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*Astrid Sigel, Helmut Sigel,
Roland K. O. Sigel (Eds.)*

METAL IONS IN LIFE SCIENCES

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, biophysics, enzymology, environmental chemistry, physiology, toxicology, 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.

METAL IONS IN LIFE SCIENCES



Note, from Volume 19 on H.S. is replaced as an Editor of the *MILS* series by his daughter-in-law Eva Freisinger

Book Series edited (see also www.bioinorganic-chemistry.org/mils)

Scheduled (contents tentative):

"Metal Ions in Bio-Imaging Techniques" :

Volume 22 of *Metal Ions in Life Sciences* (ISSN: 1559-0836; e-ISSN: 1868-0402)

Editors: Astrid Sigel, Eva Freisinger, and Roland K. O. Sigel;
Walter de Gruyter, GmbH, Berlin, Germany; 2021

1. Metal Ions in Bio-Imaging Techniques: A Short Overview

Sergej Shuvaev and Peter Caravan

2. Gadolinium(III)-Based Contrast Agents for Magnetic Resonance Imaging: A Re-Appraisal

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3. Manganese Complexes and Manganese-Based Nanostructures as Contrast Agents for Magnetic Resonance Imaging

Sara Lacerda, Daouda Ndiaye, and Éva Tóth

4. Responsive Magnetic Resonance Imaging Contrast Agents for *in vivo* Imaging of Metal Ions (Ca, Fe, Cu, Zn, etc.)

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6. Lanthanide Complexes Used for Optical Imaging

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7. Radiometals for Positron Emission Tomography (PET) Imaging

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8. 99m Technetium-Based Imaging Agents and Developments in ^{99}Tc Chemistry

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In Press:

"Metals, Microbes, and Minerals: The Biogeochemical Side of Life"
Volume 21 of Metal Ions in Life Sciences (ISSN: 1559-0836; e-ISSN: 1868-0402)

Guest editors: **Peter M. H. Kroneck**, University of Konstanz, Germany, and **Martha E. Sosa Torres**, Universidad Nacional Autónoma de México, México

Series editors: Astrid Sigel, Eva Freisinger, and Roland K. O. Sigel; Walter de Gruyter, GmbH, Berlin, Germany; 2020/2021

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2. Microbes: Masters of the Global Element Cycles
Bernhard Schink
3. Biological Isotope Fractionation and Earth History: From Enzymes to Cells, to Ecosystems
Shawn E. McGlynn
4. Imaging Trace Metals in Biological Systems
Jiyao Yu, Shefali Harankhedkar, Arielle Nabatilan, and Christoph J. Fahrni
5. Minerals and the Emergence of Life
Simon Duval, Kilian Zuchan, Frauke Baymann, Barbara Schoepp-Cothenet, Elbert Branscomb, Michael J. Russell, and Wolfgang Nitschke
6. The Formation of Iron Biominerals in Magnetotactic Bacteria
René Uebe and Dirk Schüler
7. Living on Iron
Stefanie Becker, Allison M. L. Enright, and Andreas Kappler
8. Extracellular Redox Chemistry

Inês B. Trindade, Caterina M. Paquete, and Ricardo O. Louro

9. Coping with Toxic Metals

Zhiguang Xiao and Anthony G. Wedd

10. The Biochemistry of Rare Earth Elements

Lena J. Daumann and Huub J. M. Op den Camp

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Published:

"Transition Metals and Sulfur: A Strong Relationship for Life"

Volume 20 of *Metal Ions in Life Sciences* (ISSN: 1559-0836; e-ISSN: 1868-0402. ISBN: 978-3-11-058889-7; e-ISBN (PDF): 978-3-11-058975-7; e-ISBN (EPUB): 978-3-11-058894-1. DOI: 10.1515/9783110588897) Guest editors: **Martha E. Sosa Torres**, Universidad Nacional Autónoma de México, México, and **Peter M. H. Kroneck**, University of Konstanz, Germany

Series editors: Astrid Sigel, Eva Freisinger, and Roland K. O. Sigel; Walter de Gruyter, GmbH, Berlin, Germany; 2020

1. Introduction: Transition Metals and Sulfur

Martha E. Sosa Torres and Peter M. H. Kroneck

2. Sulfur, the Versatile Non-metal

Martha E. Sosa Torres, Alfonso Rito Morales, Alejandro Solano Peralta, and Peter M. H. Kroneck

