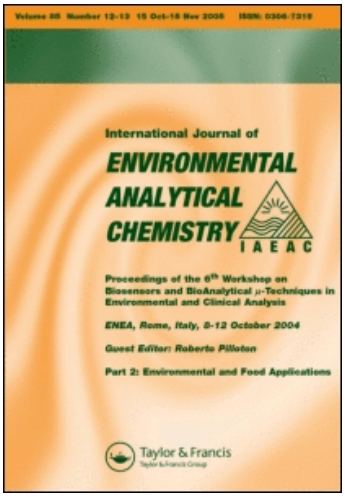

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Book Reviews

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BOOK REVIEWS

ENVIRONMENTAL ANALYSIS: TECHNIQUES, APPLICATIONS AND QUALITY ASSURANCE, Techniques and Instrumentation in Analytical Chemistry Volume 13 edited by D. Barcelo (Department of Environmental Chemistry, C.I.D. E-08034 Barcelona, Spain) 646 pages (including 249 figures, 103 tables, newest references added to the chapters, and a good subject index of 12 pages), Elsevier Science Publishers, Amsterdam London New York Tokyo, (1993). ISBN 0–444–89648–1. Dfl. 465.

24 experienced practitioners from Germany, France, Scotland, Spain, The Netherlands, Sweden, Canada, Austria, Belgium, and the U.S.A. treat aspects of environmental analysis: the use of various techniques, applications to trace analysis of pollutants, mainly organic compounds, and quality assurance aspects. In fact the assessment of the quality of our environment depends also on the availability of reliable analytical data as scientific conclusions, and political decisions on environmental issues are based on their interpretation. Effective quality assurance is only possible if analytical techniques are available, that can generate reliable data and their appropriate application. The excellent book for environmental chemists, post-graduate students, and users of analytical data is structured into four parts (with 17 chapters):

- Field sample techniques and sample preparation (including extraction) of atmospheric, aqueous, sedimentary and biologic pollutants,
- Application areas (including chromatographic separation), such as the determination of PCB's, phenolic compounds, pesticides, radionuclides (exposure to natural and manmade sources) and marine toxins,
- Quality assurance and reference materials, and
- Novel and emerging analytical techniques, such as fluorescence spectroscopic techniques in the determination of PAH's, characterization of surfactants, LC-MS interfacing systems in polar pesticide analysis, speciation of organometallic compounds (particularly tin, arsenic and mercury derivatives) by hyphenated techniques, and capillary electrophoresis.

The volume is well presented and contains very valuable, concrete information, particularly also as far as interpretation of chromatograms and of spectra. It thus fulfills the goals of an updated, excellent handbook.

BIOSENSORS WITH FIBEROPTICS, edited by D. L. Wise, Northeastern University, Boston, Massachusetts, U.S.A.) and L. B. Wingard, Jr. (+) (University of Pittsburgh, Pennsylvania, U.S.A.) 370 pages (including 113 figures, 19 tables, newer references added to the chapters, and an index of 4 pages) The Humana Press Inc., Crescent Manor, Clifton, New Jersey 07015, U.S.A. (1991). ISBN 0–89603–190-X. US$ 79.50/89.50.

The practical, up-to-date reference text has been written for researchers and clinicians. Novel biotechnology-based fiberoptic biosensors are used for detection of very low levels of chemical and biological moieties. Direct assay and redout of bioinstrumentation

information are provided. Sensitivity and selectivity of laboratory medical diagnostics are brought to measure traces in the body and in environmental situations, monitoring during bio-remediation and continued surveillance. Around the perimenter of a hazardous waste site it is for instance possible to in-situ surveil hazardous leachates by micro-immunosensors with biopolymer coatings on the fibers. In rapid "doctor's office"—type systems biological and chemical moieties may be detected, no one disease vector need be focused upon. The Volume for a wide audiance is structured into the ten chapters

- Concepts, Biological Components, and Scope of Biosensors,
- Chemical Sensing with Fiberoptic Devices,
- Fluorescent Labels,
- Chemistry and Technology of Evanescent Wave Biosensors,
- Optical Characteristics of Fiberoptic Evanescent Wave Sensors,
- Evanescent Wave Immunosensors for Clinical Diagnostics,
- Instrumentation for Cylindrical Waveguide Evanescent Fluorosensors,
- Immunoassay Kinetics at Continuous Surfaces,
- Luminescence in Biosensor Design, and
- In-Vivo Applications of Fiberoptic Chemical Sensors.

