

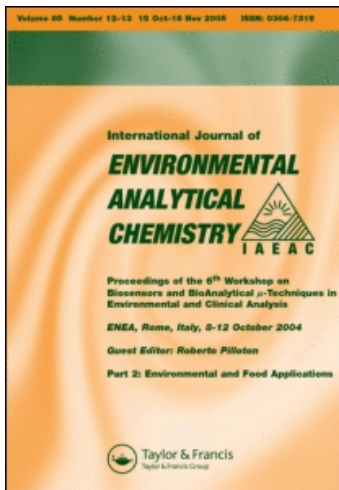
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BOOK REVIEWS

ELEMENT CONCENTRATION CADASTERS IN ECOSYSTEMS, edited by Helmut Lieth and Bernd Markert, University of D-W-4500 Osnabrück, 448 pages (incl. 123 figures, 119 tables, and a not very good index of 8 pages), hard cover, format 245 × 179 mm, ISBN 3-527-28054-5, VCH Verlagsgesellschaft mbH Weinheim-Basle-Cambridge-New York (1990), DM 164.

These proceedings of a Workshop, which took place in Osnabrück on 13-15 March 1989 describes methods of assessment and evaluation, and is thus structured after an introduction into six parts:

- Sampling
- Sample Preparation
- Instrumental Measurement
- Quality Control and Data Evaluation
- Use and Interpretation and Interpretation of Multielement Data
- Political Aspects.

It includes 29 chapters, presented by German, Dutch, British, Japanese, Belgian, Spanish, Italian, Hungarian, Polish, Austrian, and Swiss scientists. The goal of the Workshop and of the Proceedings was to improve our understanding of the elemental composition of ecosystem components and to predict flow directions by a holistic approach. The bulk of the elements are normally bound as insoluble compounds—many have a high affinity to amino acids—until they are mobilized, for instance by weathering processes. The contributions deal predominantly with methodological problems, that is to say with convenient methods of presenting the quantitative analyses of individual samples. For each particular element in a representative table 50% levels situated between two orders of magnitude have been determined. Of course correct sampling and correct analytical chemistry are prerequisites for meaningful tabulation.

Though the steadily increasing pollution, caused by inorganic and organic substances introduced by man, requires permanent global monitoring of the enrichment of potential pollutants and consequently the observation of adverse biological effects on the ecosystem, emphasis was not so much laid on environmental analytical chemistry. Arbitrarily one finds information on soil and plant sampling, on sample preparation of some human extracts with fluorine, iodine, and other elements, on short informations on signal and peak handling, on Zeeman graphite-furnace-AAS, and on inductively coupled plasma techniques combined with emission or mass spectroscopy, as well as on neutron activation analysis. More than half of the book is however dedicated to data presentation. Perhaps more care should be given to critical limitations of such tables. Nevertheless one

finds interesting data on biomonitoring with plants, lichens, and peat, and on lead, arsenic and cadmium fluxes. But although there would be a need for a coherent and uniform screening system for chemical risks, it seems to be doubtful whether such approaches are a basis for developing ecological tolerance limits for human activities. One cooperating scientist made clear that differentiation is at least necessary between source restrictions, effect mitigation measures, and steps to rehabilitate polluted ecosystems. The book thus causes the reader to think over in a critical way all "analytical" steps in monitoring without presenting unassailable propositions how to act. But this is already a reason to study the book.

ENVIRONMENTAL CHEMISTRY AND TOXICOLOGY OF ALUMINUM
by Timothy E. Lewis, Lookhead Engineering and Sciences Company, Las Vegas, Nevada 89119, 344 pages (including 94 figures, 70 tables, newest references added to the chapters, and an index of 4 pages), hard cover, format 242 × 163 mm, ISBN 0-87371-194-7, Lewis Publishers, Inc., Chelsea, Michigan 48118, U.S.A. (1989), £48.55.