3. The Type 1 Blue Copper Site: From Electron Transfer to Biological Function

Trinidad Arcos-López, Nils Schuth, and Liliana V. Quintanar

4. Purple Mixed-Valent Copper A

Marcos N. Morgada, Daniel H. Murgida, and Alejandro J. Vila

5. The Tetranuclear Copper-Sulfide Center of Nitrous Oxide Reductase

Sofia R. Pauleta, Marta S. P. Carepo, and Isabel Moura

6. Cytochrome P₄₅₀. The Dioxygen-Activating Heme Thiolate
F. Miguel Castro Martínez, R. Daniel Páez López, Pedro D. Sarmiento Pavía, Martha E. Sosa Torres, and Peter M. H. Kroneck
7. Basic Iron-Sulfur Centers
Claudia Andreini and Simone Ciofi-Baffoni
8. The Cofactors of Nitrogenases
Ivana Djurdjevic, Christian Trncik, Michael Rohde, Jakob Gies, Katharina Grunau, Florian Schneider, Susana L. A. Andrade, and Oliver Einsle
9. Molybdenum and Tungsten Cofactors and the Reactions They Catalyze
Khadanand KC and Martin L. Kirk
10. The Siroheme-[4Fe-4S] Coupled Center
Isabel Askenasy and M. Elizabeth Stroupe
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Gaetano Malgieri, Luigi Russo, Gianluca D'Abrosca, Ilaria Baglivo, Paolo V. Pedone, Roberto Fattorusso, and Carla Isernia

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"Essential Metals in Medicine: Therapeutic Use and Toxicity of Metal Ions in the Clinic"

Volume 19 of *Metal Ions in Life Sciences* (ISSN: 1559-0836; e-ISSN: 1868-0402. ISBN: 978-3-11-052691-2; e-ISBN (PDF): 978-3-11-052787-2; e-ISBN (EPUB): 978-3-11-052698-1. DOI: 10.1515/9783110527872)

Guest editor: **Peggy L. Carver**, University of Michigan, USA

Series editors: Astrid Sigel, Eva Freisinger, and Roland K. O. Sigel;
Walter de Gruyter, GmbH, Berlin, Germany; 2019, 456 pages

1. Metals in Medicine: The Therapeutic Use of Metal Ions in the Clinic
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2. Small Molecules: The Past or the Future in Drug Innovation?
Anne Robert, Françoise Benoit-Vical, Yan Liu, and Bernard Meunier
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Guido Crisponi, Valeria M. Nurchi, and Joanna I. Lachowicz
4. Ironing out the Brain
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5. Infections Associated with Iron Administration
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6. Iron Oxide Nanoparticle Formulations for Supplementation
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7. Building a Trojan Horse: Siderophore-Drug Conjugates for the Treatment of Infectious Diseases
Elzbieta Gumienna-Kontecka and Peggy L. Carver
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10. Manganese: Its Role in Disease and Health
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11. Cobalt-Schiff Base Complexes: Preclinical Research and Potential Therapeutic Uses
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13. Metal Compounds in the Development of Antiparasitic Agents:
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"Metallo-Drugs: Development and Action of Anticancer Agents"
Volume 18 of Metal Ions in Life Sciences (ISSN: 1559-0836; e-ISSN: 1868-0402. ISBN: 978-3-11-046984-4; e-ISBN (PDF): 978-3-11-047073-4; e-ISBN (EPUB): 978-3-11-046990-5; Set-ISBN: 978-3-11-047074-1. DOI: 10.1515/9783110470734)
Editors: Astrid Sigel, Helmut Sigel, Eva Freisinger, and Roland K. O. Sigel; Walter de Gruyter, GmbH, Berlin, Germany; 2018, 630 pages

1. Cisplatin and Oxaliplatin: Our Current Understanding of Their Actions
Imogen A. Riddell and Stephen J. Lippard

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Viktor Brabec, Jana Kasparkova, Vijay Menon, and Nicholas P. Farrell

3. Platinum(IV) Prodrugs
V. Venkatesh and Peter J. Sadler

4. Metalloglycomics
Nicholas P. Farrell, Anil K. Gorle, Erica J. Peterson, and Susan J. Berners-Price

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Enzo Alessio and Luigi Messori

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Maria V. Babak and Wee Han Ang

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Angela Casini, Raymond Wai-Yin Sun, and Ingo Ott

8. Coordination Complexes of Titanium(IV) for Anticancer Therapy

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"Lead: Its Effects on Environment and Health"

Volume 17 of *Metal Ions in Life Sciences* (ISSN: 1559-0836; e-ISSN: 1868-0402. ISBN: 978-3-11-044107-9; e-ISBN (PDF): 978-3-11-043433-0; e-ISBN (EPUB): 978-3-11-043301-2; Set-ISBN: 978-3-11-043434-7. DOI: 10.1515/9783110434330)

