

# *metal ions in biological systems*

volume 16

*methods involving metal ions and complexes  
in clinical chemistry*

edited by

Helmut Sigel



# **Metal Ions Volume 4**

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



## **Metal Ions Volume 4:**

**Neurodegenerative Diseases and Metal Ions** Astrid Sigel, Helmut Sigel, Roland K. O. Sigel, 2006-07-11 About the Series Metal Ions in Life Sciences links coordination chemistry and biochemistry in their widest sense and thus increases our understanding of the relationship between the chemistry of metals and life processes The series reflects the interdisciplinary nature of Biological Inorganic Chemistry and coordinates the efforts of scientists in fields like biochemistry inorganic chemistry coordination chemistry molecular and structural biology enzymology environmental chemistry physiology toxicology biophysics pharmacy and medicine Consequently the volumes are an essential source for researchers active in these and related fields as well as teachers preparing courses e g in Bioinorganic Chemistry About this Book Volume 1 devoted solely to the vital research area concerning the role of metal ions in neurodegenerative diseases offers in 15 stimulating chapters an authoritative and timely view of this fascinating subject Written by 41 internationally recognized experts Neurodegenerative Diseases and Metal Ions highlights supported by 130 illustrations the recent progress made in understanding the role metal ions play in diseases like transmissible spongiform encephalopathies Creutzfeldt Jakob and related diseases Alzheimer s Parkinson s Huntington s Wilson s and Menkes diseases as well as in familial amyotrophic lateral sclerosis and others The interplay between metal ions catecholamines and the formation of reactive oxygen species resulting in oxidative stress is considered as is the metalloneurochemistry of zinc and the neurotoxicity of aluminum cadmium lead and mercury The need for novel drugs which manipulate metal centered neuropathology is emphasized

Metal Ions in Toxicology: Effects, Interactions, Interdependencies Astrid Sigel, Helmut Sigel, Roland K.O. Sigel, 2015-07-24 Volume 8 solely devoted to the toxicology of metals and metalloids as well as their compounds focuses on human health Not surprisingly all related research areas are rapidly developing due to the role of metals and metalloids in the environment for the work place for food and water supply etc Written by 40 internationally recognized experts the 14 stimulating chapters provide an authoritative and timely resource for scientists working in the wide range from analytical physical inorganic and environmental biochemistry all the way through to toxicology physiology and medicine Volume 8 highlights supported by nearly 1900 references in a comprehensive and timely manner the principles of risk assessment regarding the effects of metals on human health It examines how metal ions and their compounds affect the pulmonary cardiovascular gastrointestinal including liver hematological immune and neurological systems the kidney skin and eyes as well as human reproduction and development MILS 8 terminates with the role of metal ions as endocrine disrupters in genotoxicity and cancer risk

**Metal Ions in Bio-Imaging Techniques** Astrid Sigel, Eva Freisinger, Roland K.O. Sigel, 2021-03-08 Volume 22 entitled Metal Ions in Bio Imaging Techniques of the series Metal Ions in Life Sciences deals with metal ions as tools in imaging This dates back to the first half of the past century when barium sulfate was orally given to patients undergoing X ray examination The use of contrast agents has since developed into a large interdisciplinary field encompassing not only

medicine but also chemistry material sciences physics biology engineering and computer sciences MILS 22 provides deep and current insights in 17 stimulating chapters on the new research frontiers of this fast growing field on bio imaging and beyond For example adding bio sensing yields theranostic agents meaning diagnosis and therapy linked in the same molecule ions of Gd Mn Fe Co Ir  $^{99m}\text{Tc}$  etc are involved Other important topics are e g metal complexes in paramagnetic Chemical Exchange Transfer paraCEST radiometals for Positron Emission Tomography PET imaging or paramagnetic metal ion probes for  $^{19}\text{F}$  magnetic resonance imaging MILS 22 is written by 57 internationally recognized experts from 12 countries that is from the US via Europe to China The impact of this vibrant research area is manifested by more than 2300 references and nearly 120 figures mostly in color and several informative tables To conclude Metal Ions in Bio Imaging Techniques is an essential resource for scientists working in the wide range from material sciences enzymology analytic organic and inorganic biochemistry all the way through to medicine including the clinic not forgetting that also excellent information for teaching is provided *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 metalloid 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 *Metal Ions in Biological Systems* Helmut Sigel, Astrid Sigel, 2024-11-01 Continuing to explore the relationship between the chemistry of metals and life processes this volume in the Metal Ions in Biological Systems series examines the

degradation of environmental pollutants by micro organisms It covers the action of micro organisms and metalloenzymes on lignin tannins hemicelluloses cellulose and aromatic compounds as well as on halogenated aromatics and aliphatics analyzes mechanistic aspects considers the role of metalloproteases in biotechnology and wastewater sludge treatment and describes the metal dependent conversion of inorganic nitrogen and sulfur compounds **Metallothioneins and Related Chelators**

