

Chromatographic fractionation of polymers

Chromatography of Synthetic and Biological Polymers. Vol. 1: Column Packings, GPC, GF and Gradient Elution. Edited by Roger Epton. Pp. 386. (Wiley: London and New York, 1978.) £18.

THIS book is the first of a two-volume set devoted to the chromatographic fractionation of naturally occurring and synthetic polymers. The first volume is confined wholly to separations depending on differences in molecular dimensions, methods which are referred to in synthetic polymer science as gel permeation chromatography (GPC) and in biochemistry as gel filtration (GF). Neither term is logical as both methods may use rigid stationary phases such as porous glass or silica, and the connotation of "permeation" and "filtration" is at best vague. I prefer the directly descriptive terms, molecular sieve chromatography or more briefly, exclusion chromatography, which are equally applicable to both groups of separations.

The fields of application to synthetic and biological polymers have become so diversified that the decision to include both in a single publication is itself questionable. This diversity arises, not as the editor suggests in his introduction, from the differences in the scientific backgrounds of the investigators, but rather from the intrinsic differences in the chemistry of synthetic and biological polymers. The former are usually weakly polar or non-polar and mostly water-insoluble, whereas the latter are polar, frequently ionised, and generally soluble only in aqueous media. This fundamental difference has necessitated corresponding differences in the stationary phases used for separations in the two fields, so that very few are applicable to both. In this book (the proceedings of a conference held in Birmingham in 1976), 16 of the 28 individual communications deal exclusively with synthetic polymers, ten with biological polymers, and two with both fields.

Part 1 (papers 1-11) is the most valuable section of the book, as it provides a comprehensive account of the column packings used for exclusion chromatography, many of them novel and reviewed here in detail for the first time. These include the Ultrogels, composite agarose-polyacrylamide gels, the Enzacryls, poly(acryloyl morpholine) gels, and the Spherons, poly(hydroxyethyl methacrylate) gels. The latter two media are compatible with

both aqueous and organic solvents, whereas the Spherons (like the bead-form celluloses described in chapter 6) are readily converted into ion-exchange derivatives.

Part 2, on preparative and industrial scale chromatography, deals with scaling-up methods (chapter 12), and the intriguing topic of continuous flow chromatography is well reviewed in chapter 13 by Barker and his associates, who have pioneered in this field. I found chapter 14 disappointing, as despite its title, it deals only briefly with gradient elution as generally understood in separation science, and predominantly with synthetic polymer fractionation in a temperature gradient field.

Part 3, on applications, provides the usual miscellany of papers presented at conferences of this type. A notable exception is chapter 18 by Brewer and

Soderberg on fractionation of proteins between a cross-linked dextran stationary phase and a mobile phase containing water-soluble polymers. This short paper is of outstanding importance, as it promises to provide a means of applying the powerful Albertsson polymer two-phase liquid partition systems to chromatography. The Albertsson systems are unequalled in selectivity and range of application.

In summary this volume, despite its specialised appeal to two dissimilar groups of readers, provides the best account of recent advances in exclusion chromatography now available, and is warmly recommended.

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Collision spectroscopy

Collision Spectroscopy. Edited by R.G. Cooks. Pp.458. (Plenum: New York, 1978.) \$54.60.

PROCESSES like collisions between ions and molecules at high energies (in the kilovolt range), play a predominant role in the charge balance in the ionosphere as well as in laboratory plasmas. Collisional activation has recently been applied to metastable ions in mass spectroscopy to derive from them energy-differentiated spectra which can be used for the identification of fragment ions leading to the elucidation of the structures of complex organic molecules and the mechanisms of gaseous ion reactions. This book is intended to review a variety of studies concerned with these topics.

Following an introductory chapter by the editor there are seven chapters written by specialists on different aspects of the subject. The first covers electronic excitation of the ion or the target molecule in elastic collisions. It describes the two major experimental techniques for these studies: the energy-loss spectra of the primary particle itself; and the detection of photons emitted from the excited states resulting from the collision. Chapter 2 covers charge transfer in atomic systems from both a theoretical and experimental point of view. Information on potential energy functions for these transfer reactions is obtained by measuring cross sections which are differential in both scattering angle and kinetic energy.

The third chapter, dealing with both

charge exchange and excitation reactions, emphasises the value of translational energy measurements as a source of data on the primary collision event. It discusses a molecular orbital theory of inelastic collisions which seeks to construct time variable molecular orbitals for the dynamic system. It also describes the time-of-flight techniques which have been used to study the fast neutral products of inelastic collisions and has an important section on ion-photon and photon-photon coincidence techniques. Chapter four deals with the charge inversion of positively charged ions, the reaction being characterised in terms of the kinetic energy spectra of the product anions. Chapter five shows how several modified types of mass spectra which depend on the occurrence of ion-molecule interactions can be recorded. By appropriate adjustment of the electrostatic analyser of a mass spectrometer it can readily be arranged that only ions of a certain energy to charge ratio will be transmitted. The resulting spectra are a unique source of information on the structure and chemistry of polyatomic ions. Chapters 6 and 7 continue the study of collision-induced dissociation in diatomic and polyatomic ions and its application in mass spectrometry.

The book covers a rapidly growing and important subject which has many different facets. It performs the valuable service of integrating these in an authoritative way.

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