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BOOK REVIEWS

ANALYTICAL METHODS FOR DRINKING WATER. ADVANCES IN SAMPLING AND ANALYSIS, edited by P. Quevauviller and K. C. Thompson, 180 pages, John Wiley & Sons, Ltd, Chichester, UK (2006). ISBN 0-470-09491-5. £80.00.

Exchanges between scientific and policy-making communities represent key elements of progress for better environmental protection. This book has been written by experts in the field of drinking water policy and analysis. It does not pretend to give an exhaustive view of drinking water analytical developments, but rather illustrates recent scientific advances in this field, which have contributed to policy development.

The first chapter gives an overview of EU and US drinking-water policies, as well as on standardization. Analytical developments are described in depth in Chapter 2, focusing on bromate in drinking water. The third chapter deals with the development of a sampling protocol for determining lead in drinking water, thus mixing analytical development with standardization needs. Finally, Chapter 4 focuses on oil standardization aspects (pre-normative research) related to materials in contact with drinking water.

The gathered information will be of direct use to policymakers, water scientists, researchers, and analytical laboratories.

PRACTICAL ENVIRONMENTAL ANALYSIS, 2nd edition, by M. Radojević and V. N. Bashkin, 457 pages, RSC Publishing, Cambridge, UK (2006). ISBN 0-85404-679-8. £39.95.

The main aim of the book is to give undergraduate students and laboratory technicians a basic understanding of the role of analytical methods in the broader picture of environmental pollution control. The coverage includes a general introduction to the environmental compartments and pollutant cycles, and the chemical analysis of important pollutants in rain water, air, water, soils, sediments, sludges and dust, and plant tissues. Each chapter provides detailed instructions for relatively easy experiments, requiring only basic laboratory equipment. Therefore, there is a strong bias towards inorganic analysis as this is less instrumentally demanding. Some of the simpler experiments may also be used by secondary school teachers of chemistry to illustrate applications of chemistry to the environment, a topic of growing

concern among today's school students. Also, worked examples of problems relating to analytical and environmental chemistry are included, where appropriate. Suggestions for further study, questions and exercises, and recommended further reading, are given after each experiment.

This new edition has been revised and updated to include information on new monitoring techniques, useful Internet resources and professional ethics, an issue of particular relevance in the field of environmental analysis where low-quality and fraudulent data can have drastic consequences on those affected by environmental pollution.

Like its predecessor, this informative text is certain to be valued as an indispensable guide to practical environmental analysis by students, academics and laboratory technicians on a variety of science courses and their lecturers.

TRACE ELEMENT ANALYSIS OF FOOD AND DIET, by N. K. Aras and O. Y. Atarnan, 344 pages, RSC Publishing, Cambridge, UK (2006). ISBN 0-85404-576-7. £109.95.

This timely book introduces the subject in a practical way, from sampling and the techniques available for trace analysis, through procedures for specific elements and analysis of the data. Beginning with a brief introduction and discussion of statistical evaluation of data, the subsequent chapter looks at trace analysis in general, with its essentials and terminology. Another section introduces sampling and preparation of foodstuffs such as wheat, potato, vegetables and milk, and, more interesting, collection of diet samples. This is followed by descriptions of the various spectrometric techniques (atomic absorption, atomic emission, atomic fluorescence) that are available. Plasma techniques for both optical emission and mass spectrometry are also presented, as are nuclear activation analysis and X-ray methods. A comparison of the various analytical techniques is provided, and a separate chapter handles speciation analysis of trace elements. Finally, procedures for determining essential and toxic elements such as arsenic, iron, selenium, and zinc are suggested; this chapter includes many recent references.

Detailed explanations and a simple format will enable laboratory technicians and graduate students as well as more experienced researchers to benefit from this book and acquire new perspectives. With its comprehensive coverage, coupled with illustrations and a guide to relevant literature and manufacturers, the book is a valuable source of information for anyone working on analysis of trace elements in food, diet or other biological or environmental samples—particularly government testing agencies, food engineers, and agricultural scientists.

