

# **The Handbook of Environmental Chemistry**

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# Biogeochemistry of the Atmosphere, Ice and Water of the White Sea

The White Sea Environment Part I

Volume Editors: Alexander P. Lisitsyn · Viacheslav V. Gordeev

With contributions by

A. I. Agatova · N. V. Arzhanova · T. A. Belevich · V. A. Bobrov ·  
L. L. Demina · V. V. Gordeev · L. V. Ilyash · N. M. Kokryatskaya ·  
V. B. Korobov · K. N. Kosobokova · N. M. Lapina · G. A. Leonova ·  
A. P. Lisitsyn · N. V. Mordasova · I. A. Nemirovskaya ·  
A. N. Novigatsky · N. M. Pertsova · O. S. Pokrovsky ·  
I. G. Radchenko · T. N. Ratkova · V. V. Sapozhnikov ·  
V. P. Shevchenko · D. P. Starodymova · N. I. Torgunova ·  
A. A. Vinogradova · L. S. Zhitina

*Editors*

Alexander P. Lisitsyn  
Shirshov Institute of Oceanology  
Russian Academy of Sciences  
Moscow, Russia

Viacheslav V. Gordeev  
Shirshov Institute of Oceanology  
Russian Academy of Sciences  
Moscow, Russia

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## Editors-in-Chief

Prof. Dr. Damià Barceló

Department of Environmental Chemistry  
IDAEA-CSIC

C/Jordi Girona 18–26  
08034 Barcelona, Spain  
and

Catalan Institute for Water Research (ICRA)

H20 Building  
Scientific and Technological Park of the  
University of Girona

Emili Grahit, 101  
17003 Girona, Spain  
*dbcqam@cid.csic.es*

Prof. Dr. Andrey G. Kostianoy

Shirshov Institute of Oceanology  
Russian Academy of Sciences

36, Nakhimovsky Pr.  
117997 Moscow, Russia  
*kostianoy@gmail.com*

## Advisory Editors

Prof. Dr. Jacob de Boer

IVM, Vrije Universiteit Amsterdam, The Netherlands

Prof. Dr. Philippe Garrigues

University of Bordeaux, France

Prof. Dr. Ji-Dong Gu

The University of Hong Kong, China

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Prof. Dr. Thomas P. Knepper

University of Applied Science, Fresenius, Idstein, Germany

Prof. Dr. Alice Newton

University of Algarve, Faro, Portugal

Prof. Dr. Donald L. Sparks

Plant and Soil Sciences, University of Delaware, USA

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## Aims and Scope

Since 1980, *The Handbook of Environmental Chemistry* has provided sound and solid knowledge about environmental topics from a chemical perspective. Presenting a wide spectrum of viewpoints and approaches, the series now covers topics such as local and global changes of natural environment and climate; anthropogenic impact on the environment; water, air and soil pollution; remediation and waste characterization; environmental contaminants; biogeochemistry; geoecology; chemical reactions and processes; chemical and biological transformations as well as physical transport of chemicals in the environment; or environmental modeling. A particular focus of the series lies on methodological advances in environmental analytical chemistry.

## Series Preface

With remarkable vision, Prof. Otto Hutzinger initiated *The Handbook of Environmental Chemistry* in 1980 and became the founding Editor-in-Chief. At that time, environmental chemistry was an emerging field, aiming at a complete description of the Earth's environment, encompassing the physical, chemical, biological, and geological transformations of chemical substances occurring on a local as well as a global scale. Environmental chemistry was intended to provide an account of the impact of man's activities on the natural environment by describing observed changes.

While a considerable amount of knowledge has been accumulated over the last three decades, as reflected in the more than 70 volumes of *The Handbook of Environmental Chemistry*, there are still many scientific and policy challenges ahead due to the complexity and interdisciplinary nature of the field. The series will therefore continue to provide compilations of current knowledge. Contributions are written by leading experts with practical experience in their fields. *The Handbook of Environmental Chemistry* grows with the increases in our scientific understanding, and provides a valuable source not only for scientists but also for environmental managers and decision-makers. Today, the series covers a broad range of environmental topics from a chemical perspective, including methodological advances in environmental analytical chemistry.

In recent years, there has been a growing tendency to include subject matter of societal relevance in the broad view of environmental chemistry. Topics include life cycle analysis, environmental management, sustainable development, and socio-economic, legal and even political problems, among others. While these topics are of great importance for the development and acceptance of *The Handbook of Environmental Chemistry*, the publisher and Editors-in-Chief have decided to keep the handbook essentially a source of information on "hard sciences" with a particular emphasis on chemistry, but also covering biology, geology, hydrology and engineering as applied to environmental sciences.

The volumes of the series are written at an advanced level, addressing the needs of both researchers and graduate students, as well as of people outside the field of

“pure” chemistry, including those in industry, business, government, research establishments, and public interest groups. It would be very satisfying to see these volumes used as a basis for graduate courses in environmental chemistry. With its high standards of scientific quality and clarity, *The Handbook of Environmental Chemistry* provides a solid basis from which scientists can share their knowledge on the different aspects of environmental problems, presenting a wide spectrum of viewpoints and approaches.

*The Handbook of Environmental Chemistry* is available both in print and online via [www.springerlink.com/content/110354/](http://www.springerlink.com/content/110354/). Articles are published online as soon as they have been approved for publication. Authors, Volume Editors and Editors-in-Chief are rewarded by the broad acceptance of *The Handbook of Environmental Chemistry* by the scientific community, from whom suggestions for new topics to the Editors-in-Chief are always very welcome.

Damià Barceló  
Andrey G. Kostianoy  
Editors-in-Chief



# Preface

This book in the series “The Handbook of Environment Chemistry” consists of two parts and is devoted to the most significant results of multiannual investigations (2001–2016) in frameworks of the program “The White Sea System.” This program was realized by the Shirshov Institute of Oceanology of the Russian Academy of Sciences. The main task of the program was to use the new sources of information (micro- and nano-sized particles, satellite information, hydro-optical and hydrophysical methods, biostratigraphy of high resolution, and particularly the direct measurements of the vertical fluxes of sedimentary material from different geospheres of the Earth) to create the system of investigations of the new generation on the White Sea example.

Part I of the book contains the results of water column investigations of this sea. The new data are presented in the fields of researches of the sources of sedimentary material (aerosols, river discharge), hydrochemistry, the biological pools of the sea (phytoplankton, zooplankton), nutrients and organic carbon, trace elements in seawater, suspended matter, and in total plankton and oil products in water and snow-ice cover of the sea. The presented results confirm the important role of the biogenic factor and biofiltration process in the transformation and transportation of sedimentary material from water surface layer to the bottom even under conditions when, according to our data, the terrigenous material prevails in the bottom sediments of the White Sea.

In this book, the united research results are considered, which were performed in the framework of the state assignment of FASO Russia (theme No 0149-2018-0016).

Moscow, Russia  
Moscow, Russia

Alexander P. Lisitsyn  
Viacheslav V. Gordeev

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