Each of the 19 chapters represents a detailed summary (and a more in-depth manuscript with updated references) of platform discussions at a three-day symposium "The Environmental Chemistry of Aluminum" held during the 194th Annual Meeting of the American Chemical Society in New Orleans, August/September 1987. The co-authors tried to overcome the general lack of communication. Recently research has focused on the effects of increased mobilization of aluminum by acidic deposition. But for instance the tea plant is able to grow in very acidic soil (tea leaves serve as a sink for aluminum). Effects in the environment are highly dependent upon the form in which the element enters the system, and toxicity is a function of the concentration of the biologically active fraction of the total. Analytical methods have been improved for determining the multitude of forms of aluminum. Some human disorders, such as Alzheimer's disease and senile dementia, have been of public concern.

Twelve chapters do deal with coordination chemistry, speciation, interactions with organic carbon (e.g. with humic substances), episodic variations, and transfers in soils. One chapter discusses chronic concentrations of aluminum for trouts (European research results are however not discussed). One chapter is related to composition and consequences of aluminum in water, beverages, and other ingestibles. Four chapters deal with aluminum neurotoxicity, and the last chapter with possible counteractive steps. While four speciation oriented contributions originate from the United Kingdom, the Netherlands, and Norway, the other 15 manuscripts were written by Northamerican (U.S.A. and Canada) scientists. While the scientific level of the book is on a high level and allows to answer most questions, one does thus not find access to important European and Japanese publications on biological aluminum effects, although some Belgian, German, Italian, and Swiss chemists and toxicologists have certainly contributed to the state of the art.

ORGANOTIN CHEMISTRY (ORGANOMETALLIC CHEMISTRY LIBRARY 21) by Iwao Omae, Tokyo Research Center, Teijin Limited, Asahigaoka, Hino (Japan), 356 pages (including 35 figures, 78 tables, many formulae and equations, over 1000 references distributed in the nine chapters, and an index of 13 pages), hard cover, format 245 × 171 mm, ISBN 0-444-87456-9, Elsevier Science Publishers B.V., P.O. Box 330, NL-1000-AH Amsterdam, or P.O. Box 882, Madison Square Station, New York, N.Y. 10159 (1989), Dfl. 270.00 or US\$ 142.00.

The author proposed and confirmed (by X-ray diffraction studies) a hypothesis for the existence of an intramolecular-coordination five-membered-ring structure of organotin compounds. He maintained a keen interest in the field. The book thus comprehensively covers synthetic methods, reactions, structures, spectroscopic analyses, and industrial applications of organotin compounds to organic syntheses, and provides appropriate references to recent articles, reviews, and books. After the introduction the volume is structured into the eight chapters:

- The Metal Tin and Inorganic Tin Compounds
- Basic Methods of Preparation of Organotin Compounds
- Preparation and Properties of Organotin Compounds
- Reactions of Organotin Compounds
- Organic Syntheses with Organotin Compounds
- Structure of Organotin Compounds
- Spectroscopic Investigations
- Applications of Organotin Compounds.

In the second-last chapter the author characterized organotin compounds by IR, ^1H NMR, ^{13}C NMR, mass spectroscopy, and especially by ^{119}Sn NMR spectroscopy (shifts in non-coordinating solvents are discussed) and by ^{119}Sn Mössbauer spectroscopy. In the last chapter the applications—and the mechanisms of protecting effects—of PVC stabilizers, catalysts, wood preservatives, antifoulants, agricultural chemicals, tin containing pharmaceuticals (particularly bactericides and antitumor agents), and flame resistant compounds are discussed, but biological and ecotoxicological side-effects are not even mentioned (and not explained). One misses in the book also newest information regarding environmental analytical chemistry, which is no doubt of increasing importance, for instance in studies (e.g. in harbors) related to the fates of organotin compounds. Some degradation mechanisms of technological interest are however discussed.

AIR POLLUTION AND FORESTS (INTERACTION BETWEEN AIR CONTAMINANTS AND FOREST ECOSYSTEMS), Second Edition, by William H. Smith, Yale University, New Haven, Connecticut, 618 pages (including 120 figures, 182 tables, references added to each chapter, and an index of 8 pages), hard cover, format 243 × 160 mm, ISBN 3-540-97084-3, Springer-Verlag, Berlin-Heidelberg-New York-London-Paris-Tokyo-Hong Kong (1990), DM 198.00.

