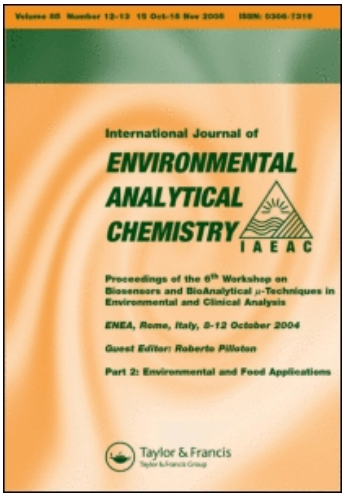

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Book reviews

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Book Reviews

ENVIRONMENTAL CHEMISTRY. GREEN CHEMISTRY AND POLLUTANTS IN ECOSYSTEMS, edited by E. Lichtfouse, J. Schwarzbauer and D. Robert, Springer, Heidelberg, Germany, 2005, 780 pages, €213.95 (ISBN 3-540-22860-8).

Environmental Chemistry is a fast-developing discipline aiming at understanding the fate of pollutants in ecosystems and at designing novel processes that are safe for ecosystems. This book is a collection of 69 papers arranged into seven topics, namely: Analytical Chemistry, Toxic Metals, Organic Pollutants, Polycyclic Aromatic Hydrocarbons, Pesticides, Green Chemistry, and Ecotoxicology.

The contents do not provide a comprehensive overview of the field but reflect results of the particular research areas of the authors. In fact, the different contributions are presented as scientific papers rather than in a review format. Many of them are just applications of analytical techniques to case studies. The analytical chemistry section describes modern sensitive methods for tracing the fate of pollutants in complex matrices, like soils, sediments, and groundwaters. Chemiluminescence, FT-IR, laser-desorption MS, and multi-isotopic analysis are some of the described techniques. The following sections describe advances regarding the pollution of water, soils, atmosphere, food and living organisms by toxic metals, fossil fuels, pesticides, and other organic pollutants, particularly PAHs. Special emphasis is given to biotic and abiotic degradation processes and bioremediation studies. The Green Chemistry section highlights novel chemical reactions based upon environmentally friendly conditions. Finally, the Ecotoxicology section presents novel bio-assays to assess the toxicity of various pollutants such as Cr(VI), Cd(II), dioxins, and endocrine disrupters.

Although the contributions include cutting-edge research results, the coverage of the subject is too disperse to highlight the main areas of development. Therefore, it will be of interest mainly to scientists who are working in specific domains dealt with. Rather than a book, it could be considered as a current issue of an environmental chemistry journal.

TRACE AND ULTRATRACE ELEMENTS IN PLANTS AND SOIL, edited by I. Shtangeeva, WIT Press, Southampton, UK, 2005, 348 pages, £136.00/€204.00 (ISBN 1-85312-960-7).

The biological significance of many trace elements that occur in soil and in different plant species is presently unknown, but the increasing capability and improving

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sensitivity of modern analytical methodologies have allowed the rapid development of ultratrace-element research, which has served as a basis for the advance of the biogeochemistry of trace elements.

This book describes different aspects of the analytical chemistry, rhizosphere chemistry, and environmental chemistry of trace elements. The first two chapters are devoted to the application of six methods for multi-element analysis of plant and soil samples (INAA, SXFR, PIXE, AAS, ICP-AES, and ICP-MS) and to multivariate data analysis of soil and plant multi-element data. The following chapters focus on the current status of our knowledge and future potential for understanding the biogeochemistry of trace elements; both well-known toxic elements like lead, cadmium, copper, and arsenic, and rare elements of unknown biological role such as scandium, gold, and thorium. Since the environmental chemistry of trace elements is controlled by a number of different interacting processes, there are also detailed descriptions of the biology and chemistry of the rhizosphere, factors affecting the fractionation and bioavailability of different trace elements in soil, potential phytoremediation methodologies and other applications. The book finally attempts to show areas where cooperation between biochemists, soil scientists, analytical chemists, and plant physiologists would be most productive for improving the knowledge of possible mechanisms of trace-element transport from soil to plant and of the subsequent behaviour of many elements in plant tissues.

ENVIRONMENTAL TOXICITY TESTING, edited by K. Olive Thompson, K. Wadhia and A.P. Loibner, Blackwell Publishing, Oxford, UK, 2005, 388 pages, £129.95 (ISBN 1-4051-1819-9).

As an integral component of environmental policy, it has become essential to regulate and monitoring toxic substances. Key issues to be addressed include identification of pertinent tests, reproducibility and robustness of these tests, and cost considerations. This book examines these issues and describes and explains the approaches that have been developed for environmental-toxicity evaluations. Advantages, benefits, and drawbacks of the strategies and methods are highlighted.

