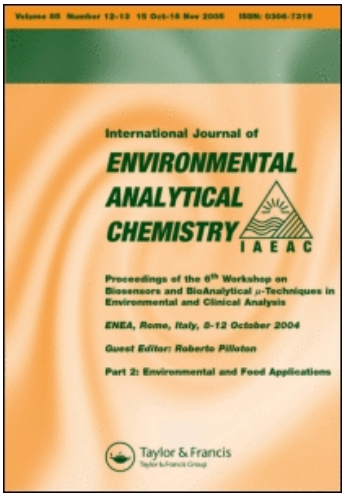

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Book Reviews

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BOOK REVIEWS

ENVIRONMENTAL ORGANIC CHEMISTRY, by René P. Schwarzenbach, Philip M. Gschwend, and Dieter M. Imboden, (ETH-Z and EAWAG, CH-8600 Dübendorf and M.I.T., Cambridge, Massachusetts, U.S.A.,) 681 pages John Wiley & Sons, Inc. New York Chichester Brisbane Toronto Singapore, (1993). ISBN 0-471-83941-8. £54.

The authors from the ETH-EAWAG, M.I.T. and the University of Minnesota with different scientific backgrounds have created an outstanding textbook, to provide an understanding of how molecular interactions and macroscopic transport phenomena determine the distribution in space and time of organic compounds, e.g. hydrocarbons, heterocyclic substances, and their polyhalogenated derivatives, released into the natural environment. Emphasis is placed on quantification of processes at each level. It is recommended to use the structure of the chemicals to deduce their properties, and to build understandings that can be combined in mathematical models. To help the readers the chapters are divided into more elementary and more advanced parts to see how to arrive at quantitative results for particular cases of interest.

The authors thus distinguished accidents, hazardous wastes, and chronic contamination by anthropogenic chemicals in rapidly growing use. Knowing that one should also look at effects, they concentrated this time particularly on the required knowledge of the processes that govern the transport and transformations of organic pollutants, for instance the discussion from the perspective of aquatic environments: groundwater, streams and rivers, ponds and lakes, and estuaries and oceans. Special emphasis is placed on the interrelationship between chemical structure and environmental behavior of the organic substances. The authors demonstrate how chemical structures cause molecular interactions, illustrate how principles of chemistry, physics and biology can be used to quantify processes, and provide a modeling framework for evaluating the relative importance of the transfer mechanisms, reaction processes, and transport phenomena. After the introductions (with information on classifications) the recommended textbook is structured into the thirteen chapters

- Background Thermodynamics,
- Vapor Pressure,
- Solubility and Activity Coefficients in Water,
- Air-water Partitioning: The Henry's Law Constant,
- Organic Solvent-Water Partitioning: The Octanol-Water Partition Constant,
- Organic Acids and Bases: Acidity Constant and Partioning Behavior,
- Diffusion
- The Gas-Liquid Interface: Air-Water Exchange,
- Sorption: Soil-Aqueous Solution Exchange,
- Chemical Transformation Reactions,
- Photochemical Transformation Reactions,
- Biological Transformation Reactions, and
- Modeling Concepts.

FIRE IN THE ENVIRONMENT: THE ECOLOGICAL, ATMOSPHERIC, AND CLIMATIC IMPORTANCE OF VEGETATION FIRES, Dahlem Environmental Sciences Research Workshop Report No. 13, edited by P. J. Crutzen and J. G. Goldammer, (Max Planck Institutes for Chemistry, D-55116 Mayence and D-79098 Freiburg,) 400 pages (updated references added to each chapter, an author index of one page, and a subject index of 10 pages, but analytical chemistry, metal species, PCB's and PCDD/DF's are not included) John Wiley & Sons, Inc. Chichester New York Brisbane Toronto Singapore, (1993). ISBN 0-471-93604-9. £80.