Forests have the ability to function both as a source of and a sink, for air contaminants. Many interactions take place. The author has provided an excellent

compendium of the most significant relationships between forests and air pollution under low-, intermediate-, and high-exposure conditions. Before acute morbidity or mortality are observed, individual tree species or individual members of given species may be affected. The ecosystem impact in this instance may include reduced productivity and biomass alterations, increased insect outbreaks or microbial disease epidemics. Heavier ecosystem impacts include also gross simplification, impaired energy flow, changes in biogeochemical cycling, hydrology and erosion, climate alteration, and forest destruction. The volume contains mainly discussed statistical informations, and is structured after the introduction into the four sections (with 20 chapters):

- Forest Function as Sources and Sinks for Air Contaminants—Class I Interactions
- Forests are influenced by Air Contaminants in a Subtle Manner—Class II Interactions
- Forest ecosystems are influenced by Air Contaminants in a Dramatic Manner—Class III Interactions
- Global Atmospheric Stress and Forest Risk Assessment.

Analytical Chemistry is not discussed, but the role of forests in major element and compound cycles, influences on tree reproduction (pollen, flowers, seeds), nutrient cycling, and (symptomatic) foliar damage. Phytotoxicity thresholds of metal compounds are also discussed throughout the book and in a special sub-chapter.

THE HANDBOOK OF ENVIRONMENTAL CHEMISTRY, Volume 1 (Part E), Volume 2 (Part E), Volume 3 (Part E), and Volume 4 (Part B), edited by Prof. Otto Hutzinger, Chair of Ecological Chemistry and Geochemistry, University of D-W-8580 Bayreuth, linen, format 248 × 170 mm, Springer-Verlag, Berlin-Heidelberg-New York-Tokyo (1989/1990).

We have already earlier informed on this excellent handbook (see for instance *Intern. J. Environ. Anal. Chem.* **15**, 319/320 (1983), **19**, 244/246 (1985), **23**, 158/160 (1985), **27**, 343/345 (1986), and **36**, 191/192 (1989)), to which now four other additions have been published:

Volume 1 (The Natural Environment and the Biogeochemical Cycles, Part E) contains 192 pages (including 66 figures, 5 tables, references added to each contribution, and a subject index of 4 pages), ISBN 3-540-15548-1, DM 128.00.

The book contains four contributions on the thermodynamics of ecosystems, environmental systems, global transport processes in the atmosphere (dealing particularly with modelling and the ozone problem), and the atmospheric physical properties and climate change.

Volume 2 (Reactions and Processes, Part E) contains 240 pages (including 50 figures, 40 tables, references added to each contribution, and a subject index of 4 pages), ISBN 3-540-51126-1, DM 168.00.

The book contains four contributions on the photochemistry of ozone, non-enzymatic biomimetic oxidation systems (theory and application to transformation studies of environmental chemicals, particularly pesticides and solvents), quantitative structure-activity relationships of environmental pollutants (particularly of aliphatics, aromatics, and chlorinated organic compounds in aquatic organisms), and biotransformation of organic chemicals (particularly polycyclic aromatics, phenols, and chlorinated compounds) by fish: enzyme activities and reactions. A valuable appendix on fishes and their scientific names is added.

Volume 3 (Anthropogenic Compounds, Part E) contains 189 pages (including 23 figures, 42 tables, references added to each contribution, and a subject index of 5 pages), ISBN 3-540-51423-6, DM 128.00.

The book contains four noteworthy contributions on organotin compounds (including sources, analytical chemistry and its limitations, environmental interactions, and toxicology to animals and humans), chemicals in the rubber industry (including trends, classification, exposures, epidemiology and toxicology; carcinogenicity, genotoxicity, and teratogenicity are particularly discussed), organolead compounds (sources, concentrations, sinks, analytical chemistry), and aluminum (differentiating between aquatic and terrestrial aluminum, and discussing particularly kinetics and toxicity for plants, aquatic biota, and mammals, including occupational exposure).

