

The Handbook of Environmental Chemistry

Founded by Otto Hutzinger

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Volume 10

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The Handbook of Environmental Chemistry

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The Handbook of Environmental Chemistry

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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

In the twentieth century, the combination of an exploding world population and an ongoing industrial revolution caused an entirely new hazard for mankind: exposure to a large variety of chemicals that are present in our food, drinking and swimming water, and in the air. In particular, halogenated organic compounds have a persistent character. They are not easily degraded, accumulate in organisms such as birds, fishes and marine mammals and enter the human body where, dependent of their concentration, they cause an array of effects such as immunotoxic, carcinogenic and endocrine disrupting effects. Nowadays a number of these chemicals have been regulated in many countries, often through production bans such as for polychlorinated biphenyls (PCBs) and toxaphene. Most of them are, however, still around and their environmental levels are being monitored in national and international programmes such as the Stockholm Convention on Persistent Organic Pollutants (POPs).

Remarkably, the class of chlorinated paraffins has not received much attention, while the worldwide production surpasses by far that of PCBs and substantial environmental levels are being reported. The enormous complexity of the mixture with tens of thousands of congeners may be one of the reasons for that. Environmental analysts have been deterred by this complexity, which demands qualitative and quantitative methods at a level beyond the performance characteristics of their instruments. However, now the selectivity and sensitivity of analytical instruments are improving rapidly and have reached performance levels that were previously unthought-of. That brings a reliable analysis of chlorinated paraffins within reach, though it is still not easy.

This book describes the state-of-the-art methods for synthesis and analysis of chlorinated paraffins. It provides an overview of their worldwide occurrence and impact and describes their toxicological properties. International regulations and production volumes are presented, as well as an example of a risk assessment study that was carried out in Japan. Therefore, this book will be useful not only for environmental scientists who need to study the occurrence and toxicology of chlorinated paraffins in environmental matrices, but also for authorities and producers who could use this book as a valuable and comprehensive source of information.

Chlorinated paraffins are normally divided into three sub-groups: short-chain (SCCP), medium-chain (MCCP) and long-chain (LCCP) chlorinated paraffins.

The emphasis in this book is on SCCPs, as most of the information available is on this sub-group. SCCPs have carbon chains of C_{10} - C_{13} . However, some chapters have included valuable information on MCCPs (C_{14} - C_{17}) and LCCPs (C_{20} - C_{30}) as well. We have used the term “chlorinated paraffins” throughout the book, whereas “chlorinated alkanes” is also used in the literature.

Amsterdam
February 2010

Jacob de Boer

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