Astrid Sigel, Helmut Sigel, Roland K.O. Sigel, 2015-07-24 These sulfur rich chelators being important in metal ion homeostasis find increasing attention MILS 5 written by 30 internationally recognized experts focuses on this hot topic The reader is supported by about 20 tables more than 80 illustrations and nearly 2000 references This book is an essential resource for scientists working in a wide range of disciplines from environmental toxicology and inorganic biochemistry all the way through to physiology and medicine Interplay between Metal Ions and Nucleic Acids Astrid Sigel, Helmut Sigel, Roland K.O. 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 **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 Metallomics and the Cell Lucia Banci, 2013-04-18

Metallomics and the Cell provides in an authoritative and timely manner in 16 stimulating chapters written by 37 internationally recognized experts from 9 nations and supported by

more than 3000 references several tables and 110 illustrations mostly in color a most up to date view of the metallomes which as defined in the omics world describe the entire set of biomolecules that interact with or are affected by each metal ion The most relevant tools for visualizing metal ions in the cell and the most suitable bioinformatic tools for browsing genomes to identify metal binding proteins are also presented Thus MILS 12 is of relevance for structural and systems biology inorganic biological chemistry genetics medicine diagnostics as well as teaching etc

**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

Metallo-Drugs: Development and Action of Anticancer Agents Astrid Sigel, Helmut Sigel, Eva Freisinger, Roland K.O. Sigel, 2018-02-05 Volume 18 entitled Metallo Drugs Development and Action of Anticancer Agents of the series Metal Ions in Life Sciences centers on biological medicinal inorganic chemistry The serendipitous discovery of the antitumor activity of cis diamminodichloroplatinum II cisplatin by Barnett Rosenberg in the 1960s is a landmark in metallodrug based chemotherapy The success of cisplatin in the clinic followed by oxaliplatin and carboplatin along with their drawbacks relating mainly to resistance development and severe toxicity initiated research on polynuclear platinum complexes and on Pt IV complexes as prodrugs Furthermore the indicated shortcomings led to the exploration of other transition and main group metal ions among them Ru II III Au I III Ti IV V IV V and Ga III including also the essential metal ions Fe II III Cu I II and Zn II Ionic as well as covalent and non covalent interactions between structurally very different complexes and biomolecules like nucleic acids proteins and carbohydrates are studied and discussed with regard to their possible anticancer actions Hence MILS 18 summarizes the research at the forefront of medicinal inorganic chemistry including studies on the next generation tailor made anticancer drugs All this and more is treated in an authoritative and timely manner in the 17 stimulating chapters of this book written by 39 internationally recognized experts from 10 nations from the US via Europe to China and Australia The impact of this vibrant research area is manifested by more than 2700 references nearly 150 illustrations more than half in color and several comprehensive tables Metallo Drugs

Development and Action of Anticancer Agents is an essential resource for scientists working in the wide range from enzymology material sciences analytical organic and inorganic biochemistry all the way through to medicine including the clinic not forgetting that it also provides excellent information for teaching

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

**Organometallics in Environment and Toxicology** Astrid Sigel, Helmut Sigel, Roland K. O. Sigel, 2015-07-24 Volume 7 devoted to the vital and rapidly expanding research area around metal carbon bonds see also MILS 6 focuses on the environment With more than 2500 references 35 tables and nearly 50 illustrations many of these in color it is an essential resource for scientists working in the wide range from organometallic chemistry inorganic biochemistry environmental toxicology all the way through to physiology and medicine In 14 stimulating chapters written by 29 internationally recognized experts Organometallics in Environment and Toxicology highlights in an authoritative and timely manner environmental cycles of elements involving organometalloid compounds as well as the analytical determination of such species This book examines methane formation involving the nickel coenzyme F430 as well as the organometalloid compounds formed by tin lead arsenic antimony bismuth selenium tellurium and mercury In addition it deals with the environmental bioindication biomonitoring and bioremediation of organometalloid s and it terminates with methylated metalloid species occurring in humans by evaluating assumed and proven health effects caused by these

