

propylene supplied in granular form.

Chapters 5 and 6 examine mixing and residence time distributions, which are particularly important if twin screw extruders are to be used as polymerization reactors. Mixing occurs both in the flow chambers and in the intensely sheared leakage flows. Although twin screw extruders are often considered to offer much better mixing performance than single screw machines, the author points out that this is not always true and depends on the geometry of the particular machine. An analysis of residence time distributions is presented, as are experimental results from both the model apparatus and laboratory extruder, using coloured fluid and radioactive tracer techniques, respectively. Although there is only moderately good agreement between theory and experiment, counterrotating closely intermeshing twin screw extruders are shown to have remarkably stable residence time characteristics, largely independent of operating conditions.

In Chapter 7, some experiments on melting suggest that it takes place over a short axial length of the extruder, and the complete melting sequence can be observed in each flow chamber. The mechanism of melting is quite different from that found in single screw machines. Overall machine operating conditions and performance are discussed in Chapter 8 and relatively simple control system models are developed to represent the observed behaviour. Finally, Chapter 9 compares and contrasts single and twin screw extruders on a largely qualitative basis, and the last chapter summarizes the main conclusions of the work.

The monograph does not offer a complete description and accurate analysis of twin screw extrusion. It does, however, provide qualitative descriptions of a number of previously poorly understood aspects of the process. Although the essentially isothermal Newtonian flow analyses presented are of only limited usefulness in predicting extruder performance, they provide starting points for more realistic treatments. Also, the investigation of melting is relatively superficial. In view of the limited amount of previous work on twin screw extrusion, however, the author is to be congratulated on the extent of his contributions to the subject. The book will be of interest to engineers and technologists concerned with the design and operation of twin screw extruders, and indispensable for those involved with extrusion research. As pointed out in the Preface, a knowledge of the physical phenomena that underly the process is necessary for attempts to improve it.

*R. T. Fenner*

### **ESR Spectroscopy in Polymer Research (Polymers: Properties and Applications, Volume 1)**

*B. Rånby and J. F. Rabek*

Springer-Verlag, Heidelberg—Berlin, 1977, pp 410, \$49.30

The volume under review is one in the series *Chemie, Physik und Technologie der Kunststoffe in Einzeldarstellungen* which is now entitled *Polymers: Properties and Applica-*

tions. It is written by two authors who work in the Technical University of Stockholm and is written for polymer physicists, chemists, biochemists and material scientists who may wish to apply e.s.r. methods to their research problems. The emphasis throughout is on research but there is a chapter on the fundamental principles of e.s.r. spectroscopy for those who want an introduction to the field. In this the background, nomenclature and theory is given and since the basic interpretation of e.s.r. spectra requires understanding of quantum mechanics and the use of matrix, vector and tensor calculations these are included where appropriate but with a minimum of mathematical treatment. There is an up to date chapter on experimental instrumentation and then there follow chapters on

e.s.r. studies of polymerization and degradation processes of polymers in reactive gases, oxidation, molecular fracture, graft copolymerization and crosslinking. In their preface the authors say they hope the book will provide a useful source of information by giving a coherent treatment and extensive references to original papers, reviews and discussions in monographs and books. This it does. There is an abundance of information, 2519 references obtained from an exhaustive survey of the literature and of *Chemical Abstracts* in the period 1960 to 1975 and the book is profusely illustrated with e.s.r. spectra. It should be available to any research scientist working in this field.

*H. G. Jerrard*

#### *Conference Announcement*

### **Chromatography of Polymers and Polymers in Chromatography**

Institute of Macromolecular Chemistry, Heyrovský Square 2,  
Prague 6-Petřiny, Czechoslovakia, 17–21 July 1978

The 6th Discussion Conference on Chromatography of Polymers and Polymers in Chromatography is being organized by the Czechoslovak Academy of Sciences, Institute of Macromolecular Chemistry in cooperation with the Institute of Chemical Technology, Prague, the Laboratorní Pístroje, Prague and the International Union of Pure and Applied Chemistry, Macromolecular Division. The conference will be held in Prague from 17–21 July 1978. The meeting will cover fundamental (theoretical and experimental) aspects of separation of synthetic and natural macromolecules by various chromatographic techniques. Topics to be discussed will include: chromatography of polymers; polymers in chromatography; theory of chromatography. The programme will consist of invited lectures, panel discussions and poster sessions. All correspondence should be addressed to the P. M. M. Secretariat, c/o 162 06 Prague 616, Czechoslovakia.

#### *Conference Announcement*

### **Synthetic and Semisynthetic Polymer Catalysts and Affinants: 18th Microsymposium on Macromolecules**

Institute of Macromolecular Chemistry, Heyrovský Square 2,  
Prague 6-Petřiny, Czechoslovakia, 10–13 July 1978

The Czechoslovak Academy of Sciences, Institute of Macromolecular Chemistry in cooperation with the Institute of Organic Chemistry and Biochemistry, Prague and the International Union of Pure and Applied Chemistry, Macromolecular Division are organizing a conference on Synthetic and Semisynthetic Polymer Catalysts and Affinants to take place in Prague in July 1978. The Microsymposium will review the most promising ways of synthesizing polymers with intended catalytic and affinity functions and should help to elucidate the role of the polymeric carrier in binding active groups and in the functional mechanism of final products. The programme will consist of invited lectures and contributed papers, and topics covered will be: carriers of catalytic functions; carriers of enzymatic functions; carriers of affinity functions. All correspondence should be addressed to the P. M. M. Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague 616, Czechoslovakia.