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Book review

Strategies in Size Exclusion Chromatography, Edited by Martin Potschka and Paul L. Dublin; American Chemical Society, Washington, DC, USA; published June 1996; xiii+415 pp.; US \$109.5, ISBN 0-8412-2314-0

This work forms No. 635 of the ACS Symposium Series and was developed from a symposium sponsored by the Division of Polymer Chemistry, Inc., and the Division of Analytical Chemistry held at the 209th National Meeting at Anaheim, California, April 2–6, 1995. The volume consists of 21 mainly short chapters authored by established workers.

The first two chapters concern detector based analysis, the first determining the true number-average molecular weight of copolymers rather than an apparent value as usually determined by light scattering detection. The theoretical and technical aspects of Coupled Multiangle Light Scattering and Viscometric detection are discussed followed by the application of the procedures to the characterization of polyelectrolytes.

The next eight chapters describe column based analysis, the first considering gel chromatography for characterization of size and molecular mass of proteins. This review details the application of Stokes Radius and includes the use of globular proteins of known size to characterize gel pore size distribution. Chapter 4 describes the Monte Carlo simulation of freely rotating chains which allows detailed evaluation of the chromatographic radius of macromolecules of varying flexibility. A soft-Body Theory of Size Exclusion Chromatography forms Chapter 5. The author develops a theory that retention and dispersion are directed by different shape criteria.

Protein retention on Superose 12 is studied over a

wide pH range in Chapter 6. The influence of the net protein charge and the stationary phase charge on the retention of proteins are discussed. Modeling of stationary phases with binary eluents forms Chapter 7. Distribution coefficients for polystyrene samples obtained by size exclusion chromatography on a silica based stationary phase in benzene-methanol binary eluents were used in the study.

A mechanism for the degradation of macromolecules in a non-homogeneous hydrodynamic field is proposed in Chapter 8 of the volume. The mechanism is based on the distortion of the homogeneous concentration in the bulk of the polymer solution because macromolecules undergo directed migration transverse to the flow lines. Chapter 9 concerns large-pore, permeable packings and shows that the improved performance of the packings is the augmented diffusivity due to convection. The final chapter in the column based analytical section details a unified thermodynamic model applicable to size exclusion chromatography, hydrodynamic chromatography and gel electrophoresis

The Synthesis and Characterization of Packings forms the third section of the volume and consists of three chapters. The first chapter mainly considers organic packings, commercially available polymer packings are listed as are commercially available polysaccharide packings. Silica Gel Modifications and other inorganic packings are very briefly mentioned. Chapter 12 discusses the use of inverse steric size exclusion chromatography for morphological characterization and Chapter 13 authored by a worker from Pharmacia indicates the characteristics of modern packings for use in aqueous systems.

Analysis of Polymer Composition forms the fourth section of the volume and again consists of three

chapters. Chapter 14 reviews the related methodologies of adsorption and limiting conditions of solubility of polymers. A tabulation of stationary and mobile phases for the critical and limiting conditions for a number of polymers is presented. Compositional heterogeneity of polyvinyl alcohol is reported in Chapter 15 using a procedure which appears to employ a size exclusion mechanism and also by a HPLC method. Chapter 16 discusses nonstandard methods based on size exclusion principles, which the author indicates intrinsically enlarges polymer and biopolymer chromatography capabilities.

Applications form the final section of the volume and consists of five chapters, which probably could have been included into the earlier sections. Chapter 17 describes methods for the direct observation and measurement of micelles. Lower and higher concentrations of micelles were determined using dual detection (multi-angle laser light scattering and refractive index) and light scattering respectively with polyethylene glycol and a copolymer of polyethylene glycol with lactate and acrylate groups (8KLX). A comparison of secondary effects namely hydrophobic interactions of sodium poly(styrenesulfonate) compounds of different degrees of sulfonation forms Chapter 18. The separations were conducted on a glycerylpropyl bonded silica column with elution

using sodium phosphate buffer (pH 7.0). Molecular characterization of high-amylose starch forms Chapter 19 and again refractive index and light scattering detection was used. The size exclusion chromatography of polysaccharides has been restricted by the solvents available. Chapter 20 reports the use of *N,N*-dimethylacetamide with 0.5% lithium chloride as an improved solvent/mobile phase with light scattering and refractive index detection. The final chapter discusses developments in ultracentrifugal sedimentation, a techniques well established for the determination of the polydispersity of a solute, but a technique which has lost popularity to more easily applied light scattering and viscometric techniques.

The volume is far from elementary and is a work for specialists with many chapters mathematical in nature. The volume will find its readers among established workers in size exclusion chromatography who desire to be aware of developments in the area. The volume lists almost 700 references to the scientific literature, about 30% of the references having appeared in the 5 years preceding the symposium. The work is thus quite timely and is recommended as an addition to the libraries of workers active in size exclusion chromatography.

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