This volume represents an organized synthesis of a global fire ecology and defines the most urgent problems to be tackled scientifically. The Dahlem Workshop in March 1992 was based on 17 background papers, prepared by 34 contributors from relevant sciences, and the results of the discussions are laid down in four group reports jointly prepared, and covering 53 pages at the end of the book. One participant thought that anthropogenic fire is a uniquitous technology that has been inserted into every conceivable place for every conceivable purpose, and that presently human activities are rapidly reconstituing the geography and ecology of fire on a planetary scale and in often unprecedented ways. The editor stresses that since 1,5 million years, a date of the earliest evidence of the use of fire by hominids, natural fire regimes have been successively altered by humans. In most regions of the Earth, human-caused fires are now more important than natural fires. Carbon and other elements formerly stored in the Earth's vegetation are now being redistributed by fire. Some of the carbon becomes unavailable for terrestrial life and biogeochemical processes. Biomass burning leads also to a significant loss of fixed nitrogen, and to increasing emissions of HCN, CH_3CN and NO. Together with additionally produced CO, CH_4, CH_3Cl and H_2 the stratospheric ozone chemistry may be changed. The experts are now interested to merge wildland fire science and atmospheric sciences, in order to develop a modern global fire ecology. Emphasis is laid on the assessment of trace gas emissions and the resulting atmospheric chemical and climatic effects. Many uncertainties are discussed. A few multidisciplinary scientific programs, related mainly to emissins and effects of low molecular gaseous compounds produced by fires, are described, including their roles in tropospheric ozone formation. Only occasional attention is yet paid to the fate of anthropogenic emissions (e.g. nitrogen and sulfur, heavy metal species, radioactive contaminants, pesticides) that were deposited on plants and subsequently were involved in free combustion (the editors refer to D. A. Hegg *et al.* (J. Geophys. Res. 92(D12), 701–709, 1987), C. K. McMahon and P. B. Bush (Am. Ind. Hyg. Assoc. J. 53, 265–272, 1992), and S. I. Dusha-Gudym (Int. Forest Fire News ECE/FAO) 2/1992, 4–6) in this respect.

ELEMENT-SPECIFIC CHROMATOGRAPHIC DETECTION BY ATOMIC EMISSION SPECTROSCOPY, edited by Peter C. Uden, (Department of Chemistry, University of Massachusetts, Amherst, MA 01003, U.S.A.,) 350 pages (including 18 figures, 51 tables, references added to the chapters (up to 1990), and a subject index of 12 pages), American Chemical Society ACS Symposium Series 479, Washington D.C., U.S.A., (1992). ISBN 0-8412-2174-X. US$ 79.95.

This excellent booklet was developed from a symposium of the American Chemical Society, held in Boston, Massacusetts in April 1990. Emphasis is laid on speciation and the analysis of metal-, halogen-, sulfur- and phosphorus-containing organic compounds. Primary problems are resolution of the sample components and the identification and

overall characterization of separated eluates. Within chromatography an increasing proportion of detection now involves combined, tandem, or interfaced "characterization detectors". In gas chromatography the absence of a condensed mobile phase often permits efficient analyte transfer to the detector. But also many effective high-performance liquid chromatographic and supercritical-fluid chromatographic interfaces are devised, too. Mass spectrometry is a widely used interfaced-detection technique, and Fourier-transform infrared instrumentation has likewise facilitated the development of GC-IR spectroscopy for functionality characterization.

Element analysis is the particular strength of atomic spectroscopy. Particularly analytical atomic emission spectroscopy because of the developments of analytical plasmas (inductively coupled plasma, microwave induced plasma, etc.) has increased element-specific chromatographic detection feasibility. An important development has been the introduction of commercial instrumental systems for GC-AES, and the recommended booklet gives many excellent advices to improve instrumentation. The volume is structured into 19 chapters, written by 56 American and European experts on interfaces and detectors.

SUPERCRITICAL FLUID EXTRACTION AND ITS USE IN CHROMATOGRAPHIC SAMPLE PREPARATION, edited by S. A. Westwood, (Head of Analytical Methods, Horseracing Forensic Laboratory Ltd., Newmarket, Suffolk CB8 7DT, U.K.,) 170 pages (including 79 figures, 17 tables, somewhat one-sidedly selected references added to the chapters (e.g. the results of the relevant I.A.E.C. Symposia on Handling of Environmental and Biological Samples in Chromatography, organized by R. W. Frei, K. Zech and D. Barcelo, and published in Journals of Chromatography are practically not even mentioned), and a not too helpful index of two pages only). Blackie Academic & Professional (Chapman & Hall, and CRC Press, Inc.) London Glasgow New York Tokyo Melbourne Madras, (1993). ISBN 0-7514-0089-0. £45.