GLOBAL CHANGES IN THE PERSPECTIVE OF THE PAST, Dahlem Workshop Report (Environmental Sciences Research Nr. 12), edited by J. A. Eddy, (University Center, Michigan 48710, U.S.A.) and H. Oeschger, (University of CH-3012 Berne, Switzerland) 383 pages (including 82 figures, 10 tables, references added to the chapters, and an index of 13 pages), John Wiley & Sons, Chichester New York Brisbane Toronto Singapore (1993). ISBN 0–471–93603–0. £ 80.

Leading scientists from the U.S.A., France, Germany, Belgium, Switzerland, Australia, Canada and Sweden met in December 1991 in Berlin to discuss interdisciplinarily the use of paleoclimatic data for analyzing climatic processes and for modeling the future evaluation of climate. The report contains background papers and summary group conclusions of the workshop. Documentation of past changes help to understand how global systems work, what is connected to what and how. Four discussion groups thus tried to answer the questions

- are Paleodata Good Analogs for Future Global Changes?
- what and where are the Gaps in evaluating Strategies for Reconstructing Global Changes?
- how can we use Paleodata for Evaluating the Internal Variability and Feedbacks in the Climate System?
- how can we use Paleodata for Evaluating the Forcing of Past and Future Climates?

Analytical techniques are not particularly discussed, but data reliability and isotope calibration. Dating techniques include deapsea sediments, ice cores, tree-rings, and U-Th mass spectrometry.

RISK BASED STANDARDS FOR ARSENIC, LEAD AND CADMIUM IN URBAN SOILS, by R. L. Chaney (U.S. Dept. Agriculture, Beltsville, Maryland 20705) and J. A. Ryan (U.S. EPA, Cincinaati, Ohio 45224) 130 pages (including 12 figures, 33 very valuable tables, and 30 pages of references, but no index) DECHEMA Fachgespräche Umweltschutz, D-60061 Frankfurt am Main (1994). ISBN 3–92–6959–63–0. DM 24.

The characteristics of the source of metals in a contaminated soil may have a strong effect on the potentential for subsequent risk of those metals in the soil. The authors thus describe the application of the Pathway Approach for Risk Assessment which was created to support developments of U.S. limits for contaminants in soils ammended with sewage sludges. The relevance of many sources of data on direct injection of soil, ingestion of crops grown on contaminated soils (including home garden soil), and ingestion of livestock which consumed forages and/or soils were carefully evaluated. False high estimates of phyto-availability and false high bioavailability of metal species in animal feeding have been observed. Zinc reduces both the uptake of cadmium by plants and the effect on human health. High quality sludges may for instance be applied in unlimited amounts over time, though sludge may add metal adsorption capacity to soils (not just metal species).

After the Introduction the very important booklet is structured into four chapters:

- Soil Cadmium Risk to Humans,
- Evaluation of the Potential for Lead Risk to Children who ingest Lead-rich Urban Soil,
- Risk from Soil Arsenic (short), and
- Current Status of the Biosolids Quality Approach to Regulation. Informations and methods developed to estimate standards for urban contamination are summarized.

In the case of cadmium species risks through home vegetable gardens are for instance discussed. Phytotoxicity from zinc limits the maximum levels of cadmium which can be reached before substantial yield reduction is observed. Addition of limestone plus zinc as salt or composted biosolid gives the expected reduction in lettuce cadmium. Present recommended limits for daily cadmium ingestion (1 μg Cd/kg body weight/day) contain both a listed safety factor of 4 and hidden safety factors. Individuals who actually consume garden vegetables have a very good diet and are not going to be the nutrient deficient people who are the most sentsitive populations at highest risk for dietary cadmium.

