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BOOK REVIEWS

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BOOK REVIEWS

HANDBOOK OF THIN-LAYER CHROMATOGRAPHY (Chromatographic Science Series, Vol. 55), edited by J. Sherma and B. Fried, (Lafayette College, Easton, Pennsylvania, USA), 1064 pages. Marcel Dekker Inc., New York (1991). ISBN 0-8247-8335-2. US \$198.

The present volume contains a survey of Thin-Layer Chromatography applications with 31 chapters written by experts in the field. In the first part of the book, however, the principles, instrumentation and solvent gradient developments in TLC are discussed very extensively. The second section is a very valuable part for those who are new in the field or experienced that would like to see the overview of analyzing different classes of compounds with this technique.

The chapter on carbohydrates covers the carboxylic acids wide group of sugars, including mono-, di-, oligo- and polysaccharides, and different derivatized sugars. The chapter on phenols, aromatic carboxylic acids and indols comprises an extensive part with tabulated R_f -values for a long number of these compounds on different gels. This is of great help for the users in the field.

Other chapters included in the book correspond to applications on organo-metallics—a growing field of interest in environmental analysis—natural pigments, toxins, namely mycotoxins and plant toxins, synthetic dyes and pesticides—a group of compounds that the author of the book knows more deeply since he is editor of books and reviews on this topic.

The book is a complete compilation of TLC applications in different fields and offers a review with many references. Certainly, it is one of the best practical books in this field. The only questionable aspect concerns the discussion on sample handling. This is known to be a pre-step to the TLC separation and is dealt with in several chapters. This valuable information of different sample handling techniques is spread out in the book. It would have been more beneficial to the reader if one chapter would have been devoted only to sample clean-up, a part where the broad area and practical usability could have been presented.

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LIQUID CHROMATOGRAPHY/MASS SPECTROMETRY APPLICATIONS IN AGRICULTURAL, PHARMACEUTICAL, AND ENVIRONMENTAL CHEMISTRY (ACS Symposium Series, No. 420), edited by M. A. Brown, (California Department of Health Services, Berkeley, CA 94704, USA) 298 pages, American Chemical Society, Washington, DC (1990). ISBN 0-8412-1740-8. US \$64.95.

This book contains the papers presented at a Symposium held by the Division of Agrochemicals during the 197th National Meeting of the American Chemical Society in Dallas, Texas, April 1989. In a total of 18 chapters it provides state-of-the-art information on recent applications of liquid chromatographic-mass spectrometric (LC-MS) techniques in the fields of (A) Pesticides metabolism and degradation, (B) Pharmaceuticals and metabolism and (C) Environmental analysis.

The first chapter briefly reviews the development of LC-MS with an introduction to the different interface and ionization systems, with regard to both their design and performance characteristics. Particle beam and thermospray are the two currently discussed interfaces.

The following chapters are focused on the LC-MS analysis of agricultural chemicals and their metabolites and describe in some detail the different techniques available to enhance the usually scarce structural information provided by LC-MS, such as chemical derivatization, particle beam methods, tandem MS, wire repellers and modification of solvent adduct ions with novel additives in the LC eluent.

Five chapters, under the heading Pharmaceuticals deal with examples on how to approach the qualitative and in some cases quantitative analysis of various types of compounds, such as biliary drug metabolites in their conjugate forms, tetracyclines and retinoic acid in human plasma.

Six more chapters, grouped under the heading Environmental analysis, close this book. These chapters deal with the use of particle beam (PB) LC-MS for the determination of pollutants in waste samples or of sulphate and glucuronide conjugates of phenols.

One of the chapters in this group presents comparative data on direct liquid introduction (DLI), TSP and fast atom bombardment (FAB) MS for the secondary metabolites of benzo(a)pyrene, showing that, as opposed to DLI and TSP, FAB-MS did not cause thermal decomposition and thus gives higher molecular ion responses. Another of the chapters describes in some detail the recently developed combined TSP-EI interface, also called the "universal interface". Finally, there is a useful description of the use of highly sophisticated MS equipment for structural studies of protein alkylation by electrophilic xenobiotic metabolites.

Overall, the book should not be considered as a manual on LC-MS but rather a collection of specialized manuscripts reflecting presentations in a meeting. It will be of help to environmental and biological analytical chemists that would like to know the usefulness of LC-MS in these fields of research.