The valuable, well presented booklet notes that the combination of properties exhibited by supercritical fluids makes them uniquely suitable for the purposes of extraction, sample preparation, and as mobile phases in chromatography. Besides off-line techniques, the automation of sample preparation using supercritical fluids add a new dimension to existing chromatographic methods: on-line application leads to time savings, improved reproducibility, and sensitivity. The small handbook is structured into six chapters, covering theoretical details and giving practical advice:

- Introduction to Supercritical Fluid Extraction in Analytical Science,
- Methodology for Off-line Supercritical Extraction,
- Coupled (On-line) Supercritical Fluid Extraction-Gas Chromatography,
- Coupled Supercritical Fluid Extraction-Capillary Supercritical Fluid Chromatography.
- Supercritical Fluid Extraction coupled to Packed Column Supercritical Fluid Chromatography, and
- Supercritical Fluid Extraction-High Performance Liquid Chromatography: On-line and Off-line Strategies.

Thus, one gets practical ideas in routine laboratories how to replace many currently used extraction methodologies by more cost-effective techniques, obtaining better analytical data. The high diffusivity of supercritical fluids provides rapid sample preparation and extraction under mild thermal conditions. The techniques may also be coupled further with spectroscopic techniques, such as Fourier transform infrared, ultraviolet or mass spectrometry, to provide specific identification or structural information.

DIODE ARRAY DETECTION IN HPLC, Chromatographic Science Series Volume 62, edited by Ludwig Huber and Stephan A. George, (Hewlett-Packard Company, D-76337 Waldbronn and Atlanta, Georgia, U.S.A.,) 400 pages (including 239 figures, 22 tables, references up to 1990 added to the chapters, and a good index of 8 pages), Marcel Dekker, Inc. New York Basel Hong Kong, (1993). ISBN 0-8247-8947-4. US$ 150.

It is a must to have this well presented and clearly written handbook if one is interested in automatic measurement of highly polar and non-volatile compounds with high selectivity and sensitivity by high-performance liquid chromatography. Modern software with 32-bit processors can evaluate in a very short time the large amount of data provided by a diode array detector (new microprocessors lead to further improvements). The most significant improvements have been made in optics. The technique is now also used for routine analysis. The volume is structured into 14 chapters within four parts:

- Theory and Design:
  - Historical Developments,
  - Modern Developments,
- Advantages of Diode Array Detectors to Chromatographers:
  - Diode Array Detection Advantages for the Chromatographer,
  - Spectral Matching and Peak Purity,
  - Chemometrics and Photodiode Array Detection,
- Applications of Diode Array Detectors:
  - The Use of Diode Array Detectors in the Pharmaceutical Industry,
  - Clinical Applications,
  - Toxicological Applications,
  - Applications in the Analysis of Amino Acids, Peptides and Proteins
  - Food and Beverages,
  - Environmental Applications,
  - Chemical, Petrochemical, and Polymer Applications,
- Guidelines on how to optimize Sensitivity, Selectivity, Automation:
  - Optimization of Diode Array Detection, and
  - Using Diode Array Detectors for Automated Routine Analysis.

HANDBOOK OF ECOTOXICOLOGY, VOLUME 1: TECHNIQUES AND TESTS USED FOR PREDICTION, edited by Peter Calow, (University of Sheffield S10 2UQ, U.K.,) 478 pages (including 73 figures, 76 tables, references added to the chapters, a glossary of 5 pages, a taxonomic index of 4 pages, and a subject index of 8 pages (not referring to specific pollutants) that may be improved in a second edition), Blackwell Scientific Publications Oxford London Edinburgh Boston Melbourne Paris Berlin Vienna, (1993). ISBN 0-632-03573-0. £79.50.

The well presented first volume fills an important gap since such an updated encyclopedia is still missing. Perhaps the only shortcoming is the fact that practically "only" Anglosaxon information is used and mentioned, and for instance scientific results from German, French and Japanese speaking scientists are practically not discussed. More emphasis is lead on effects to microorganisms and animals than on phytotoxicity, and ecotoxicology of metal species is only rarely mentioned. The handbook covers however thorough descriptions of the main laboratory tests and field observations, a critical analysis of these tests in terms of ease of handling, repeatability and ecological relevance, and bibliography citing descriptions and evaluations of key methodology. For

freshwater, marine and terrestrial habitats monitoring, bioaccumulation and biodegradation are considered. The important publication is thus structured into the four parts

- General Principles,
- Freshwater Systems,
- Marine and Estuarine Systems, and
- Terrestrial Systems

and into 22 subchapters. The editor made distinctions between legally adopted tests and others, and between anticipation and assessment. But all tests should have the ultimate goal to protect ecological systems. He noted also that single-species tests are more common than multi-species tests, and that the sampling designs and the analysis of stress in natural systems must still make progress. While there is a special subchapter on biodegradation, consequences of biotransformation (and of abiotic transformation) and of interactions should also be discussed in a future edition.

