Publications

Book reviews

Flow Injection Analysis – Chemical Analysis Monographs, Vol. 62, by J. Ruzicka and E.H. Hansen (John Wiley & Sons, 605 Third Ave., New York, NY 10016, 1981, 207 pp., $32.50).

Conventional continuous flow analysis is based on the concepts of the steady state signal and air segmentation introduced by Skeggs more than 20 years ago. Continuous flow analysis in equipment such as that manufactured by Technicon has revolutionized certain areas of analytical chemistry. Equipment of this type has become particularly well accepted in clinical chemistry laboratories with heavy sample loads. Basically, Ruzicka and Hansen take the position that significant savings in analysis time and reagent cost may be realized by ommission of air segmentation in flow injection analysis (FIA). This little book is their attempt to cope with the theoretical objections and to outline how, in practice, the concept can be made to work by application of seven rules. They have obviously met with some success, as a recent ACS meeting included a session on this topic.

Air segmentation has a number of easily understood advantages. The sample is divided into a number of discrete "packages" which can be mixed with reagents and subjected to a variety of treatments. After being pumped around reaction coils for appropriate time periods and removal of the air bubbles the sample may be directed through an appropriate detector as a homogenous stream. Without air segmentation, the sample zone disperses according to the parabolic velocity profile characteristic of laminar flow. Liquid in the center of the tube moves at twice the mean speed and the closer the layers to the wall, the progressively more retarded. The key to the FIA system lies in the control of how the sample zone disperses when injected into the moving carrier stream. According to the authors, the desire to produce a homogenous mixture of reagent and sample has been the stumbling block in all designs prior to FIA (Danish patent, 1974). In their system, mixing between the sample and the carrier is always incomplete, but the mixing pattern for a given experimental setup is perfectly reproducible (p. 12). Furthermore, as little as a 10% approach toward the equilibrium state seems (p. 30) to be adequate for a reproducible measurement. FIA systems are characterized by small overall internal volumes, usually only a few hundred microliters. An abbreviated statement or paraphrasing of the seven rules may illustrate the way FIA systems are operated: 1. increasing sample volume increases peak height and sensitivity; 2. dispersion is minimized by minimizing system length; 3. dispersion increases with path length and decreases with decreasing flow rate; 4. a mixing chamber greatly increases dispersion, lowers sensitivity and sampling frequency and increases reagent and sample consumption; 5. to obtain maximal sensitivity, it is necessary to balance the approach to reaction equilibrium against the dispersion; 6. to obtain maximal sampling frequency, the overall axial dispersion should be kept low and the sample volume small; 7. a decrease in flow rate in a narrow tube will lead to a decrease in dispersion. According to the authors, many types of analysis including dialysis, solvent extraction, gas diffusion, and pH titrations are practical. There is one negative comment that seems appropriate. The unprofessional hardsell with which the authors begin this book engenders the feeling that the method cannot really be worthwhile if such an approach is considered necessary or desirable. Such criticism aside, FIA seems to have considerable potential. This book can be recommended to any chemist, lipid or otherwise, faced with the automation of the analysis of large volumes of relatively routine samples.

Lipid Biochemical Preparations, edited by L.D. Bergelson (Elsevier/North Holland, Inc., 52 Vanderbilt Ave., New York, NY 10017, 1980, 306 pp., $69.75).

The editor is from the Lipid Laboratory in the Shemyakin Institute for Bioorganic Chemistry, Moscow, USSR, and the methods presented have been checked by Bergelson and his colleagues. Introductory sections cover extraction, column chromatography, preparative HPLC, nonchromatographic methods and determination of purity. The procedures sections are divided into categories including fatty acids, neutral glycerides, choline phospholipids, amino phospholipids, polyglycerolphosphatides and phosphatidic acid, inositolphosphatides, glycolipids and related substances, and miscellaneous products. These are, of course, the expected traditional headings, but some of the preparations are surprising.

The authors consider, for instance, that all the simple fatty acids are commercially available. They therefore describe only the production of linolenic, arachidonic and mycolic acids. Chemical syntheses of 2- and 3-hydroxy acids, tuberculostearic acid, spin-labeled, fluorescent and photo-reactive fatty acids are included. This section includes the enzymatic conversion of arachidonate to prostaglandins E_2 and $F_{2\alpha}$. In some sections, the procedures include preparation of tritium or ^{14}C-labeled materials. Frequently, a lipid prepared by one procedure, e.g., egg lecithin, is used as the starting material for another procedure, e.g., syntheses of lecithins with specific fatty acid composition via the cadmium chloride complex of glycerylphosphorylcholine. Several preparative applications of the phospholipase D reaction are given. The section on glycolipids includes ceramides, cerebrosides, gangliosides and glycosyldiglycerides. Each preparation gives reasonably complete directions and a sequence of notes relative to purification of reagents, chromatographic conditions and product stability. In general, preparations tend to be scaled at the level of a few hundred milligrams of lipid to be produced in about 2 days. A number of the procedures appear quite familiar to the extent of being verbatim transcripts of published procedures, but we are assured via footnotes that each has been tested and/or modified by Bergelson's colleagues. Rat liver or special microbial cultures are frequently cited as starting materials. This may cause some laboratories a problem. Literature citations after 1976 are relatively scarce but do extend to about 1978 with a footnote to an important 1979 paper. Perhaps,

for this reason, preparative applications of HPLC are absent. Of the materials suggested for routine purifications, Unisil appears to be no longer commercially available. Since the editor's native language is not English, one must either rapidly adjust to frequent relatively harmless aberrations or discard the book. Most readers should have little problem in coping with oxidated (oxidized), crystallic (crystalline), or J as the symbol for iodine. Actual typos, e.g., the wrong formula for phosphatidyl dimethylethanolamine on p. 145, appear relatively rare.