A historical perspective on effective management of the environment is presented in Chapter 1, which provides a comprehensive overview of the subject. This is followed by a chapter on effective monitoring of environmental toxicity, including aspects of quality control. In Chapter 3, the fundamental concepts of ecotoxicological testing and evaluation are described, with explanations of the relevant methodology and systems. The extent of variability and standardization of testing are clarified. The rationale for the utilization of toxicity tests and the inference of data employing different techniques is discussed in Chapter 4. Aspects relevant to the aquatic environment are conveyed in Chapter 5, and biological methods available for the assessment of the terrestrial environment are described in Chapter 6. Chapters 7 and 8 on biomarkers and genotoxic substances clarify these two controversial areas of increasing importance. Chapter 9 examines legislation in a global context, with examples from the UK, the Netherlands, Germany, and the USA, as the strategies adopted are country-dependent. The penultimate chapter is an illustrative case study from the petroleum industry, which

illustrates the use of a robust, pragmatic approach to a complex problem. The final chapter provides an insight into the future, highlighting likely new developments that should improve environmental toxicity testing in respect of relevance of tests, improvement in efficiency, and, ultimately, reductions in costs.

Directed equally at ecotoxicologists, industrial chemists, analytical chemists and environmental consultants, this book is written in a way that will prove helpful to both new and experienced practitioners.

PREPARATIVE ENANTIOSELECTIVE CHROMATOGRAPHY, edited by G. B. Cox, Blackwell Publishing, Oxford, UK, 2005, 330 pages, £110.00 (ISBN 1-4051-1870-9).

The development of chiral liquid chromatography facilitating the straightforward separation of enantiomers was a significant advance in chromatography, leading to widespread application in analytical chemistry. Application in preparative chromatography has been less rapid, but with the development of single enantiomer pharmaceuticals its use is increasingly common in chemical synthesis at laboratory, pilot plant, and even full production scale.

The aim of the book is to bring the expertise of people who have been in and around the pharmaceutical industry at the cutting edge of the development of the technique to answer many of the questions that are often raised: What chiral stationary phase should one use? How does one carry out preparative chromatography; what equipment should be used? What about production-scale chromatography; is it possible and economic, and should it be done in-house or outsourced?

Written for chemists, chemical engineers and analytical chemists, *Preparative Enantioselective Chromatography* demonstrates the considerable utility of the technique in contemporary discovery development and production-scale chemistry. By briefly covering basic preparative chromatography then developing the discussion to cover chiral stationary phases for preparative use, method development, including steady-state recycling and simulated moving bed techniques, and practical applications, the first part of this book serves as an ideal introduction to the technology for laboratory and pilot plan scale application. The more detailed information presented in the later chapters, on applications in discovery, process developments and large-scale or production environments, including case studies and equipment selection issues, ensures the book will serve as a sound reference for experienced separation scientists.

SAMPLE PREPARATION FOR HYPHENATED ANALYTICAL TECHNIQUES, edited by J. M. Rosenfeld, Blackwell, Oxford, 2005, 226 pages, £85.00 (ISBN 1-4051-1106-2).

The hyphenation of analytical techniques—linking commonly used but perhaps mutually incompatible techniques—generally leads to enhanced analytical performance. Hyphenated techniques are therefore widely used, particularly in areas where

samples are presented in complex matrices, e.g. environmental, pharmaceutical, and biochemical analysis. Sample preparation is a critical, often complex, part of the analytical process but has a huge influence on the quality of the analytical results.

Written as an authoritative guide for analytical chemists in universities, research and testing organizations, and the pharmaceutical, agrochemical, and speciality chemical industries, *Sample Preparation for Hyphenated Analytical Techniques* reviews the sample-preparation chemistry that has enabled the present sensitivity, specificity, and high throughput available across a range of hyphenated analytical techniques, from the conventional GC and LC-MS to LC-MS/MS and LC/MALDI-MS, or flow cytometry and capillary electrophoresis with laser-induced fluorescence detection, for the analysis of organic molecules to cells. Furthermore, it illustrates the successful utilization of existing sample-preparation methodologies in various analytical applications, and points to areas where new methodologies are required. Among these are molecular pathology, applications of genomic analyses to diagnosis of genetic diseases, Measurement of oxidative DNA damage by gas chromatography—mass spectrometry and liquid chromatography—mass spectrometry, Utility of chemical derivatization schemes for peptide mass fingerprinting, Oligosaccharides, Hyphenated techniques in drug discovery: purity assessment, purification, quantitative analysis and metabolite identification.

By dealing with issues wider than those generally found in review papers, this book provides insights that are not available by searching the literature for papers on a specific topic.

INSTRUMENTATION, CONTROL AND AUTOMATION IN WASTEWATER SYSTEMS, by G. Olsson, M. Nielsen, Z. Yuan, A. Lynggaard-Jensen and J.-P. Steye, IWA, London, 2005, 246 pages, £65.00 (IWA members £48.75) (ISBN 1-900222-83-3).