Volume 2 is supposed to focus on the chemical toxicants themselves (thus probably answering some open questions mentioned above?), describing their ecological effects and methods of predicting effects from physicochemical properties alone.

HARMFUL CHEMICAL SUBSTANCES, VOLUME 1: Elements in Groups I–IV of the Periodic Table and their Inorganic Compounds, edited by V. A. Filov, B. A. Ivin and A. L. Bandman, (Institute for the Study of Xenobiotics and Russian Academy of Natural Sciences, St. Peterburg, Russia), 722 pages (including 85 tables, an appendix of 89 pages, an index of 12 pages, and relatively new references added to each chapter), Ellis Horwood Limited Chichester, New York, London, Toronto, Sydney, Tokyo, Singapore, (1993). ISBN 0-13-383373-9. US$ 120.

The valuable updeated translation (from Russian) is well structured and informs on the identities and physicochemical properties, the natural occurrences and environmental levels, production, uses, manmade sources of emissions into the environment, toxicity (also to plants and animals), absorption, distribution and elimination in organisms, hygienic standards, methods of determination, measures to control exposure and first aid in poisoning of hydrogen, lithium, sodium, potassium, rubidium, cesium, copper, silver, gold, beryllium, magnesium, calcium, strontium, barium, zinc, cadmium, mercury, boron, aluminum, gallium, indium, thallium, rare-earth elements, thorium, uranium, carbon, cyanides and cyanates, silicon, germanium, tin, lead, titanium, zirconium, hafnium, and their inorganic compounds. While the texts are based on international information, the tables contain mostly Russian lethal doses and exposure limits. Volume 2 with the data on elements in groups V–VIII of the periodic table is in preparation and is said to follow in 1994.

TERATOGENS (Chemicals which cause Birth Defects), 2nd Completely Revised Edition, edited by Vera M. Kolb, (Department of Chemistry, University of Wisconsin-Parkside, Kenosha, WI 53141, U.S.A.,) 586 pages (including 12 figures, 14 tables, an alphabetic list of 5625 substances (with synonyms and CAS register numbers) on 463 pages, references added to the chapters, and a very short index of 3 pages), Elsevier Science Publishers Amsterdam London New York, (1993). ISBN 0-444-81482-5. Dfl. 390. US$ 222.75.

Besides the not very meaningful alphabetic list of substances causing reproductive effects (but unfortunately without information on effect categories and critical literature), the volume-particularly addressed to chemists—is structured into eight chapters, written by various American, Canadian and Finnish contributors:

- Principles and Mechanisms of Teratogenesis,
- Maternal Occupational Exposure and Spontaneous Abortion,
- Biochemical Determinants of Chemical Teratogenesis: Studies with Phenytoin, Benzo(a)pyrene and Related Xenobiotics (looking at various bioactivation schemes),
- Legal and Ethical Aspects of Fetal Protection Policies,
- How to obtain Information about the Teratogenic Potential of Chemicals (informing on handling of literature and of decribed databases),
- Registry of Toxic Effects of Chemical Substances as a Source for compiling a List of Teratogens, and
- Safe Handling of Teratogenic Chemicals in the Laboratory.

In the list for instance 13 arsenic, three beryllium, 10 cadmium, six chromium, seven lead, 18 mercury, seven nickel, five platinum, six selenium, four tellurium, two tin, three titanium, 11 zinc, and one zriconium species are mentioned. It seems that the list is not very critical. Of course most of the substances listed are organic.

CATALYTIC CONTROL OF AIR POLLUTION BY MOBILE AND STATIONARY SOURCES, edited by Ronald G. Silver, John E. Sawyer and Jerry C. Summers (Allied-signal Automotive Catalyst Company, Tulsa, Oklahoma 74158-0970, U.S.A.,) 175 pages (including 79 figures, 32 tables, references added to the chapters, and an index of 12 pages), American Chemical Society ACS Symposium Series 405, The Maple Press Distribution Center, 1–83 Industrial Park, York, Pennsylvania 17405, U.S.A., (1992). ISBN 0-8412-2455-2. US$ 49.95.