This is a well organized, comprehensive book written in an easy-to-read, if not always exactly grammatically correct, style and includes helpful hints and details that will endear it to the user. It is suitable for a graduate level laboratory course in lipid chemistry or as a simple procedure manual for the lipid chemist who must occasionally whip up a small quantity of this or that in a hurry.

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Soviet Science Reviews/Section D: Biology Reviews; Vol. 1, edited by V.P. Skulachev, and Section B: Chemistry Reviews; Vol. 2, edited by M.E. Volpin (Harwood Academic Publishers, Poststrasse 22, CH-7000 Chur, Switzerland, 1980, Section D, 476 pp., $79.50; Section B, 469 pp., $90).

These two volumes are part of a continuous series, published in an attempt to make available to non-Russian scientists the latest research being carried out in the USSR. These are planned to be annual series in chemistry, physics, mathematics, physics, biology, and astrophysics and space physics. The chemistry volume covers catalytic properties of zeolite systems, metal complex catalysts, biphotonic photochemistry and other chapters dealing with physicochemical topics. The chapters concerning catalysis will be of interest to those members involved in polymerization and hydrogenation processes.

The volume concerned with biology deals with many branches of physicochemical biological research. Much of the work involves the membrane-proteins and peptides, electron transfer and electrochemical phenomena. Other chapters cover work dealing with eukaryotic cells and genomes, *E. coli* RNA polymerase, and other aspects of protein research. This volume will find use by those chemists primarily interested in the biophysical chemistry of membranes and proteins.

The chapters in the volumes and the volumes themselves contain no index other than the table of contents, thus making these books difficult to use. The high price of these books will preclude their ready availability in these days of slashed library budgets. The cost of translation is undoubtedly high but the cost of these volumes seems unduly so.

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CRC Handbook of Electrophoresis, Vol. 1: **Lipoproteins: Basic Principles and Concepts**, and Vol. 2: **Lipoproteins in Disease**, edited by L.A. Lewis and J.J. Opplt (CRC Press Inc., 18901 Cranwood, Cleveland, OH 44128, 1980; Vol. 1, 312 pp., $56.95; Vol. 2, 378 pp., $59.95).

Volume 1 of this handbook consists of: History of Electrophoresis, Basic Principles of Electrophoresis, Composition and Electrophoretic Characteristics of Serum Lipoproteins, Composition and Structure of Apolipoproteins, Special Methods of Electrophoresis as Adapted for Study of Lipoproteins in Serum and Other Body Fluids, and Electrophoresis for Study of Lipoproteins in Cell Membranes and in Tissues. Detailed procedures are given for performing various electrophoreses, in particular (a) analysis of serum apolipoproteins by polyacrylamide gel electrophoresis in the presence of 7 or 8 M urea, sodium dodecyl sulfate polyacrylamide gel electrophoresis, and analytical isoelectric focusing in 6 M urea, (b) paper, agarose-gel, and polyacrylamide-gel electrophoreses of serum lipoproteins.

Volume 2 is devoted to lipoprotein changes induced by physiological and disease processes. This subject is divided into: Genetically Directed Hyperlipoproteinemias, Lipoprotein Changes as Affected by Nutrition, and Lipoprotein Changes in Disease.

The advantages of electrophoretic methods in detecting lipoprotein changes are generally simplicity, low cost, speed, and a requirement for only small amounts of materials. Methodological problems, however, persist in standardizing variables that could affect the electrophoretic behaviors of lipoproteins and in obtaining reproducible staining of lipoprotein bands. Furthermore, due to the lack of sufficient dissolution of lipoproteins in unfractionated hyperlipemic serum or plasma, only limited success is obtained in accurately identifying the electrophoretic patterns of the lipoproteins. Thus, many investigators abandoned routine serum electrophoresis as a practical tool for lipoprotein phenotyping. As indicated in the handbook, the electrophoretic methods will provide the most accurate information on the lipoprotein changes when used in conjunction with other methods of fractionation and quantitation, e.g., centrifugation, polyanion precipitation, immunochemical methods, and determination of cholesterol and triglyceride contents.

Volume 1 also contains a brief review of various nomenclatures of lipoproteins, and concepts of lipoprotein families. Volume 2 contains, in the appendix, 115 pages of lipoprotein literature which includes topics such as lipoproteins in general, electrophoretic methods, lipoproteinemia, and lipoproteins in various diseases. The references given were published in 1964-77 and, thus, some of those cited are outdated. However, they are valuable for surveying basic studies conducted in the lipoprotein field. The books would be handy references, especially for clinical chemists in acquiring basic electrophoretic procedures and in recognizing the advantages and limitations of various electrophoretic methods.

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