AEROSOL MEASUREMENT: PRINCIPLES, TECHNIQUES, AND APPLICATIONS, edited by P. Baron and K. Willeke, 1131 pages, Wiley Interscience, Hoboken, NJ (2005). ISBN 0-471-78492-3. £76.50.

Until the late 1980s, the measurement of aerosols was primarily motivated by the need for monitoring indoor and outdoor environments. However, during the past several

years, industry has become increasingly interested in modern aerosol measurement methods, not only to protect the health of their workers but also to increase productivity and, thereby, gain competitive advantage. As a consequence, the number of undergraduate and graduate students taking courses in aerosol science and measurement has been continuously rising.

Aerosol Measurement was first published in 1993. This second edition contains new chapters, and many of the original chapters have been significantly upgraded, reflecting the latest scientific and technological advances. In Part I of the book, the fundamentals relevant for beginners to this field are presented. These include some historical aspects, gas/particle motion, physical and chemical changes in the particulate phase, size distribution of aerosols and performance of aerosol measurements. The chapters in this part stress the physics and give useful equations but avoid lengthy scientific derivations.

Almost all the equations in the book have been incorporated into a spreadsheet program (freely available on the Internet) that is described in Chapter 2, allowing the reader to easily perform calculations and plot results.

Readers familiar with the principles of aerosol measurement can find details on specific instrumental techniques in Part II, namely sampling, collection techniques (filtering, centrifugal, thermal, etc.), and the large range of methods for the physical and chemical characterization of aerosols. The practitioner concerned with the special requirements of their field, such as industrial hygiene or industrial aerosol processing, can find extensive aerosol measurement applications in Part III. The bringing together of many applications fields by experts enables the reader to look into the practices of related fields so that technology transfer and adaptations may result.

Many of the chapters offer sample calculations, thus making the book suitable for use as a teaching text. However, this will be of reference for air pollution regulators, industrial hygienists, and environmental scientists or engineers.

ENVIRONMENTAL FORENSICS. CONTAMINANT SPECIFIC GUIDE, edited by R. D. Morrison and B. L. Murphy, 541 pages. Academic Press, Amsterdam (2006). ISBN 0-12-507751-3. £59.99.

Environmental forensics is the systematic and scientific evaluation of physical, chemical, and historical information for the purpose of developing defensible scientific and legal conclusions regarding the source or age of a contaminant release into the environment.

The purpose of this book is to provide a contaminant-specific resource for investigating and solving the questions of when a contaminant release occurred, the origin of the release, and a basis for apportioning liability among multiple responsible parties. The structure of the book on a contaminant specific approach rather than a methodological or analytical perspective provides the reader with the ability to quickly review contaminant-specific information that is most useful to their particular contaminant-based inquiry. Chapters deal on mercury, asbestos, sewage, lead, chromium, arsenic, radioactive compounds, methane, pesticides, perchlorate, polychlorinated biphenyls, microbial forensics, chlorinated solvents, dioxins and furans, polycyclic aromatic hydrocarbons, crude oil and refined products. Each chapter

provides an overview of the chemistry of the contaminant, current analytical methods used for detection, identification of natural and anthropogenic sources, and finally a presentation of forensic techniques for consideration.

As with many sciences, certain areas are more evolved than others. Petroleum hydrocarbons, for example, have decades of forensic techniques development, as contrasted with the emerging contaminants, such as dioxins or perchlorate. The forensic strategies are rapidly changing often as a function of the global interest of the scientific community in a particular contaminant or a forensic technique. Advances in analytical methods, such as comprehensive gas chromatography, gas chromatography with isotopic ratio mass spectrophotometry, and laser ablation inductively coupled plasma mass spectrometry, that provide greater analytical precision, lower detection limits, and a greater number of contaminants to examine forensically have definitely contributed to the evolution of environmental forensics. When used in concert, these techniques as well as emerging statistical tools provide the forensic investigator with a multitude of possible techniques for answering the forensic questions of contaminant age dating and origin.