The volume is based on a symposium of the ACS Division of Colloid and Surface Chemistry, that took place in New York in August 1991 with the 202nd National ACS Meeting. Catalysts are used to control emissions from both mobile sources, such as automobiles, and stationary sources, such as industrial plants. The book is thus split into two sections, inspite of the fact that the catalyst chemistry involved is the same or similar. In order to improve and expand the capabilities of these pollution controls, it is of course important to understand this catalyst chemistry in all systems. The booklet includes overviews of recent mobile source emission control legislation, discussions of catalysts for alternative fuels such as natural gas or methanol, a comparision of hydrocarbon reactivities, studies of the effects that surface properties of catalysts have on reactions for pollution control, regulations for stationary sources and examples of catalytic reduction, oxidation, combustion, and thermal decomposition of pollutants. Of the many aspects surface science of catalysis is of primary importance. Twelve chapters discuss structures and modes of operation:

- Catalyst Technologies to meet Future Emission Requirements for Light-duty Vehicles,
- Methane Oxidation over Noble Metal Catalysts as Related to Controlling Natural Gas Vehicle Exhaust Emissions,
- Automotive Catalyst Strategies for Future Emission Systems,
- Experimental Comparison among Hydrocarbons and Oxygenated Compounds for the Elimination by Three-way Automotive Catalysts,

- Steady-state Isotopic Transient Kinetic Analysis Investigation of CO-O_2 and CO-NO Reactions over a Commercial Automotive Catalyst,
- Particle Size and Support Effects in NO Adsorption on Model Pt and Rh Catalysts,
- Effect of Ce on Performance and Physicochemical Properties of Pt-containing Automotive Emission Control Catalysts,
- The 1990 Clean Air and Catalytic Emission Control Technology for Stationary Sources,
- Selective Catalytic Reduction of Nitric Oxide with Ammonia over Supported and Unsupported Vanadia Catalysts,
- Catalytic Oxidation of Trace Concentrations of Trichlorethylene over 1,5% Platinum on δ-Alumina ,
- Catalytic Oxidation of Trichloroethylene over PdO Catalyst on δ-Al_2O_3, and
- Thermal Decomposition of Halogenated Hydrocarbons on a Cu(III)-surface.

ENVIRONMENTAL REMEDIATION (REMOVING ORGANIC AND METAL ION POLLUTANTS), edited by George F. Vandegrift, Donald I. Reed, and Ian R. Tasker, (Argonne National Laboratory, Illinois 60439 and National Institute for Petroleum and Energy Research, Bartlesville, Oklahoma 74005, U.S.A.,) 275 pages (including 67 figures, 59 tables, references added to the chapters, and an index of 11 pages), American Chemical Society, ACS Symposium Series 509, Washington D. C. 20037, U.S.A., (1992). ISBN 0-8412-2479-X. US$ 66.95.

The volume is based on a symposium within the Division of Industrial and Engineering Chemistry, at the 201st National ACS Meeting of April 1991 in Atlanta, Georgia. It is known that more than 75,000 registered hazardous waste generators and more than 25,000 possible hazardous waste sites exist in the United States of America. It is said that potentially great benefits await those who can develop economical effective, and efficient solutions to environmental remediation and waste avoidance. After an overview of the extent of the abuse of the environment, the high costs of its clean-up, and federal regulations in the field, the 17 chapters are structured into the three parts:

- Remediation Technologies for Groundwater and Soil Decontamination,
- Waste Treatment Avoidance Technologies, and
- Fundamental Research for Developing New Technologies, and Measuring the Problem of the Effectiveness of the Treatment.

Separation science continues to play a key role in the remediation techniques. Uranium, plutonium, and lead species are for instance removed by supported liquid membranes, adsorbants, chelating agents, and acid leaching volatile or semi-volatile organic compounds by membrane-assisted solvent extraction, low temperature thermal treatment, surfactant flooding, or non-foaming bubble fractionation, and polymers by using differences in density. Future directions may involve ligand-modified micellar-enhanced ultrafiltration and substrate selective polymer ligands for copper/calcium and other ions separation, and solvent extraction methods for separation of environmental radionuclides. Shingara S. Sandhu (Claflin College, Orangeburg, South Carolina 29115, U.S.A.) determines trace element species distribution in dissolved and solid aquatic phases.

HANDBOOK OF INDUSTRIAL WASTE TREATMENT, Volume 1, edited by Lawrence K. Wang, (Zorex Environmental Engineers, Inc., Pittsfield, Massachusetss, U.S.A.) and Mu Hao Sung Wang, (New York State Department of Environmental

Conservation, Albany, N. Y., U.S.A.,) 392 pages (including 80 figures, 76 tables, bibliographic references added to the chapters, and an index of 8 pages), Marcel Dekker Inc., New York, N. Y. 10016, U.S.A., (1992). ISBN 0-8247-8716-1. US$ 150.