Volume 4 (Air Pollution, Part B) contains 261 pages (including 93 figures, 42 tables, references added to each contribution, and an index of 7 pages), ISBN 3-540-50915-1, DM 198.00.

The book contains five contributions on control equipments, materials damage, peroxyacid nitrates, semivolatile organic compounds in the atmosphere, and in Arctic haze. In one contribution for instance corrosion of metals, damage to masonry, air pollution effects on paints and organic coatings, and configuration effects are discussed. Service life of galvanized steel varies for instance between 30 years in Carolina and 80 years in Dakota. Of special interest is also a contribution distinguishing between measurement techniques for pollutants of incomplete combustion, petrochemicals, biogenics, and smog aerosols.

It is true what the editor explains in the prefaces: The (available) environmental exposure concentrations depend on the fate of chemical compounds in the environment, and thus their distribution between compartments and their reaction behavior. The volumes help graduate students and practising scientists in industry and regulatory bodies to understand the basic occurring processes, and contain relevant data too.

TOXICOLOGICAL CHEMISTRY (a Guide to Toxic Substances in Chemistry) by Stanley E. Manahan, Professor of Environmental and Toxicological Chemistry, University of Missouri, Columbia, Missouri, U.S.A., 317 pages (including 26 figures, 10 tables, many formula, a few literature references added to the chapters, and an index of 11 pages), hard cover, format 242 × 162 mm, ISBN 0-87371-149-1, Lewis Publishers, Inc., Chelsea, Michigan 48118, U.S.A. (1989), £35.70.

The useful text-book is structured primarily on the basis of classes of inorganic and organic chemical substances to retain a chemical emphasis. After the

introductions to toxicology and toxicological chemistry, fundamentals of chemistry (analytical chemistry is not discussed), exposure and effects of toxic substances, and biochemical action and transformation of toxicants, one finds thus ten chapters on toxic elements, organometallics and organometalloids, toxic inorganic compounds, toxic organic compounds and hydrocarbons, oxygen-containing organic compounds, nitrogen-containing organic compounds, organohalide compounds, sulfur-containing organic compounds, phosphorus-containing organic compounds, and toxic natural products. The small handbook is clearly arranged, contains many examples, but it cannot be very differentiated. Important biological effects are described for many substances, and the short introduction on uptake and metabolism is very suitable, whereas carcinogenicity and mutagenesis is only treated very summarily. Carcinogenicity of cadmium and arsenic compounds is not discussed, and nickel compounds are not found in the index.

A GUIDE TO MATERIALS CHARACTERIZATION AND CHEMICAL ANALYSIS by John P. Sibilja, Allied Corporation, Morristown, N.J. 07960-1021, U.S.A., 318 pages (including 204 figures, no tables, and an index of 12 pages), hard cover, format 242 × 161 mm, ISBN 0-89573-269-6, VCH-Publishers, Inc., New York, N.Y. 10010, U.S.A. (1988), DM 75.00, £25.95.

It is not quite clear how the term "Materials" has to be defined within the scope of the useful guide, which includes approximately seventy-five techniques and general methodologies used in Allied-Signal Inc. It is an extension of the earlier "Analytical Sciences Skills" booklets. Emphasis is lead on "typical" problems related to the analysis of chemicals, polymers, ceramics, metals, and composites. In fact it is concluded that materials characterization have given impetus to technological advances in optical-electronics, chemicals development, polymers, the biosciences, and materials development in general. Each chapter describes the use, sample requirements, principle, some typical applications, limitations and some general references of the respective techniques. After the Introduction the volume is structured into 12 chapters:

- Molecular Spectroscopy
- Mass Spectrometry
- Chromatography
- Chemical Analysis, Electrochemistry, and Atomic Spectroscopy
- X-Ray Analysis
- Microscopy
- Surface Analysis
- Thermal Analysis
- The Viscosity and Molecular Weight of Polymers
- Physical Properties of Particles and Polymers
- Physical Testing
- Scientific Computation.

