research in different countries and regions of the world Covers issues behind specific questions and describes the best available scientific methods for environmental risk assessment **Interrelations between**

**Essential Metal Ions and Human Diseases** Astrid Sigel, Helmut Sigel, Roland K.O. Sigel, 2014-01-27 MILS 13 provides an up to date review on the relationships between essential metals and human diseases covering 13 metals and 3 metalloids The

bulk metals sodium potassium magnesium and calcium plus the trace elements manganese iron cobalt copper zinc molybdenum and selenium all of which are essential for life Also covered are chromium vanadium nickel silicon and arsenic which have been proposed as being essential for humans in the 2nd half of the last century However if at all they are needed only in ultra trace amounts and because of their prevalence in the environment it has been difficult to prove whether or not they are required In any case all these elements are toxic in higher concentrations and therefore transport and cellular concentrations of at least the essential ones are tightly controlled hence their homeostasis and role for life including deficiency or overload and their links to illnesses including cancer and neurological disorders are thoroughly discussed Indeed it is an old wisdom that metals are indispensable for life Therefore Volume 13 provides in an authoritative and timely manner in 16 stimulating chapters written by 29 internationally recognized experts from 7 nations and supported by more than 2750 references and over 20 tables and 80 illustrations many in color a most up to date view on the vibrant research area of the Interrelations between Essential Metal Ions and Human Diseases Handbook on Metalloproteins Ivano Bertini, Astrid Sigel, 2001-06-29 This Handbook on Metalloproteins focuses on the available structural information of proteins and their metal ion coordination spheres It centers on the metal ions indispensable for life but also considers metal ions used as substitution probes in studies of metalloproteins Emphasizing the structure function relationship the book covers the common

**The Alkali Metal Ions: Their Role for Life** Astrid Sigel, Helmut Sigel, Roland K. O. Sigel, 2016-02-09 MILS 16 provides an up to date review of the impact of alkali metal ions on life Their bioinorganic chemistry and analytical determination the solid state structures of bio ligand complexes and the properties of alkali metal ions in solution in the context of all kinds of biologically relevant ligands are covered this includes proteins enzymes and nucleic acids G quadruplexes Minerals containing sodium Na and potassium K are abundant in the Earth's crust making Na and K easily available In contrast the alkali elements lithium Li rubidium and cesium are rare and the radioactive francium occurs only in traces Since the intra and extracellular as well as the compartmental concentrations of Na and K differ significantly homeostasis and active transport of these ions are important this involves transporters carriers and pore forming ion channel proteins Systems like Na K ATPases H K ATPases or Na H antiporters are thoroughly discussed The role of K in photosynthesis and the role of Na in charging the battery of life are pointed out Also the relationships between alkali metal ions and diseases e g Parkinson or traumatic brain injury are covered and the relevance of Li salts in medicine pharmacology and mechanism is reviewed This and more is treated in an authoritative and timely manner in the 16 stimulating chapters of Volume 16 The Alkali Metal Ions Their Role for Life which are written by 44 internationally recognized experts from 12 nations The impact of this vibrant research area is manifested in nearly 3000 references over 30 tables and more than 150 illustrations two thirds in color MILS 16 also provides excellent information for teaching Astrid Sigel Helmut Sigel and Roland K O Sigel have long standing interests in Biological Inorganic Chemistry Their research focuses on metal ion

interactions with nucleotides and nucleic acids and on related topics They edited previously 44 volumes in the series Metal Ions in Biological Systems

**Reviews of Environmental Contamination and Toxicology** George W. Ware, Francis A. Gunther, 2012-12-06 International concern in scientific industrial and governmental communities over traces of xenobiotics in foods and in both abiotic and biotic environments has justified the present triumvirate of specialized publications in this field comprehensive reviews rapidly published research papers and progress reports and archival documentations These three international publications are integrated and scheduled to provide the coherency essential for nonduplicative and current progress in a field as dynamic and complex as environmental contamination and toxicology This series is reserved exclusively for the diversified literature on toxic chemicals in our food our feeds our homes recreational and working surroundings our domestic animals our wildlife and ourselves Tremendous efforts worldwide have been mobilized to evaluate the nature presence magnitude fate and toxicology of the chemicals loosed upon the earth Among the sequelae of this broad new emphasis is an undeniable need for an articulated set of authoritative publications where one can find the latest important world literature produced by these emerging areas of science together with documentation of pertinent ancillary legislation Research directors and legislative or administrative advisers do not have the time to scan the escalating number of technical publications that may contain articles important to current responsibility Rather these individuals need the background provided by detailed reviews and the assurance that the latest information is made available to them all with minimal literature searching