Editors: Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel; Walter de Gruyter, GmbH, Berlin, Germany; 2017, 596 pages

1. The Bioinorganic Chemistry of Lead in the Context of Its Toxicity
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Astrid Sigel, Bert P. Operschall, and Helmut Sigel
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14. Environmental Impact of Alkyl Lead(IV) Derivatives: Perspective after Their Phase-out
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"The Alkali Metal Ions: Their Role for Life" (ISBN: 978-3-319-21755-0; e-book: 978-3-319-21756-7) (DOI: 10.1007/978-3-319-21756-7)
Volume 16 of *Metal Ions in Life Sciences* (ISSN: 1559-0836; electronic: 1868-0402)

Editors: Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel; Springer International Publishing, Cham, Switzerland; 2016, 669 pages

1. Bioinorganic Chemistry of the Alkali Metal Ions
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2. Determination of Alkali Ions in Biological and Environmental Samples
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Volume 15 of Metal Ions in Life Sciences (ISSN: 1559-0836; electronic: 1868-0402)

Guest editors: **Peter M. H. Kroneck**, University of Konstanz, Germany, and **Martha E. Sosa Torres**, Universidad Nacional Autónoma de México, México

Series editors: Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel;

Springer International Publishing, Cham, Switzerland; 2015, 364 pages

1. The Magic of Dioxygen

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2. Light-Dependent Production of Dioxygen in Photosynthesis

Junko Yano, Jan Kern, Vittal K. Yachandra, Håkan Nilsson, Sergey Koroidov, and Johannes Messinger

3. Production of Dioxygen in the Dark: Dismutases of Oxyanions

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4. Respiratory Conservation of Energy with Dioxygen: Cytochrome *c* Oxidase

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Volume 14 of Metal Ions in Life Sciences (ISSN: 1559-0836; electronic: 1868-0402)

Guest editors: **Peter M. H. Kroneck**, University of Konstanz, Germany, and **Martha E. Sosa Torres**, Universidad Nacional Autónoma de México, México

Series editors: Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel;
Springer SBM, Dordrecht, The Netherlands; 2014, 368 pages

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(ISBN: 978-94-007-7499-5; e-book: 978-94-007-7500-8) (DOI:
10.1007/978-94-007-7500-8)
Volume 13 of Metal Ions in Life Sciences (ISSN: 1559-0836; electronic:
1868-0402)
edited by Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel; Springer
SBM, Dordrecht, The Netherlands; 2013, 610 pages

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16. Selenium. Role of the Essential Metalloid in Health
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"**Metallomics and the Cell**" (ISBN: 978-94-007-5560-4; e-book: 978-94-007-5561-1) (DOI: 10.1007/978-94-007-5561-1)

Volume 12 of *Metal Ions in Life Sciences* (ISSN: 1559-0836; electronic: 1868-0402)

Guest editor: **Lucia Banci**, University of Florence, Italy

Series editors: Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel;
Springer SBM, Dordrecht, The Netherlands; 2013, 645 pages

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"Cadmium: From Toxicity to Essentiality" (ISBN: 978-94-007-5178-1; e-book: 978-94-007-5179-8) (DOI: 10.1007/978-94-007-5179-8)
Volume 11 of *Metal Ions in Life Sciences* (ISSN: 1559-0836; electronic: 1868-0402)
edited by Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel; Springer SBM, Dordrecht, The Netherlands; 2013, 596 pages

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"**Interplay between Metal Ions and Nucleic Acids**" (ISBN 978-94-007-2171-5; e-book: 978-94-007-2172-2) (DOI: 10.1007/978-94-007-2172-2)
Volume 10 of *Metal Ions in Life Sciences* (ISSN: 1559-0836; electronic: 1868-0402)

edited by Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel; Springer SBM, Dordrecht, The Netherlands; 2012, 386 pages

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edited by Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel; The Royal Society of Chemistry, Cambridge, UK; 2011, 422 pages

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edited by Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel; The Royal Society of Chemistry, Cambridge, UK; 2011, 453 pages

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edited by Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel; The Royal Society of Chemistry, Cambridge, UK; 2010, 604 pages

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edited by Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel; The Royal Society of Chemistry, Cambridge, UK; 2009, 537 pages

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edited by Astrid Sigel, Helmut Sigel, and Roland K. O. Sigel; The Royal Society of Chemistry, Cambridge, UK; 2009, 543 pages

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