This new handbook series provides technical and economical information on the development of feasable total environmental control programs, that can benefit both industry and local municipalities. It is said that many topics, such as waste minimization, treatment of stormwater, photographic processing wastes, and metal finishing wastes, have been presented in detail for the first time in an industrial waste treatment book. Volume 1 discusses the eight topics

- Waste Minimization,
- Stormwater Management and Treatment,
- Treatment of Metal Plating and Finishing Wastes,
- Treatment of Photographic Processing Wastes,
- Treatment of Soap and Detergent Industry Wastes,
- Treatment of Acid Pickling Wastes of Metals,
- Treatment of Textile Wastes, and
- Treatment of Phosphate Industry Wastes.

The volume thus focuses on developments in innovative and alternative environmental technology, design criteria, effluent standards, managerial decision methodology, and regional and global environmental conservation. It is applicable to waste management problems of specific industries, is acceptable by practicing environmental professionals and educators, and presents informations on process alternatives, costs, standards, and future trends for industrial and commercial operations. Wastes and wastewaters—and materials and processes leading to them—are characterized, but the analytical techniques to get the needed data are not discussed. Of great interest are the many case studies. For instance regarding cadmium species one finds information on hydroxide precipitation in metal plating, on their presence in some specialized photographic films, and on treatment of acid pickling wastes of metals. Silver compounds play of course a role in photographic processing wastes.

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ENVIRONMENTAL ANALYSIS, by R. N. Reeve, John Wiley & Sons, Chichester, U.K. 284 pp, (1994). ISBN 0-471-938-335. $31.50.

This monograph is published in a series of easy to read books written by lecturers in Analytical Chemistry in the United Kingdom and published on behalf of the ACOL (Analytical Chemistry By Open Learning). The books in this series are designed for convenient and flexible training, continuing education and updating of all technical staff concerned with Analytical Chemistry. The summaries and self-assessment questions, including the answers, certainly help to familiarize with the material discussed in this monograph and for those wishing to revise their knowledge of basic analytical chemistry a list of learning material is given.

After a short introduction, subsequently the (i) transport of pollutants in the environment, (ii) water analysis — major constituents, (iii) water analysis — trace pollutants, (iv) analysis of solids, (v) atmospheric analysis — gases, (vi) atmospheric analysis — particulates and (vii) ultra-trace analysis is discussed.

In the extremely short introduction some definitions (e.g., environment, pollution) are given and the role of Analytical Chemistry in environmental analysis is discussed followed by a discussion on pollutant sources and dispersion, and reconcentration and degradation of pollutants. Finally some information is given on a general approach for environmental analysis.

In the last six chapters the analysis of water, solid and atmospheric samples is discussed, with emphasis on the techniques used, and the problems related to trace analysis. In the chapter on water analysis first of all an introduction on the major constituents of water, the way of sampling and finally briefly, the analytical techniques that can be used to determine some standard parameters (e.g., BOD, COD, TOC, nitrate, phosphate) are treated. In the chapter on the determination of trace pollutants in water, the most frequently applied techniques (i.e., gas and liquid chromatography, atomic and visible spectrometry, voltammetry) are mentioned, but again only some basic information and application possibilities are given. In the chapters on the analysis of solids a subdivision is made in the analysis of biological samples, sediments, and soils, but mainly some specific problems are highlighted here. Rather interesting chapters are the ones on atmospheric analysis (gases and particulates). In these sections quite a number of new analytical techniques are discussed including there potential application areas.

With respect to analytical chemistry the last chapter (25 pages) is the most important one, because in this chapter data are given on detection sensitivity, mass spectrometric detection, quantitation and quality control.

The positive features of this monograph are that the text is elucidated with a significant number of figures, questions scheme and tables, and that it is easy to read for people not familiar with analytical environmental analysis, but because in most cases only basic information is given, this monograph is not suitable for those who want to use the discssed techniques without consulting textbooks on the methods and procedures described in this monograph.