ANALYTICAL METHODS IN FORENSIC CHEMISTRY by Mat H. Ho, Prof. of Chemistry of Alabama, Birmingham, U.S.A., 440 pages (including 217 figures, 71 tables, (not very new) references added to each chapter, and an index of 9 pages), hard cover, format 247 × 174 mm, ISBN 0-13-037961-1, Ellis Horwood Series in Analytical Chemistry, Chichester, West Sussex, U.K.–New York–London–Toronto–Sidney–Tokyo–Singapore (1990), £56.00.

The 29 chapters were written by about 30 American and about 15 non-American scientists. The book is devoted to the analytical methodology, approaches, techniques and instrumentations for forensic and toxicological applications. Well established methods, methods and techniques which have undergone improvement, and essentially new approaches which promise to be useful, are assessed together with modern analytical instrumentations and novel analytical methods.

The book begins with six chapters that address the applications of various mass spectrometric methods (MS), including MS/MS and GC/MS, to forensic analysis. The next four chapters are devoted to the applications of several spectroscopic methods to the solution of specific forensic problems, including chiroptical methods, three-dimensional (3-D) fluorescence, radiative energy attenuation (REA), and flame atomic absorption spectrophotometry and flameless atomic absorption spectrophotometry. The greater part of the book includes a selection of chromatographic methods and their applications. Thin-layer, gas-liquid, high-performance liquid, and gel-permeation chromatography are reviewed. The radioimmunological screening, latex particle agglutination techniques, and semi-automated extraction are discussed. Also electrochemical techniques, proton-induced X-ray emission, and Fourier transform IR are able to help in specific problem situations.

The book thus deals especially with the forensic analytical chemistry of drugs (including narcotics) and drug metabolites. But trace metals, petroleum based products and firearm residues are also treated shortly. Emphasis is however lead on organoforensic chemistry. One finds a greater number of stimuli to techniques in the rapidly advancing field, but not all questions are systematically answered since the examples are selected somewhat arbitrarily, at least in non-drug forensic chemistry. Therefore the literature references are of particular value (unfortunately the titles of the cited literature are not mentioned, which would be particularly helpful in this case).

FOREST DECLINE AND AIR POLLUTION, A STUDY OF SPRUCE ON ACID SOILS by Ernst-Detlef Schulze, D-8580 Bayreuth, Otto L. Lange, D-8700 Würzburg, and Ram Oren, Durham, North Carolina 27706, U.S.A., 495 pages (including 186 figures, 95 tables, references added to the chapters, and a good subject index of 7 pages), linen, format 240 × 161 mm, ISBN 3-540-50793-0, Springer-Verlag Ecological Studies 77, Berlin–Heidelberg–New York–London–Paris–Tokyo–Hong Kong (1989), DM 298.00.

During the last decade, forest decline has become increasingly apparent. The decline in forest health was often reported to be associated with air pollution. The present study on Norway spruce stands in the Fichtelgebirge analyses various

processes interacting within forest ecosystems. It covers transport and deposition of air pollutants, the direct effects of pollutants on above-ground plant parts, the responses of soil to acid rain, the changing nutrient availability, and the accompanying effects on plant metabolism and growth. The role of fungi, microorganisms and soil animals in the decline of these stands is also discussed.

The excellent analysis of the problem is structured into five parts (each with a preface and several subchapters):

- Air Pollution: Transport and Deposition (with method descriptions)
- The Role of Fungi, Microorganisms and Soil Animals
- Direct Effects of Pollutants and Above-ground Plant Parts
- Soil Responses to Acid Rain and Associated Effects on Plants
- Processes Leading to Forest Decline: A Synthesis.

Of special interest is the last part, in which various factors and interactions are discussed. Particularly the combined effects of acidification and of ammonium and nitrate deposition lead to nutrient imbalance and a reduction in magnesium (and calcium) for plant uptake. In Part 2 one finds information on aluminum effects, e.g. on microorganisms, as well as information on electron microscopy techniques, e.g. for needle fungi studies. In Part 3 for instance leaching and uptake of ions through above-ground spruce tree organs are discussed. Soil chemistry (including cycling) is the relevant topic of Part 4, of course also in relation to root development.