The material in this book will be a useful reference for students and scientists of environmental forensics and will certainly raise ideas for developing additional techniques in this emerging field.

HEAVY METALS IN THE ENVIRONMENT: ORIGIN, INTERACTION AND REMEDIATION, edited by Heike Bradl, 282 pages, Elsevier, Amsterdam (2005). ISBN 0-12-088381-3. £75.00, €110.00.

The study of heavy metals in the environment is a good example for an interdisciplinary field of work ranging from geology, mineralogy, and geochemistry, if their origin and natural occurrence is concerned, to analytical, physical, and colloid chemistry, when it comes to detection of heavy metals and their interactions with environmental media, and biology, ecology, ecotoxicology, and medicine, if one is concerned with their impact on global ecosystems and their effects on human and animal health. Finally, the remediation of heavy metals requires cooperation of several engineering disciplines such as environmental, chemical, and civil engineering.

This book aims at giving an overview on the most important topics for the reader interested in the subject. The first chapter gives some ideas on both natural and anthropogenic sources of heavy metals in the environment. The second chapter introduces analytical methods for their detection, the most important biogeochemical processes regulating their mobility, and their ecotoxicological effects on plants, animals, and humans. In this chapter, detailed information over the behaviour of some selected heavy metals is given as well. The third chapter gives an overview over different strategies for the remediation of heavy metals. In this context, innovative new strategies for the remediation of soil and groundwater contaminated with heavy metals such as permeable reactive barriers are discussed along with approved technologies such as encapsulation, soil washing, solidification, and phytoremediation.

Although it is not possible to cover this wide range of issues in sufficient depth in one single book alone, *Heavy Metals in the Environment* provides an excellent coverage of the field, and will certainly be of interest to graduate and postgraduate students as

well as academic researchers in environmental science and environmental/chemical engineering.

OIL POLLUTION AND ITS ENVIRONMENTAL IMPACT IN THE ARABIAN GULF REGION, edited by M. Al-Azab, W. El-Shorbagy and S. Al-Ghais, 256 pages, Elsevier, Amsterdam (2005). ISBN 0-444-52060-0. £90.00.

This book compiles recent studies presented during an international conference held in United Arab Emirates in 5–7 October 2003, addressing diverse topics related to oil pollution issues in the Arabian Gulf region that affect not only severely unique habitats, such as coral reefs, algal mats and mangroves, but also the main source of desalinated water.

The book starts with an article about the history and workings of the International Oil Pollution Compensation Funds. The second section titled 'Monitoring and Characterizing Oil Spills' has contributions on the use of satellite images in monitoring coastal environment and detecting oil spills taking place in the United Arab Emirates coastal waters, the use of remote sensing in providing synoptic, repetitive and multispectral data to serve the inventory and monitoring of coastal habitats, and the atmospheric–marine system RAMSES designed to provide necessary marine and weather predictions useful for oil-spill monitoring. Other studies present several techniques used in investigating the structure and function of microbial communities in oil biodegradation and the role of oil-sediment aggregation in dispersion and biodegradation of spilled oil. Section III, titled 'Modelling the Fate of Pollutants and Oil Slicks in Marine Water', presents different numerical techniques in modelling the transport of pollutants in coastal waters, using three-dimensional formulations. The last study in this section introduces a mathematical method to quantify interfacial fluxes near and through permeable interfaces, simultaneously, that can be applied for calculation of contaminant transport through permeable sediments. Section IV, titled 'Environmental Effects of Oil Pollution on the Ecosystem Components', contains two studies addressing the direct effect of oil pollution and spilled hydrocarbons on various marine fauna and flora. The last section, titled 'Combating, Prevention and Treatment of Oil Pollution', presents an overall discussion of preventing and/or combating oil pollution in the ROPME area, which includes all the Arabian Gulf countries.

Surprisingly, the book illustrates in the cover and inside the wreck of the *Torrey Canyon* with a picture of the *Prestige* tanker. This updated source of information will be of interest to marine geologists, environmental geologists, geotechnical engineers, and oil-spill-response organizations.