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AIR MONITORING BY SPECTROSCOPIC TECHNIQUES, edited by M. W. Sigrist (ETH Zurich, Switzerland) 531 pages, Volume 127 of Chemical Analysis, Wiley, New York, (1994). ISBN 0-471-55875-3

It is generally recognized that even trace concentrations of atmospheric species can play a substantial role in diverse environmental problems such as global climate change, photochemical smog formation and stratospheric ozone depletion. A diversity of species are involved in complex chemical and physical processes and interactions. This diversity explains why, in recent years, spectroscopic techniques are increasingly used in air monitoring. In the volume concerned the different techniques are grouped together and can be studied independently after a brief, nice, introductory chapter to environmental sensing considering the role of atmospheric trace gases in the environment and overviewing both nonspectroscopic and spectroscopic detection schemes. Emphasis is on applications in the troposphere. Also instrumental aspects of the various techniques receive considerable attention; it should be noted that non-laser based systems are promising, despite of the fact that, of course, lasers have imposed a strong impact in the field.

First, DOAS (differential optical absorption spectroscopy) techniques are considered, based on long path absorption (for instance in folded arrangements) in the ultraviolet and visible range in order to achieve detection limits in the 0.1 ppt to ppb range. Absence of wall losses makes DOAS suitable for the detection of unstable species like OH radicals. Future developments will be directed on wavelengths below 300 nm, where Rayleigh scatter and oxygen absorption limit the maximum light path length, while species like NH_3 and NO provide very interesting absorption feactures. Chapter 3 gives a very clear treatment of LIDAR (light detection and ranging) with emphasis on the differential mode denoted as DIAL (differential absorption lidar), with nice illustrations and appealing applications. DIAL provides unique possibilities for three-dimensional mapping of the atmosphere and for measuring total fluxes from industrial and urban areas. Laser photoacoustic spectroscopy is restricted to point monitoring but can be carried out in the entire infrared (IR) wavelength range. Its potential strongly depends on the availability of tunable IR laser sources. Tunable diode laser absorption spectroscopy (TDLAS) operates in the middle (fundamental) IR region and is especially useful for unequivocal identification of atmospheric species in polluted air or in automobile stack emissions. Chapter 6 gives a detailed study on gas measurements in the IR region and provides an extensive collection of molecular spectra, probably useful for further applications. The final chapter is devoted to more or less exotic techniques which will not be routinely applied in the near future i.e. matrix isolation in combination with electron spin resonance and FTIR spectroscopy; nevertheless it is worth to be incorporated in a text like this.

To summarize, this volume will be an important reference for people working in the field. It will also be appropriate as a text book for graduate-level courses.

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ENVIRONMENTAL SAMPLING FOR TRACE ANALYSIS, edited by B. Markert (Intern. High School, Zittan, Germany), 524 pages, VCH, Weinheim, Germany (1994). ISBN 3–527–30051–1. DM 248.

It has been recognized but too often forgotten that the quality of an analysis depends on the quality of the sample. Today the greatest error in the overall result of the analytical process is usually caused by unadequate sampling. Even the most sophisticated methodology may be useless if the sample analysed is not representative and this is particularly crucial in environmental analysis where processes are continuous in time and space.

This collective book (50 authors) pays proper attention to representative sampling. It offers an overview of the most common techniques used today for taking samples of air, water, soils and sediments and plants and animals.

After considering the historical and general aspects of sampling (place, size, frequency, errors estimation, detection limits, etc...) in parts I and II of the book, the most extended, part III, gives examples for sampling the different environmental compartments. The air sampling is focused on particle and gas measurements on filters and on organic gas sampling. The water sampling includes freshwater for trace elements and eutrophication studies, sampling programs for wastewaters and receiving streams, and groundwaters for metals. The spatial patterns of soil sampling are discussed by several authors from different perspectives, illustrated with different case studies.

Finally, the sampling of plants for environmental trace analysis in terrestrial and aquatic ecosystems is also covered. The sampling of animals for biomonitoring is restricted to the case of red wood ants. A long market survey of samplers (almost 50 pages) and a general literature survey on sampling (14 pages), are also included.

Principles, strategies and examples are abundantly presented and discussed, mainly related with the implementation of regulatory norms. Major attention is paid to the area of heavy metals monitoring, with very little reference to the organics.

The large number of contributions (27) already indicates the extensive coverage of the field, although it also results in a slight dispersion or redundance of the information and, sometimes, with an uneven presentation. In summary, an interesting handbook for scientists and engineers concerned by environmental studies.