EMERGING TECHNOLOGIES IN HAZARDOUS WASTE MANAGEMENT, ACS SYMPOSIUM SERIES No. 422 by D. William Tedder and Frederick G. Pohland, 402 pages (including 149 figures, 65 tables, references added to the chapters, and an excellent index of 12 pages), linen, format 235 × 160 mm, ISBN 0-8412-1747-5, American Chemical Society Distribution Office, Washington, D.C. 20036, U.S.A. (1990), US\$89.95.

In May 1989, the Divisions of Industrial and Engineering Chemistry, Inc., held a special symposium with the theme "Emerging Technologies for Hazardous Waste Treatment". Approximately 70 papers were presented, and 22 of them were selected for these proceedings. Dominant topics from the symposium to the book include reactive techniques for the destruction of chlorinated species and innovative methods for economically detoxifying large quantities of contaminated soils. Two sessions were conducted simultaneously. Many chapters deal with models, test substances, oxidation (for instance by hydrogen peroxide, and/or in presence of catalysts), immobilization, extraction, and recovery.

Two chapters are related to benzene and aromatics in general, and trichloroethylene, two to methanol, dichloromethane and trichloroethylene, five to phenol and phenolic compounds (including chlorinated ones), one to salicylic acid as a model compound, and other (chlorinated) compounds, and two to the dechlorination of dioxins and other chlorinated aromatics.

One chapter is devoted to mineral acids (e.g. H_2SO_4 extraction), one to (the oxidation of) sulfides, thiosulfates and cyanides, one to (the adsorption of) fluorides, one to strontium, one to calcium (dialysis), two to metal mobilization and stabilization (including energy waste), and two to actinides (technetium and plutonium).

NUCLEAR ENVIRONMENTAL CHEMICAL ANALYSIS by Juraj Tölgyessy, Bratislava, Czechoslovakia and Edwin H. Klehr, University of Oklahoma, Norman, U.S.A., 185 pages (including 61 figures, 32 tables, references added to the chapters and in a special chapter on "sources of information" of 7 pages, and an index of 5 pages), hard cover, format 247×174 mm, ISBN 0-7458-0176-5, Ellis Horwood Series in Analytical Chemistry, John Wiley and Sons, New York-Chichester-Brisbane-Toronto (1987), £35.00.

The useful booklet includes a good overview with many data, and is structured into the eight chapters "The Philosophy of Nuclear Environmental Chemical Analysis", "Environmental Sampling", "Preparation of Standards and Sample Pretreatment", "Analysis of Radioactive Environmental Samples", "Isotope Dilution Analysis", "Radio-reagent Methods", "Activation Analysis", and "Non-activation Interaction Analysis".

TOXICOLOGY OF COAL CONVERSION PROCESSING by Robert H. Gray, Battelle Pacific Northwest Laboratory, Richland, Washington, Harvey Drucker, Argonne National Laboratory, Argonne, Illinois, and Michael J. Massey, REI Technologies, Inc., Concord, Massachusetts, U.S.A., 603 pages (including 159 figures, 182 tables, two appendices on descriptions of samples assayed for toxicological activity and a summary of the toxicological database for coal-conversion oils and tars, references added to the parts, and an excellent subject index of 17 pages), hard cover, format 241×170 mm, ISBN 0-471-80264-6, Wiley-Interscience, John Wiley and Sons, New York-Chichester-Brisbane-Toronto-Singapore (1988), £70.00.

The well documented volume is structured after the Introduction and Summary into the five Parts "Coal-conversion Processes and Database Description", "Toxicological Effects of Coal-based Synfuels", "Engineering Analysis of the Toxicological Database for Coal-conversion Materials", "Chemistry of Coal-conversion Materials Related to Toxicology and Process", and "Health Effects in Coal-conversion Processes: Worker Health Experience". One finds for instance many data on aromatic compounds, chromatography, mutagenicity, and carcinogenicity.

DR. ERNEST MERIAN