ICP MASS SPECTROMETRY HANDBOOK, edited by S. M. Nelms, 485 pages, Blackwell Publishing, Oxford (2005). ISBN 1-4051-0916-5. £109.00.

Inductively coupled plasma mass spectrometry (ICP-MS) is arguably the most versatile trace-elemental analysis technique available today. Since the first reported interfacing of an ICP ion source with a mass spectrometer in 1983, instrumentation and analytical

techniques have been developed to a point where element detection limits of less than 1 pg/g can be achieved. With the application of lasers to allow direct analysis of solid samples, the advent of collision cell technology to reduce spectral interferences, and coupling of the technology to liquid and gas chromatography apparatus for elemental speciation studies, ICP-MS will continue to be an invaluable tool in a wide range of analytical applications.

The principles of this exciting technology, namely plasma generation, ion sampling and focusing, mass analysis, and ion detection are discussed in the first chapters of the book. Calibration and quantitative analysis methodologies are also reviewed together with a substantial discussion on quality assurance and result validation. The currently available liquid and solid sampling systems, from nebulizers and spray chambers to electrothermal vaporization and laser ablation, are described and discussed in detail. In addition to the advances in ICP-MS instrument and sample introduction accessory design that have occurred, applications of the technique, particularly in the field of speciation analysis, have also evolved considerably, and the present state of the art and future potential are described. Collision/reaction cell technology makes up a large part of current research into ICP-MS, and this is reflected in the substantial section devoted to the subject in the book. Finally, recent developments in the main application areas, including clinical, environmental, geological, semiconductors, and bioanalytical, are illustrated.

In summary, written for both experienced analysts and new graduates or postgraduates starting to use ICP-MS as part of their academic or industrial research, the *ICP Mass Spectrometry Handbook* provides a thorough description of ICP-MS instrumentation and techniques, giving the reader sufficient knowledge to approach the technique with confidence.

A BASIC INTRODUCTION TO POLLUTANT FATE AND TRANSPORT. An Integrated Approach with Chemistry, Modelling, Risk Assessment, and Environmental Legislation, by F.M. Dunnivant and E. Anders, 480 pages, Wiley Interscience, Hoboken, NJ (2006). ISBN 0-471-65128-1. £52.95.

This book presents and integrates all of the aspects of fate and transport: chemistry, modelling, risk assessment, and the environmental legal framework. Each one of these topics is approached initially from a conceptual perspective, and then the concepts are explained in terms of the maths necessary to model the problem.

After a general introduction on the need for modelling of pollutants in the environment, two chapters introduce the basic chemical processes involved in pollutant fate and transport and the parameters used in their modelling. Then, an overview of pollutant fate and transport modelling approaches introduces specific case studies for lake, rivers and streams, groundwater, and atmospheric systems, describing the main factors to be considered, the basic mathematical developments and the limitations of the assessment, and the remediation possibilities. In another chapter, the calculation of health risk from exposure to pollutants is also dealt with. Finally, a number of case studies of selected pollutants, such as mercury, lead, PCBs, DDT, and endocrine disruptors, are reviewed.

The book also includes a section on supporting laboratory experiments and a CD-ROM containing Fate[®] and the pC—pH Simulator[®]. Fate[®] can be used as an

effective and learning tool to illustrate how each of the fate and transport models works. It enables the instructor to show quickly and easily how changing model input parameters affect the resulting pollutant concentration in lake, river, ground water, and atmospheric systems. The pC–pH Diagram Simulator[®] works in a similar manner to Fate[®] but is used only to understand acid–base equilibrium and buffers. Finally, a Water and Wastewater Tutorial is also available from the Wiley ftp site at ftp://ftp.wiley.com/public/sci_tech_med/pollutant_fate/.

This textbook provides a very unique instructional tool for students and environmental professions who lack the rigorous mathematical backgrounds to be able to derive the governing fate and transport equations but nonetheless require an understanding of the subject. This book can be used to teach a variety of classes, from a new type of hydrology or environmental chemistry course to new fate and transport courses for support personnel who want to work in the environmental arena.