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COMPOSITIONAL AND ANALYSIS OF HEAVY PETROLEUM FRACTIONS, by K. H. Altgelt (Consultant, San Rafael, CA, U.S.A.) and M. M. Boduszynski (Chevron Research and Technology, Co, Richmond, CA, U.S.A.), 495 pages, Marcel Dekker Inc., N. Y. Basel, Hong Kong. (1994). ISBN 0–8247–8946–6, US$175.00.

The ever increasing demand of low-boiling fuels (gasoline and diesel-oil) has grown the interest in technologies enabling their production from heavy petroleum feedstocks, thus using the economic significance of products formerly used only to cover the pavements of our roads or our roofs. These technologies must also reduce the sulfur and nitrogen contents in the end products, to cope with environmental regulations. The best use of these products and the optimization of the refinery operations require an adequate compositional characterization of the raw materials and this is not easy because of the enormous complexity of the heavy petroleum fractions and the limitations of our measuring techniques.

The book of Altgelt and Boduszynski constitutes the most comprehensive and updated overview on methodologies and instrumentation for this aim.

After a general introduction on the conceptual approaches to the compositional analysis of heavy petroleum fractions (chapters 1 and 2) an important innovation is introduced. This is the atmospheric equivalent boiling point (AEBP) concept, that extends the "boiling range" of petroleum to very high-boiling and even non-volatile fractions (up to about 1000°C) and permits the description of an entire crude oil in uniform terms (chapter 3). The properties of the heavy petroleum fractions (chapter 4) that can be used for their structural characterization (chapter 5) are then considered. The classical methods developed during the 1940's, making use of the viscosity, refractive index, density and molecular weight of the fractions (e.g. the n-d-M method) are extensively reviewed, as well as the further developments based on ^{1}H and ^{13}C-NMR spectroscopy. These structural group techniques are viewed as the first characterization level, the next one being based on the previous separation of the fractions into compound groups and compound classes by chromatographic techniques (chapter 6) and further characterization by soft MS ionization techniques (chapter 7) or advanced NMR (chapter 8), IR, UV-vis, etc... (chapter 9). A large number of illustrative applications makes the book easy and pleasant to read.

The last chapter (chapter 10) is dedicated to an overview on the existing knowledge on the composition of heavy petroleum fractions and the most promising techniques for their analysis.

How much more do we need to know? is the final question addressed. The authors say that for some readers it may be amazing to see how much detail is now accessible for certain fractions whereas for others, it may be disappointing to recognize how limited our understanding is of these heavy fractions. In any case, the book represents the state-of-the-art in the field.

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MIGRATION AND FATE OF POLLUTANTS IN SOILS AND SUBSOILS, edited by D. Petruzzelli (Istituto di Ricerca Acque, CNR, 70123–Bari, Italy) and F. G. Helfferich (The Pennsylvania State University, Dep. Chem. Eng., University park, PA 16802–4400, USA). 506 pages. Springer Verlag, Berlin, Heidelberg, New York (1993). ISBN 3–540–56041–6.

This is the volume 32 of Series G on Ecological Sciences of the NATO ASI Series, corresponding to the Proceedings of a Summer School, held in Italy in 1992, as is traditional in the NATO Science Programme.

Mass transport phenomena in natural permeable media are of practical importance in a variety of fields. In recent years, highly complex theories and methods, based on the novel concept of non-linear wave propagation, have ben developed and applied, particularly, in petroleum and environmental engineering. Examples are, respectively, the modeling of enhanced oil recovery and of groundwater pollution and seepage from landfills and other disposal operations. The aim of the School was to review the potential use of such knowledge for making reliable predictions on the migration and fate of chemicals in soils and subsoils.

The book contains 20 contributions distributed in three parts dealing with: Local phenomena, Global propagation phenomena and modeling and Specific problems and applications.

The contributing phenomena and their interactions are analyzed in the first two parts. Different approaches for modeling subsurface sorption-desorption processes, ion exchange phenomena in natural permeable media, interactions of metals and organics with subsoil components, including soil colloidal surfaces, and the multicomponent wave propagation in porous media principles are extensively reviewed. In the third part, numerical modeling of contaminant transport in groundwater is applied to specific problems such as the groundwater recharge with reclaimed municipal wastewater, the dispersion of contaminants from landfill operations, the risk analysis of groundwater contamination and the migration of radiouniclides in the Chernobyl accident.

The book may illustrate to environmental engineers and managers how numerical methods may provide guidance in disposal operations, preventive measures to minimize ecological damage, prediction on consequences of seepage and practical information for a better design of remedial actions.

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