Instrumentation, control and automation (ICA) in wastewater treatment systems is now an established and recognized area of technology. The book summarizes the state of the art of ICA and its application in wastewater treatment systems, and focuses on how leading-edge technology is used for more efficient operation of such systems.

After an historical introduction showing the increasing importance of ICA in wastewater-treatment operation over the last 30 years, the current status of ICA in some countries is reviewed. The following chapters deal with the different control and automation strategies for the unit processes in wastewater systems. Finally, the basis for control and detection of signals is discussed with the aim of pointing out how instrumentation is used for control purposes. The economic benefits of different control and operation possibilities are quantified. More qualitative benefits, such as better process understanding and more challenging work for operators, are also described. Several full-scale examples of how ICA has improved economic efficiency, the ease of operation, and robustness of the plant are presented. The book emphasizes both unit process control and plant-wide operation. Data reduction is pointed out as an important task for a modern control system in order to improve the evaluation of the total system performance and robustness.

Instrumentation, Control and Automation in Wastewater Systems is written for:

- practising process engineers and operators who wish to have an updated picture of what is possible to implement in terms of ICA;
- process designers, needing to consider the links between design and operation;
- researchers or students wishing to have the latest technological overview of an increasingly complex field.

BIOGEOCHEMISTRY, edited by W. H. Schlesinger, Elsevier, Amsterdam, 2005, 702 pages, €80.00/US$89.00 (ISBN 0-08-044642-6).

This volume is part of an ambitious project for offering a new, comprehensive, and integrated summary of geochemistry, entitled *Treatise on Geochemistry*, which encompasses nine introductory essays on the main terrestrial compartments, including the atmosphere, freshwaters, the oceans, the Earth crust and sediments, as well as meteorites, comets, and planets. Clearly not meant to be an encyclopedia, these volumes show where we are and the challenges that lie before us.

Biogeochemistry traces the origin and impact of life on the geochemistry of the Earth's surface, with special emphasis on the current impact on global biogeochemical cycles. The first chapter offers an overview about how life has affected Earth's chemistry through its history, whereas another extensively reviews how molecular markers in the sedimentary record may improve our understanding of the history of life on Earth. The cycles of reduction and oxidation have controlled and control the Earth's biogeochemistry, and these are covered from different perspectives in chapters dealing with the evolution of metabolism, biomineralization, and biogeochemistry of primary production in the sea and in the terrestrial environment. A key process that roughly balances net primary production is decomposition, which is considered in two chapters on the biogeochemistry of decomposition and anaerobic metabolism. Finally, a particularly challenging issue for today's biogeochemists is to fully understand the biogeochemical cycles of the various chemical elements and the human impacts on each of them. Complete and well-updated overviews are provided for the geological and contemporary histories of the carbon cycle, and the global oxygen, nitrogen, phosphorus, and sulphur cycles.

All chapters, written by leading scientists, are accurately edited and extensively referenced. The book is easy to read and should be a reference for students and teachers in geochemistry, ecology, and earth sciences, especially those interested in global change or environmental chemistry.

ENVIRONMENTAL GEOCHEMISTRY, edited by B. Sherwood Lolar, Elsevier, Amsterdam, 2005, 630 pages, €80.00/US$89.00 (ISBN 0-08-044643-4).

This is volume 9 of the *Treatise on Geochemistry* edited by H. D. Holland and K. K. Turekian, a masterwork indispensable for all those involved in the different aspects of the field. *Environmental Geochemistry* incorporates the impact both of natural geochemical processes and of anthropogenic perturbations of natural systems.

Chapter 1 provides an overview of the current policy and regulatory framework and of models for evaluating impacts in terms of risk, toxicity, and exposure assessment. Then, the volume progresses from topics related to inorganic constituents (Chapters 2–9), to an increasing emphasis on the interface between inorganic and organic geochemistry in Chapters 10 and 11, to chapters firmly focused on organic environmental pollutants in Chapters 12–16. The impact of natural processes and their importance relative to anthropogenic effects is a critical component of the chapters dealing with the metalloids (Chapter 2), heavy metals (Chapter 3), and mercury (Chapter 4), as well as minerals, dusts, and Earth materials (Chapter 7), eutrophication (Chapter 8), salinization and saline environments (Chapter 9), etc. In contrast, the chapters dealing with acid mine drainage (Chapter 5), radioactive elements (Chapter 6), acidification (Chapter 10), tropospheric ozone, and photochemical smog (Chapter 11), and the chapters dealing with organic contaminants such as the volatile and high-molecular-weight fuel hydrocarbons (Chapters 12, 13, and 16), halogenated hydrocarbons (Chapter 14), and pesticides (Chapter 15) focus more specifically on anthropogenic impacts.

The chapters are carefully cross-referenced to related topics in other volumes. The book, like the others within the *Treatise*, is an indispensable reference for academics and environmental managers and regulators. Scientists will find in their pages a large amount of relevant information for their purposes.

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