PREDICTIVE TOXICOLOGY, edited by C. Helma, 508 pages, CRC Press, Taylor & Francis, Boca Raton, FL (2005). ISBN 0-8247-2397-X. £97.00.

The public demand for the protection of human and environmental health has led to the establishment of toxicology as the science of the action of chemicals on biological systems. The elucidation of cellular and molecular mechanisms of toxicity and the application of this knowledge in safety evaluation and risk assessment of more complex biological systems are the scope of predictive toxicology.

This reference book presents an in-depth survey of strategies to characterize chemical structures and biological systems, covering prediction methods and algorithms, sources of high-quality toxicity data, the most important commercial and non-commercial predictive toxicology programs, and advanced technologies in computational chemistry and biology, statistics, and data mining. Of particular interest are the chapters on neural networks and Kernel machines for vector and structured data, applications of substructure-based SAR in toxicology, and the discussions of programs such as OncoLogic (a mechanism-based expert system for predicting the carcinogenic potential of chemicals), META (an expert system for the prediction of metabolic transformations), MC4PC (an artificial intelligence approach to the discovery of quantitative structure–toxic activity relationships), PASS (prediction of biological activity spectra for substances), and Lazar (Lazy structure–activity relationships for toxicity prediction).

Valuable to readers in a variety of disciplines, such as toxicologists, pharmacologists, computer scientists, statisticians, and researchers in environmental toxicology and drug design, this guide provides demonstrations of various algorithms and their capabilities to select, calculate, and represent the features and properties of chemical structures, demonstrations that go beyond the classical structure–activity relationships.

ENVIRONMENTAL CATALYSIS, edited by V. H. Grassian, 701 pages, CRC Press, Taylor & Francis, Boca Raton, FL (2005). ISBN 1-57444-462-X. £97.00.

With increasing groundwater pollution, increasing particulates in the atmosphere, and the increasing need to remove pollutants from industrial and automotive sources,

Environmental Catalysis addresses issues that will be instrumental in current and future environmental challenges we face. The book explores environmental catalysis from three different perspectives (1) interaction of pollutants with natural systems (air water and soils), (2) environmental remediation, and (3) green chemical processing. The book also reflects the interdisciplinary nature of the field in that the contributing authors come from a variety of disciplines including chemistry, atmospheric science, plant and soil science, civil and environmental engineering, chemical engineering, and geosciences.

Section I covers environmental catalysis primarily in natural systems in chapters dealing with environmental catalysis in air, water, and soil. Surface catalysis of airborne particles—including ice, trace atmospheric gases, soot nanoparticles, and mineral dust surfaces—as well as particles in contact with ground water and their role in surface adsorption, surface catalysis, hydrolysis, dissolution, precipitation, oxidation and ozone decomposition is explored.

Section II emphasizes the use of abiotic and biochemical catalysts as the key technology for treating emissions and reducing waste by-products. The authors review the theory behind catalytic converters and discuss the effectiveness of several catalysts, including zeolites and nanoparticles, in treating emissions, aromatic hydrocarbons, and chemical warfare agents. They also survey the use biocatalysis in environmental remediation, and industrial processes, particularly in the production of transportation fuels, fine chemicals, and pharmaceuticals. Then, the authors explain how enzymes can remove chlorinated organics and metals, and how microbes can metabolize toxic chemicals from groundwater.

Finally, section III focuses on the use of these catalysts in green chemical processing, including the use of environmentally benign solvents, biphasic catalysts, and other alternative solvents to recover and recycle catalysts based on heavy metals.

Environmental Catalysis provides an updated and relevant source of information useful for environmental, chemical, and remediation engineers, industrial chemists, applied and analytical chemists, surface chemists, physical chemists, computational chemists, ecologists, environmental regulators, and students and researchers in these areas.

CHROMATOGRAPHIC ANALYSIS OF THE ENVIRONMENT, Third Edition, edited by L.M.L. Nollet, 1297 pages, CRC Press, Taylor & Francis, Boca Raton, FL (2006). ISBN 0-8247-2629-4. £145.00.