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EPA's SAMPLING AND ANALYSIS METHODS DATABASE MANUAL, edited by L.H. Keith (Radian Corporation, Austin, TX, USA). 6 computer disks (5.25 in)+ 1 manual. Lewis Publishers, Inc., Chelsea, MI, USA (1990) ISBN 0-87371-418-0, US \$205.00

The selection of the most appropriate method for measuring the increasing number of analytes in the environment is often a difficult task. Although the comprehensive collection of sampling and analytical methods (more than 650) produced by EPA covers most of the situations it is not always easy searching through the many volumes published. Therefore, the idea to compile summaries of many of these methods and analytes in a computer database format was very timely. The result was this "electronic reference book" where appropriate methods can quickly be located using any number of keywords to focus on the specific needs of users. The main advantage is crosschecking, so that each summary may be used by itself in a report or as a file in combination with other method/analyte summaries without loss of information.

The database is organized in three volumes, including the following files:

- Volume I. Chlorinated aliphatic volatile organics.
Other halogenated volatile organics.
Nonhalogenated volatile organics.
Semivolatile organic compounds.
- Volume II. Pesticides, PCBs, dioxins and furans.
- Volume III. Elements.
Water quality parameters.

The computer requirements are a compatible PC with 1-2 drives for floppy disks (5.25 in) and 1.8 M on the hard disk, operating with the MS-DOS 2.0 or a greater system.

The first selection in the Main Menu is a tutorial that allows the user to gain a rapid understanding of how to use keywords in combination to meet his requirements.

Each report consists of a one page summary of an analyte and supporting information consisting of the method title; method name and EPA method number; analyte (e.g., compound, element); CAS registry number; application (method summary); instrumentation needed for the analysis; interferences and recommendations for their elimination, if known; applicable matrices (e.g. various waters, sewage, soils, wastes), applicable concentration range; method detection limit for the analyte; sampling and sample container requirements; maximum holding time for the sample; preservation requirements; quality control sample requirements; and EPA reference source.

This unique compilation will be a valuable tool for environmental chemists, regulatory agencies and officials, provided that the methods for specific analytes (e.g.

chlorinated acids, nitrogen- and phosphorous-containing pesticides, etc.) not yet included will be added and continuous up-dating of the information is ensured.

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ADVANCES IN AIR SAMPLING. Proceedings of the American Conference of Governmental Industrial Hygienists (ACGIH), 409 pages. Lewis Publishers, Inc, Chelsea, MI, USA (1988) second printing.
ISBN 0-87371-115-7. US \$65.00.

Although the title of the book refers to a rather broad topic, the content is focused on the occupational health field. The book contains refereed contributions to the ACGIH Symposium, that was convened to discuss the establishment of Threshold Limit Values (TLVs) for particulate substances and to review new developments in techniques for the sampling of workplace and community atmospheres.

The first section of the book (6 papers) is devoted to the current status of particle size-selective sampling and the future needs for the assessment of inhalation-related risks and the establishment of TLVs. Case studies are presented for beryllium, wood dust and sulfuric acid aerosols. In the second and third sections (8 papers), several new sampling devices for gases and vapors, including passive and pump-based systems, in ambient indoor and outdoor atmospheres are presented. Special reference is made on sampling of unstable or reactive aerosols, such as dienes, aldehydes or hydrazines.

The modern developments of real-time or continuous aerosol monitoring samplers for industrial hygiene purposes are reviewed in another five papers section, although they seem to point largely in an evolutionary direction, with aerosol sensors being miniaturized are becoming more integrated with computer systems.

Six papers in the last section are concerned with the all-important subject of sampling strategies. Sampling for compliance is not very effective in preventing acute exposure and, moreover, the current need is for prospective surveillance to correlate with and to prevent chronic diseases. Therefore, the surveillance, involving the sampling of many substances and at low concentrations, requires a completely new strategy for sampling. The problem is illustrated with case studies on exposure assessments for epidemiology and community air pollution.

In summary, the book provides many practical applications in the field of industrial occupational and non-occupational air exposure and the way to optimize workers protection.

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PRINCIPLES OF ENVIRONMENTAL SAMPLING, edited by L.H. Keith (Radian Corporation, Austin, TX, USA), 458 pages, American Chemical Society, Washington, DC (1988).
ISBN 0-8412-1437-9 (second printing 1991), US \$39.95.