In the case of lead species two significant sources remain in the urban environment: paint and soil contaminated by historic automotive lead emissions, paint residues, and stack emissions. But since garden foods transfer of soil lead is very small, risk to children via direct soil ingestion is greater, although adsoption on the soil reduces risk compared to lead from food and water. Addition of phosphate sources may additionally reduce Pb solubility and bioavailability. Effects of soil metals increase with increasing clay contents, and decrease with soil age and decreasing soil pH. Risks from soil metal species is in fact dependent on the characteristics of the metal source, and on soil properties.

In the case of arsenic species, levels in edible plant tissues remain low, since As causes phytotoxicity in food crops. Rice is among the most As-sensitive crops because it is grown in flooded soils; upon flooding, arsenite is formed in the soil, and because arsenite is adsorbed less strongly than arsenate, the soil solution arsenite concentration is increased enough to cause phytotoxicity. The ability of humans to methylate finite amounts of adsorbed arsenate may indicate that As is really a threshold toxicant, as has generally been shown by epidemiologic studies. But the role of doses on incidence of internal or skin cancers must be understood better.

HAZARDOUS WASTE SITE SOIL REMEDIATION, edited by D. J. Wilson (Vanderbilt University, Nashville, Tennessee) and A. N. Clarke (Eckenfelder Inc., Remedial Technologies Development, Nashville, Tennessee, U.S.A.) 567 pages

(including 166 figures, 80 tables, references added to the chapters, descriptions of the contributors, and an index of 9 pages) Marcel Dekker, Inc., New York Basle Hong Kong (1994), ISBN 0–8247–9107–X. US$ 165.

The authors do not discuss older technologies that may no longer be acceptable or that are too expensive. They thus handle a number of innovative technologies that have surfaced recently providing the environmental engineer with additional options. The ten chapters deal with contaminant transport and behavior in subsurfaces, problems with the remediation of diffusion-limited fracturated-rock systems, chemical stabilization of contaminated soils, soil vapor stripping, thermally enhanced vapor stripping, thermal desorption, enhanced biodegradation for on-site remediation of contaminated soils and groundwater, saturated zone remediation of volatile organic compounds through sparging, in-situ vitrification, and soil surfactant flushing/washing.

The contributors like to emphasize the need for more research support for improvements in the effectiveness of remediation techniques, expecting results in more timely cleanups and in quite substantial savings for industry, consumers, and taxpayers: techniques for site characterization (permeabilities, distribution and concentrations of contaminants, etc.) will become more accurate and less costly as new instruments and methods are developed, also because improved data processing and interpretation (such as kriging) methods will be used in the future. One can also hope that applied microbiologists will be successful in their attempts to find organisms that are able to break down refractory organics under a range of common environmental conditions. One might expect mathematical modeling to improve and to become more widely used, e.g. in the cost-effective design of remediation schemes employing, perhaps, several technologies at once or in sequence. And one may hope that methods will be forthcoming for the rapid removal of dense nonaqueous-phase liquids-sinking through saturated zones—from media in which diffusion rates are so frustrating slow.

GROUNDWATER CONTAMINATION AND ANALYSIS AT HAZARDOUS WASTE SITES, edited by S. Lesage (National Water Research Institute, Burlington, Ontario, Canada) and R. E. Jackson (Intera Inc., Austin, Texas, U.S.A.) 545 pages (including 127 figures, 87 tables, references added to the chapters, contributor biographies, and an index of 9 pages), Marcel Dekker, Inc. New York, N. Y. 10016, U.S.A. (1992). ISBN 0–8247–8720–X. US$ 175.

The intention of the 32 international experts from the U.S.A., Canada, Germany and Australia was to gather in one text information regarding the investigation of the fate of toxic chemicals emanating from hazardous waste sites, thereby contaminating the groundwater. The 17 chapters are structured into the four main sections:

- Analytical Methodologies,
- Monitoring Stategies,
- Site Investigations (Case Studies), and
- Geochemical Investigations.

