Book Review

CHROM. 5067

"*Advances in Chromatography*", Vol. 8, edited by J. C. GIDDINGS AND R. A. KELLER, Marcel Dekker Inc., New York, 1970, 400 pp., price £ 8.18.

Volume 8 in the series of *Advances in Chromatography* contains four contributions in the field of general chromatography and four in gas chromatography. In an article on gel chromatography DETERMEN points out the need for calibrating the column with standards. Polystyrenes, for example, are available in the molecular weight range of 100 to 2,000,000. For proteins, one needs only the density of the swollen gel and the elution behaviour of a single protein to calibrate a column. Paper chromatography can also be successfully used employing one protein as a marker. The method is acceptable to the range of 100,000.

LOCKE presents an article on thermodynamics of liquid–liquid partition chromatography. The interest in this field is increasing. LOCKE AND MARTIRE have chosen to define liquid–liquid chromatography relative to gas chromatography, since most of the LL research has been done by previous GC workers. The advantages of LL over GC are presented as operation generally at ambient temperature, lack of pressure effects (such as in GC), less danger of decomposition (thermal effects), and ability to separate compounds of high molecular weight.

The limitations include the need for immiscible phases, retentions must not be either close to column interstitial volume, or very large, the lack of good detectors, and where the mobile phase is polar, there is a tendency for the non-polar phase to be displaced from adsorptive supports.

The work of MARTIRE AND LOCKE started with a definable experimental system in mind, the LL chromatographic analogue of GC. Temperature control is important, which implies that temperature can be a variable, since it affects solute–solvent interaction. LOCKE suggests that temperature programming would be a productive field for research. The article contains numerous equations for the theory of solute retention and the study of complex equilibria.

SOCZEWINSKI discusses determination of optimum solvent systems for countercurrent distribution and column partition chromatography from paper chromatographic data. Numerous examples are cited to show the interrelationship between paper chromatography and column chromatography.

STRAIN AND SVEC cover some procedures for the chromatography of the fat solute chloroplast pigments. This paper is a review of the basic work done on the resolution of liquid-soluble, water-insoluble pigments of plants. Significant variations of the chromatographic methods lie in modification of the sorbents themselves. Tables are shown for the use of sugars, chalk, alumina, etc. The effect of various solvents on elution chromatography are shown, starting with petroleum ether (weakest) to pyridine (strongest eluent). The importance of the extraction step for recovery of components from plants is stressed and reviewed. While the paper deals largely with column chromatography because of the quantities involved, thin-layer and paper chromatography are also discussed.

In the field of gas chromatography, GUIOCHON discusses comparison of the

performances of various column types. This is a highly theoretical treatise on the comparison of various GC column types. These include conventional packed (CP), glass bead (B), porous layer bead columns (PLB), packed capillary (PC), glass bead packed capillary (BPC), conventional open tubular (COT), and porous layer open tubular (PLOT) columns. Results are summed up by the author, namely, packed capillary and open tubular columns can give faster and better analyses than conventional packed columns. The author feels that in the next few years, PC, conventional capillary, and PLOT columns will increase in their application. This trend is already evident in the U.S.A., particularly in the field of petroleum and petrochemicals. This is an outstanding, comprehensive, well documented presentation of the position of the column in gas chromatography. The author points out that it appears to be in the field most neglected, and, hence, the only area remaining where great advances are likely to be made.

ETTRE, MÁZOR, and TAKÁCS discuss pressure programming in GC. Although temperature programming was introduced in the early 1960's, pressure programming is relatively new, the first commercial units appearing in 1965. Advantages claimed for this approach include shorter analysis time, operation at lower temperatures, sharper peaks, more rapid recycling between runs and flow optimisation for the individual components.

There are disadvantages, including decreased column efficiency, added instrumentation requirements and problems with quantitative aspects.

Numerous examples are shown to illustrate improved chromatograms by pressure programming alone or in combination with temperature programming. Various means of achieving either stepwise pressure change or continuously varied pressure increments are cited. From a quantitative standpoint, pressure programming presents problems both to the flame ionisation detector and thermal conductivity detector. Calibration is almost always essential.

A treatise by DIMITRIADES, ELLIS, and SEIZINGER discusses gas chromatographic analysis of vehicular exhaust emissions. Gas chromatography offers the principle means of analysing the complex products of automotive exhaust. These comprise unburned hydrocarbons, oxides of nitrogen and oxygenated products as well as CO and CO_2. Problems connected with collection and sampling of exhaust gases are discussed. To facilitate analysis the oxygenated products are first removed. The hydrocarbons are then analysed by injection on a capillary column at subambient temperature, followed by temperature programming. This technique allows introduction of exceptionally large-size samples. Hydrocarbons C_1–C_{12} are listed, but no mention is made of the polycyclics present in trace amounts. Studies on diesel engine exhaust are discussed, covering the range C_1–C_{22}. The use of computers to handle the volume of data, and proper calibration of detectors are described. Check analyses between laboratories are noted as being poor.

An article by VAN SWAAY deals with a study of reaction kinetics by distortion of chromatographic elution peaks. The kinetics of first order reactions and first order equilibria occurring on a chromatographic column can be studied by the shape of the GC elution peaks. A literature review is presented and some mathematical models are described which appear promising for study of reaction kinetics.

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