Environmental sampling for chemical analysis is a complex subject that has had less status than analytical methods. However, sampling itself is a very important issue, because the best analytical technique cannot compensate for a poorly designed sample collection. What has not been reliably sampled do not justify the care and expense of analysis.

Chemical sampling is like a snapshot and the goal of this book is to point out the many variables and special techniques needed to plan and execute reliable sampling activities. Principles and important matrix requirements of sampling are addressed for each of the six sections: Planning and sample design; quality assurance and quality control; sampling waters; sampling air and stacks; sampling biota, and sampling solids, sludges and liquid wastes.

L.H. Keith has collected in this book 30 contributions from experienced scientists presenting their personal views on this topic. Contributions are generally focused on *what* should be considered when planning an environmental sampling task, rather than *how* to conduct environmental sampling. However, some procedures are always referred. This is why presentations are sometimes too general or redundant, sometimes emphasizing obvious questions for environmental chemists such as the contamination of samples, their representativity, etc. . . but it will be difficult to find an aspect missing along the more than 400 pages of the book.

Those interested in a summary of its contents, are invited to read the paper of the editor in *Environ. Sci. Technol.*, **24**, 610–617 (1990).

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LONG RANGE TRANSPORT OF PESTICIDES, edited by D.A. Kurtz (Department of Entomology, Pennsylvania State University, University Park, PA 16802), 462 pages. Lewis Publishers, Inc. Chelsea, MI, USA (1990).
ISBN 0-87371-168-8, US \$82.00.

The book is a compilation of 27 papers presented in a Symposium held in Toronto, in June 1988, several months later than an Advanced Research Workshop, sponsored by NATO in Bermuda, covered the general aspects of the long range transport of natural and contaminant substances.

The transport of contaminants around the globe has become increasingly important as we are discovering how emissions of one country or continent affect areas far removed from the sources.

The nuclear accident at Chernobyl (April 1986), the spread of chlorofluorocarbons to the stratosphere and their effect on the depletion of the ozone layer or the acid rain fallout from power plant emissions traveling across continents or oceans are some evidences of the implications of this process for the human welfare. Synthetic organic compounds do not generally appear to be volatile, but they have also been found in areas where never were used. However, since the discovery of DDT in Antarctica in 1965, data coverage for most of these compounds and over large areas of the earth's surface is very sparse.

This book provides a comprehensive overview on the processes by which pesticides, as a major example of semivolatile organic compounds, have been found to enter a transport system, be transported across international boundaries, and be deposited or available in regions far from their starting point of application.

The book includes a balanced presentation of field and compartment modeling studies. Global transport processes in ocean areas are well exemplified. Four chapters summarize the concentrations of organochlorine compounds in several locations of the Pacific and Indian Oceans as well as in the South Atlantic and Antarctic Oceans. A series of chapters discusses pesticide transport in the US Great Lakes area, where the most serious modeling work has been developed for flux and mass balance calculations. Contaminations of Arctic areas, including Canadian wildlife, arctic atmosphere and arctic snow are also well illustrated. Not to be overlooked, river transport can be an important transport mode. Transport studies of soluble pesticides (including atrazine) through drainage networks in large agricultural river basins are presented.

After a solid evidence that significant amounts of pesticides and other semivolatile organic compounds can be measured in remote areas, several chapters undertake the modeling approach for assessing the exchanges of compounds between air-soil, soil-groundwater and air-sea compartments or the atmospheric gas-particle relationships.

Finally, two chapters address the implications of this process for regulatory agencies seeking for reductions of any amount that may eventually save the earth and its inhabitants from serious problems. A very consistent index of 30 pages allows an easy introduction to the different topics.

In summary, this book should be of interest to those scientists who wish to understand some of the realities and complexities of long range transport and to those who wish to gain an overall assessment of our present knowledge of the problems involved. Individuals or agencies concerned on how one country's emissions can affect another country should also be interested in reading this publication.

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BIOMARKERS OF ENVIRONMENTAL CONTAMINATION, edited by J.F. McCarthy and L.R. Shugart (Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TE, USA), 457 pages, Lewis Publishers, Inc., Chelsea, MI, USA (1990).
ISBN 0-87371-284-6, US \$83.00

Biological markers (biomarkers) is a concept developed in Organic Geochemistry, particularly for recognizing the early appearance of life in our planet as well as their paleoecological constraints. However, the present book has nothing to do with our past but with one of the major threats of our technological civilization, that is the assessment of the impact of human activities on our ecosystems.