The principles of environmental analytical chemistry, of standards methods, and of statistical evaluations are also covered, including completed information on known types of organic contaminant plumes. Regarding analytical methodologies, for instance five chapters deal with:

- practical organic analytical chemistry for hazardous waste site investigations, looking particularly at sampling, GC-MS analysis, other hyphenated methods, and good quality control, laying emphasis on chlorinated phenols and polycyclic aromatic hydrocarbons,
- nonpriority pollutant analysis and interpretation, looking for instance at well compounds,
- establishing an analytical protocol for the measurement of EPA's Appendix IX List of Compounds (consisting of 222 entries: metal species and inorganics, chlorinated pesticides, phenoxy acid herbicides, volatile and semivolatile organics. Chlorinated dioxins and furans, etc.),
- hierarchical analytical approach to evaluating the transport and biogeochemical fate of organic compounds in sewage-contaminated groundwater (looking at a site in Massachusetts), using closed-loop stripping GC-MS, purge-and-trap analysis, liquid-liquid extraction, and solid-phase extraction, and
- application of soil-gas sampling technology to studies of trichloroethylene vapor transport in the unsaturated zone.

Of course also in other chapters, particularly those related to (field) monitoring of polynuclear aromatic hydrocarbons and of other volatile organic compounds, as well as of dense nonaqueous-phase liquids, the analytical chemistry was discussed in detail.

INDOOR AIR: IARC Environmental Carcinogens: Methods of Analysis and Exposure Measurement, Volume 12, edited by B. Seifert (Institute for Water, Soil and Air Hygine, D-14195 Berlin) H. J. van de Wiel, B. Dodet, and I. K. O'Neill (International Agency For Research on Cancer, F-69372 Lyon) 384 pages (including 40 figures, 64 tables, references added to the chapters and methods, but unfortunately no index) World Health Organization, Geneva, International Agency for Research on Cancer, Lyon, and Oxford University Press, Oxford and New York (1993). ISBN 92–832–2109–5. £ 45.

The new volume of the IARC Series of Manuals on Analysis and Exposure Measurements for environmental carcinogens provides 12 chapters reviewing the scientific background to the problem and 25 thoroughly checked methods for sampling, and analysis of indoor airborne contaminants (for instance for studying their epidemiological relationships to human diseases, as well as for monitoring and controlling levels of exposure).

The chapters are structured into four parts:

- Introduction and General Aspects,
- Sampling and Handling Procedures,
- Exposure Assessment from Field Studies, and
- Methods and Protocols for Indoor Air Pollutants in the Home and White-Collar Workplace (for instance for Radon and Radon-daughters, Asbestos, Volatile Organic Compounds, Environmental Tobacco Smoke, Respirable Particles, Carbon Monoxide, and Pesticides).

In the first chapter for instance also cooking, heating and air treatment pollutants in indoor environments, and bioassays of complex mixtures of environmental carcinogens are discussed.

AIR POLLUTION CONTROL AND DESIGN FOR INDUSTRY, edited by P. N. Cheremisinoff, (New Jersey Institute of Technology, Newark, U.S.A.) 589 pages (including 166 figures, 73 tables, some rather old references added only to a few chapters, and an index of 13 pages) Marcel Dekker, Inc. New York, Basle, Hong Kong (1993). ISBN 0–8247–9057–X. US$ 150.

The author states that a commitment to sound engineering practices and economics as well as familiarity with the control options is required, in order to succeed in controlling air pollution regardless of its source. He identified many elements for air pollution control for industry. The book is based on an earlier volume, published in 1977, and brought up-to-date with revisions required by the practioner. The 18 chapters deal with stacks in pollution control, modeling atmospheric dispersion of pollutants, gravity settling chambers, cyclones, fabric filters, electrostatics and electrostatic precipitation, gas phase adsorption for air pollution control, thermal incineration, packed wet scrubbers, jet venturi fume scrubbing, venturi scrubbers, lime/limestone scrubbing for SO_2 removal, fans and blowers, sampling and stack testing, industrial oder control, air clean-up and water pollution problems, plant compliance for managers, and indoor/in-plant air quality. Some analytical principles are discussed in the chapter "Sampling and Stack Testing", and refer for instance to sampling, to flow measurement techniques, to stack sampling pariculates, to sample location, to stack humidity determination, to test accuracy, to particle size distribution (principles of cascade impaction are also discussed), to filter media, and/or to in-stack monitors. One finds references to adsorption processes, but not really to waste problems (besides odor problems that are discussed in more detail). The word "recycling" is not yet included in the index, and waste treatment is restricted to microbiological waste treatment of pharmaceutical wastes, leading eventually to malodor production. Process survey data sheets are discussed in more detail.

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