This totally renewed edition of *Chromatographic Analysis of the Environment* is a detailed handbook on different chromatographic analytical techniques and chromatographic data for compounds found in air, water, soil, and sludge. The book discusses the parameters of each environmental compartment in a consistent format that highlights sample-preparation techniques, chromatographic separation methods, and detection modes. Most of the data are compiled in tables and illustrated with figures. These are well updated and are most useful for an easy access to the relevant literature.

The first chapters address general aspects of environmental sampling, sample preparation, and chromatographic separations, including ancillary techniques like pyrolysis, detection, quantification of environmental analytes in difficult matrices, and data processing. The second part of the book focuses on the analysis of hazardous

chemicals in the environment, including halogenated volatile organic compounds (VOCs), peroxyacyl nitrates (PANs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), phthalate esters, flame retardants, and endocrine-disrupting chemicals (EDCs). In addition, the authors feature information on compounds such as phosphates, nitrates, organic acids, amines, *n*-nitrosamines, isocyanates, and humic substances. Analytical methods for nitrogen and sulphur compounds, organometallic compounds, and VOCs, such as benzene, toluene, ethyl benzene, and xylene (BTEX), are also reviewed. Information and data relevant to insecticides and herbicides (organophosphorus, carbamates, urea derivatives, etc.), fingerprinting of oil and petroleum products, and surfactants are also included.

This unique resource of chromatographic techniques, data, and references will be an attractive read for analytical chemists, chromatographic analysts, scientists, technologists, and engineers involved in the analysis of environmental compounds and in quality assurance and control.

ESSENTIAL AIR MONITORING METHODS, edited by H. Parlar, 418 pages, Wiley-VCH Verlag GmbH & Co., Weinheim, Germany (2006). ISBN 3-527-31476-8. £70.00.

This book is part of a special edition, named *Essentials*, highlighting the wealth of information captured in the new international reference series, the MAK-Collection for Occupational Health and Safety. This *Essentials* features a special selection of Air Monitoring Methods taken from previous volumes of the MAK-Collection. After an overview of general aspects on passive sampling, quality control and aerosol determination, detailed, ready-to-use protocols for air monitoring of 16 of the most important occupational toxicants (solvent mixtures, aldehydes, diesel engine emissions, ethylene oxide and glycol derivatives, cadmium, nitrosamines, PAHs, quartz, styrene, sulphuric acid and tetrachloroethane) are described. The methods were developed to monitor concentrations of occupational toxicants at the workplace and can also be used for environmental monitoring. Methods cover all required steps, from sampling to the interpretation of results. This includes data on precision, accuracy, and detection limit, calibration procedures as well as potential sources of errors. Advantages and disadvantages of each method are clearly outlined.

The documented methods are authoritative, because they were compiled by the Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area of the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation). This compilation is particularly relevant to professionals and researchers in the fields of occupational health and safety.

ESSENTIAL BIOMONITORING METHODS, edited by J. Angerer, 450 pages. Wiley-VCH Verlag GmbH & Co., Weinheim, Germany (2006). ISBN 3-527-31478-4. £70.00.

This volume of the *Essentials* series (see the previous review) features a special selection of Biomonitoring Methods taken from previous volumes of the MAK-Collection. The selected methods are exemplary for the standards maintained by the Commission,

which works strictly according to scientific criteria. The book starts with chapters on preliminary remarks on the analysis of biological samples and on the use of gas chromatography—mass spectrometry in biological monitoring. Then follows an overview of protocols for monitoring of 30 of the most important occupational toxicants in human samples (blood and urine). The selection of compounds includes: trace metals, alcohols and ketones, BTX, TCE, halogenated hydrocarbons, trichloroacetic acid, PAH metabolites, hexane metabolites, acrylonitrile, carbon disulphide, ethylene oxide, etc. The methods are sufficiently detailed, ready to use, and illustrated with tables and figures for checking analytical performance.

Besides for professionals, the book will be useful for fostering occupational health and safety as well as toxicological research and analytical methodologies.

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