compounds      **Metals, Microbes, and Minerals - The Biogeochemical Side of Life** Peter Kroneck, Martha Sosa Torres, 2021-01-18 One of the biggest questions in today's biochemistry is how biological molecules became essential for the processes that occur within living cells This new book from outstanding Metal Ions in Life Science series gives an overview about biochemical evolution of organic molecules and metabolic pathways in living systems and outlines the vital biochemical processes in microbial cells in which metals are involved      Metal-Carbon Bonds in Enzymes and Cofactors Astrid Sigel, Helmut Sigel, Roland K.O. Sigel, 2015-07-24 The occurrence of a wide variety of metal carbon bonds in living organisms ranging from bacteria to humans is only recently recognized Of course the historical examples are the B12 coenzymes containing cobalt carbon bonds but now such bonds are also known for nickel iron copper and other transition metal ions There is no other comparable book MILS 6 written by 17 experts summarizes the most recent insights into this fascinating topic      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 Sigels 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      **Transition Metals and Sulfur - A Strong Relationship for Life** Martha Sosa Torres, Peter Kroneck, 2020-04-06 Metal Sulfur clusters play an essential role in living organisms through the unique character of sulfur metal bonding The new volume in prestigious Metal Ions in Life Sciences explores different transition metal complexes with sulfur their biosynthesis and biological functions in regulation of gene expression catalysis of important metabolic reactions and protein structure arrangement      **Handbook on Metals in Clinical and Analytical Chemistry** Hans Seiler, Astrid Sigel, Helmut Sigel, 1994-01-25 Describes general aspects of metals in clinical chemistry focusing not only on the physiology of metal ions and their analytical determination in biological materials but also on their geochemical distribution technical uses and environmental effects      Lead: Its Effects on Environment and Health Astrid Sigel, Helmut Sigel, Roland K.O. Sigel, 2017-04-10 Volume 17 entitled Lead Its Effects on Environment and Health of the series Metal Ions in Life Sciences centers on the interrelations between biosystems and lead



The book provides an up to date review of the bioinorganic chemistry of this metal and its ions it covers the biogeochemistry of lead its use not only as gasoline additive and anthropogenic release into the environment its cycling and speciation in the atmosphere in waters soils and sediments and also in mammalian organs The analytical tools to determine and to quantify this toxic element in blood saliva urine hair etc are described The properties of lead II complexes formed with amino acids peptides proteins including metallothioneins nucleobases nucleotides nucleic acids and other ligands of biological relevance are summarized for the solid state and for aqueous solutions as well All this is important for obtaining a coherent picture on the properties of lead its effects on plants and toxic actions on mammalian organs This and more is treated in an authoritative and timely manner in the 16 stimulating chapters of Volume 17 which are written by 36 internationally recognized experts from 13 nations The impact of this recently again vibrant research area is manifested in nearly 2000 references over 50 tables and more than 100 illustrations half in color Lead Its Effects on Environment and Health is an essential resource for scientists working in the wide range from material sciences inorganic biochemistry all the way through to medicine including the clinic not forgetting that it also provides excellent information for teaching

**Nickel and Its Surprising Impact in Nature** Astrid Sigel, Helmut Sigel, Roland K. O. Sigel, 2007-03-13 Helmut Sigel Astrid Sigel and Roland K O Sigel in close cooperation with John Wiley Sons launch a new Series Metal Ions in Life Sciences The philosophy of the Series is based on the one successfully applied to a previous series published by another publisher but the move from biological systems to life sciences will open the aims and scope and allow for the publication of books touching on the interface between chemistry biology pharmacology biochemistry and medicine Volume 2 focuses on the vibrant research area concerning nickel as well as its complexes and their role in Nature With more than 2 800 references and over 130 illustrations it is an essential resource for scientists working in the wide range from inorganic biochemistry all the way through to medicine In 17 stimulating chapters written by 47 internationally recognized experts Nickel and Its Surprising Impact in Nature highlights critically the biogeochemistry of nickel its role in the environment in plants and cyanobacteria as well as for the gastric pathogen *Helicobacter pylori* for gene expression and carcinogenesis In addition it covers the complex forming properties of nickel with amino acids peptides phosphates nucleotides and nucleic acids The volume also provides sophisticated insights in the recent progress made in understanding the role of nickel in enzymes such as ureases hydrogenases superoxide dismutases acireductone dioxygenases acetyl coenzyme A synthases carbon monoxide dehydrogenases methyl coenzyme M reductases and it reveals the chaperones of nickel metabolism

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web jul 9 2023 bunnacula isn t a typical rabbit the young creature is a vampire rabbit but unlike most vampires he doesn t drink blood instead he drains the juice out of carrots and other vegetables to help him increase his supernatural abilities which sometimes leads to trouble including when he unleashes a mummified monkey into his apartment

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web bunnacula is the main protagonist of tv series of the same name bunnacula is a cute vampire rabbit his body colors are black and white he has a black back that consists of a pattern extending from part of his forehead all the way to his tail the white part of bunnacula s body appears in a

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web mina builds a vegetable monster for her science project but when a blast of static electricity brings the creature to life bunnacula instantly falls for her charms fluffy the vampire pointer sets out to vanquish bunnacula once and for all when she suspects mina and her pets are under his control

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