*Homeostasis and Toxicology of Non-essential Metals* Chris M. Wood, Anthony Peter Farrell, Colin J. Brauner, 2012 Homeostasis and Toxicology of Non Essential Metals synthesizes the explosion of new information on the molecular cellular and organismal handling of metals in fish in the past 15 years These elements are no longer viewed by fish physiologists as heavy metals that kill fish by suffocation but rather as interesting moieties that enter and leave fish by specific pathways which are subject to physiological regulation The metals featured in this volume are those about which there has been most public and scientific concern and therefore are those most widely studied by fish researchers Metals such as Ag Al Cd Pb Hg As Sr and U have no known nutritive function in fish at present but are toxic at fairly low levels The companion volume Homeostasis and Toxicology of Essential Metals Volume 31A covers metals that are either proven to be or are strongly suspected to be essential in trace amounts yet are toxic in higher doses Metals such as Cu Zn Fe Ni Co Se Mo and Cr In addition three chapters in Volumes 31A and 31B on Basic Principles Chapter 1 31A Field Studies and Ecological Integration Chapter 9 31A and Modeling the Physiology and Toxicology of Metals Chapter 9 31B act as integrative summaries and make these two volumes a vital set for readers All major essential metals of interest are covered in metal specific chapters Each metal specific chapter is written by fish physiologists toxicologists who are recognized authorities for that metal A common format is featured throughout this two volume edition

Fish Physiology: Homeostasis and Toxicology of Non-Essential Metals ,2011-07-01 Homeostasis and Toxicology of Non Essential Metals

synthesizes the explosion of new information on the molecular cellular and organismal handling of metals in fish in the past 15 years. These elements are no longer viewed by fish physiologists as heavy metals that kill fish by suffocation but rather as interesting moieties that enter and leave fish by specific pathways which are subject to physiological regulation. The metals featured in this volume are those about which there has been most public and scientific concern and therefore are those most widely studied by fish researchers. Metals such as Ag, Al, Cd, Pb, Hg, As, Sr, and U have no known nutritive function in fish at present but are toxic at fairly low levels. The companion volume *Homeostasis and Toxicology of Essential Metals* Volume 31A covers metals that are either proven to be or are strongly suspected to be essential in trace amounts yet are toxic in higher doses. Metals such as Cu, Zn, Fe, Ni, Co, Se, Mo, and Cr. In addition, three chapters in Volumes 31A and 31B on Basic Principles Chapter 1 31A Field Studies and Ecological Integration Chapter 9 31A and Modeling the Physiology and Toxicology of Metals Chapter 9 31B act as integrative summaries and make these two volumes a vital set for readers. All major essential metals of interest are covered in metal specific chapters. Each metal specific chapter is written by fish physiologists, toxicologists who are recognized authorities for that metal. A common format is featured throughout this two volume edition.

*Metal Ions in Toxicology* Astrid Sigel, Helmut Sigel, Roland K. O. Sigel, 2011. It is an old wisdom that metals are indispensable for life. Indeed several of them like sodium, potassium, and calcium are easily discovered in living matter. However, the role of metals and their impact on life remained largely hidden until inorganic chemistry and coordination chemistry experienced a pronounced revival in the 1950s. The experimental and theoretical tools created in this period and their application to biochemical problems led to the development of the field or discipline now known as Bioinorganic Chemistry. Inorganic Biochemistry or more recently also often addressed as Biological Inorganic Chemistry. By 1970 Bioinorganic Chemistry was established and further promoted by the book series *Metal Ions in Biological Systems* founded in 1973, edited by H. S. who was soon joined by A. S. and published by Marcel Dekker Inc. New York for more than 30 years. After this company ceased to be a family endeavor and its acquisition by another company, we decided after having edited 44 volumes of the MIBS series, the last two together with R. K. O. S. to launch a new and broader minded series to cover today's needs in the Life Sciences. Therefore, the Sigel's new series is entitled *Metal Ions in Life Sciences*. After publication of the first four volumes 2006-2008 with John Wiley, a most experienced Publisher in the Sciences.



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