The Handbook of Environmental Chemistry

Founded by Otto Hutzinger

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Volume 49

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Dioxin and Related Compounds

Special Volume in Honor of Otto Hutzinger

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The Handbook of Environmental Chemistry

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- Aims and Scope
- Instructions for Authors
- Sample Contribution

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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/. 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

Volume Preface

On September 22, 2012, the environmental science community lost an innovator, mentor, colleague and friend. Professor Otto Hutzinger had a very distinguished professional career and was a champion who made many significant scientific contributions that shaped our understanding of the environmental chemistry, toxicity and analysis of dioxins and related POPs.

Otto Hutzinger was born on March 14, 1933, in Vienna. Between 1947 and 1952, he studied chemistry at the Polytechnic for Chemical Industry and Trade (Vienna, Austria). Subsequently, he worked at EBEWE Pharma until he and his wife (Freda) immigrated to Canada in 1956. In Canada, he studied at the University of Saskatchewan in Saskatoon with Dr. Ronald Heacock and earned an MSc degree in 1963 and, two years later, a PhD degree in chemistry. In that same year, he became a Canadian citizen. Between 1965 and 1967, he was an NIH postdoctoral fellow at the University of California in Davis.

From 1967 to 1974, Otto returned to Canada accepting a position as a scientific research officer at the National Research Council of Canada, in Halifax, Nova Scotia. In 1974, he was appointed professor and director of the Laboratory of Environmental Toxicology and Chemistry at the University of Amsterdam. In 1983, Otto was appointed chair of ecological chemistry and geochemistry, University of Bayreuth, where he remained until his retirement in 1998.

Professor Hutzinger was a strong proponent of disseminating scientific information, and in 1980, he established the Dioxin Symposia, which have become the most prestigious of international conferences on persistent organic pollutants. He founded several very highly respected scientific journals including *Chemosphere*, *Environmental Science and Pollution Research* and *Toxicological and Environmental Chemistry*. In 1980, he became the founding editor-in-chief of *The Handbook of Environmental Chemistry*.

In appreciation of his significant contributions to the field of environmental chemistry and toxicology, Dr. D. Barcelò, editor-in-chief, and Dr. T. Wassermann, publishing editor of *The Handbook of Environmental Chemistry*, have dedicated a

special volume of the handbook as a tribute to his outstanding career. I have the honour of editing this special volume.

Professor Hutzinger was an innovator and champion in the field; hence it is a fitting tribute to dedicate this volume of *The Handbook of Environmental Chemistry* on recent advances in the environmental chemistry of dioxins and related POPs to him. This volume is a collection of manuscripts written by individuals who have been inspired by his pioneering work and have continued in his footsteps by refining our current understanding in this field and opening new research areas. This volume consists of 14 chapters. In the first chapter, Heidelore Fiedler identifies sources of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans. In a subsequent chapter, Shinichi Sakai from Kyoto University describes the continued challenge for environmental control of polychlorinated dibenzo-dioxins and furans, polychlorinated biphenyls and brominated flame retardants. Analysis of dioxins and dioxin-like compounds, by far the most challenging and expensive technique in the determination of persistent organic pollutants in environmental matrices, is covered by Eric Reiner. In another chapter, Peter Fürst and his colleagues describe a cost-effective alternative method for determination of dioxins in food and feed based on gas chromatography combined with triple quadrupole mass spectrometry. Additional chapters deal with environmental levels and trends of dioxins and related compounds in environmental compartments. Wenning and Martello give an overview of levels and trends in the abiotic matrices. In the following chapter, She et al. discuss the occurrence of these compounds in aquatic environment. Shane de Solla discusses the exposure, bioaccumulation, metabolism and monitoring of persistent organic pollutants in terrestrial wildlife. A chapter on food and feed, the major routes for human exposure, is presented by Martin Rose; levels and trends of polychlorinated dibenzo dioxins and dioxins and furans in humans are discussed by Hernandez Welden and LaKind in the next chapter. Kunise and Tanabe combine different environmental compartments by discussing the occurrence of contaminants in Asian countries. The quintessential question in all of these investigations is “What are the health risks to humans and the environment”. This subject is discussed by Martin Rose in the chapter “Risk Assessment for Dioxins and Related Compounds”. The following three chapters focus on specific groups of compounds. DDT and its metabolites are discussed by Mirmigkou and de Boer, which was the first group of compounds that caught the attention of the environmental community and started the environmental movement. The second group of compounds is flame retardants, some of which were identified by Professor Hutzinger in the 1980s as potential contaminants of concern. Covaci and Malarvannan discussed determination, occurrence and trends of brominated flame retardants, and Marvin et al. discuss the analysis of chlorinated and phosphorus flame retardants.

Otto Hutzinger was an outstanding scientist whose work has significantly advanced the science of persistent toxic chemicals. It was always extremely important to Otto that new information is passed on to others through scientific meetings and publications. This volume is tribute to his efforts to pass on valuable information to others.

Burlington, ON, Canada
April 2016

Mehran Alaee

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