Biological markers are used in this book for describing measurements at the molecular, biochemical or cellular levels in organisms, that indicate that the organism has been exposed to toxic chemicals, and the magnitude of the organism's response to the contaminant. In this sense, they can be used either to diagnose sublethal stress in an organism or to detect exposure to specific contaminants. Chemical analysis not always can relate to a biological effect.

The 23 chapters of the volume describe different types of biomarkers that offer promise for environmental monitoring, hazard assessment, regulatory compliance or remediation studies, particularly in coastal environments. The biomarkers are arranged in categories defined by the nature of the toxicological target.

Anatomical and cytological abnormalities in fishes are classic endpoints that are presented as an indicator of deleterious exposure to pollutants in the marine environment. Several types of adaptative biochemical and immunological responses are also reviewed, including the induction of the MFO system or a class of proteins recently characterized as stress proteins, together with the macrophage responses of estuarine fishes.

The early assessment of effects of pollutants on DNA constitute an important ecotoxicological target. The application of genotoxic biomarkers in evaluating contamination and the proper interpretation of these responses and the use of sophisticated analysis of oncogens in fish from polluted harbours are presented. Another section deals with biomarkers indicating toxic effects of metals, which are based on detection of increasing levels of metallothioneins.

Applications of biomarkers in field evaluations are illustrated in many of the chapters dealing with specific biomarkers. However, studies in the last section focus on evaluation of environmental contamination rather than on the biomarker methodology. Reviews on the use of animals and plants as sentinels for evaluating environmental pollution, and the implementation of environmental monitoring programs based on a suite of biomarkers clearly illustrate the potential of this approach for ecological risk assessments. Interestingly, all chapters include an introductory review on the rationale for the use of the biomarker as well as illustrative applications to environmental or health problems.

This is an easy and pleasant book to read, that make the interested nonexpert aware of the current state of science on biomarker research. Furthermore, the book

concludes with some thoughts on an interdisciplinary research strategy that is needed to validate biomarkers and provide the scientific understanding necessary for interpreting sublethal responses of organisms.

In summary, anyone who needs to know how to assess and predict environment contamination and particularly regulatory agencies should consider this book of essential reading.

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BIOGENIC SULFUR IN THE ENVIRONMENT (ACS Symposium Series 393), edited by E.S. Saltzman (University of Miami, USA) and W.J. Cooper, (Florida International University, USA), 572 pages, American Chemical Society, Washington, DC (1989).

ISBN 0-8412-1616-6, US \$99.95.

The study of the biogeochemical cycle of sulfur has received increasing attention in recent years because of its connection with important phenomena such as acid deposition and global climate regulation. Sulfur has been described to be involved in cloud droplets nucleation, rain acidification, radiation absorption, microorganism and plant physiology as well as organic matter transformation in soils and sediments. Each of these processes are part of the complex natural biogeochemical cycling upon which the added burden of sulfur emissions caused by human activity must be superimposed. Getting reliable knowledge on both the occurrence and behaviour of sulfur throughout the various natural compartments is, therefore, a major goal for environmental scientists.

This book was developed from a symposium sponsored by the Division of Environmental Chemistry at the 194th Meeting of the American Chemical Society that was held at New Orleans, Louisiana, from 30 August to 4 September, 1987. It contains 34 papers (chapters) grouped in eight sections. The first two sections deal respectively with biogenic emissions and transformations in terrestrial and freshwater systems, including issues as diverse as occurrence of volatile sulfides in either wetlands and acidified lakes, and emissions from higher plants.

The three following sections deal with the occurrence and role of reduced sulfur in the oceans. Emphasis is laid on dimethyl sulfide (DMS) as the predominant form of volatile sulfur in marine systems. Section three focuses on the origin and distribution of DMS in the oceans, while section four addresses some of its environmental transformations. Section five discusses the chemical transformations of H_2S in marine waters.

The following four chapters bring partial information on the occurrence of reduced sulfur compounds in the remote atmosphere. In section seven a much more comprehensive description of gas-phase atmospheric transformations of biogenic sulfur is covered. Oxidation reactions are stressed and discussed in detail along eight chapters.

Last section is shortly devoted to aqueous-phase transformation of atmospheric sulfur compounds.

Although the papers that form the volume are now a little aged and present mainly USA research results, collectively they cover a wide range of aspects of biogenic sulfur cycling and make this book an essential reference for anyone engaged in the study of sulfur in the environment.

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