

Book Reviews

Ion-Containing Polymers: Physical Properties and Structure
A. Eisenberg and M. King
Academic Press, New York, 1977,
pp 287, £19.55, \$27.50

Although both commercial and academic interest in ion-containing polymers has increased considerably in recent years, a unified treatment of their physical aspects has not yet been published. The aim of this book is to correct this omission by serving as an introduction and review of the field, with particular emphasis on areas which are considered by the authors to require further experimental and theoretical attention. The topics covered are concerned primarily with the structure, elasticity and viscoelasticity of both organic and inorganic ion-containing polymers, and were selected by the writers with the interests of polymer physicists in mind. It should be noted however that the structure and properties of biopolymers are not discussed. In a short introductory chapter ion-containing polymers are classified according to their degree of crosslinking (ionic or covalent) and their extent of ionic character, which are treated as two essentially independent variables. Representative examples from each category are briefly described.

The second chapter is divided into two main sections. The first considers supermolecular structure and in particular experimental and theoretical evidence supporting the existence of ionic multiplets and clusters. This is followed by a review of the effects of ionic forces in polymers on their glass transitions. Studies on a variety of systems are reported, including polar polymers containing dissolved inorganic salts, ionic copolymers of low ion content (such as sodium salts of styrene-methacrylic acid copolymers), completely ionizable homopolymers (e.g. polyphosphates), and aliphatic ionenes.

The major part of the book is contained in Chapters III and IV (amounting to a combined total of 163 pages), which examine the viscoelastic properties of ion-containing homopolymers and copolymers, respectively. Chapter III is a survey of published work on the viscoelastic response of three main types of polymer; inorganic homopolymers such as polyphosphates and silicates, mixtures of organic non-ionic homopolymers with low molecular weight salts, and ionizable organic homopolymers (polyelectrolytes). The latter group is particularly interesting since details are given of their relaxation phenomena in the solid state, in moderately concentrated solution (1–20% polymer), and in the relatively unexplored dilute solution range.

Mechanical properties of copolymers whose major component is non-ionic and minor component ionizable or ionic, are considered in Chapter IV. Such materials include ionomers based on styrene, butadiene and ethylene. Also discussed in this chapter are the results from a recent study of the mechanical and dielectric properties of Nafion, a perfluorinated ionic polymer, and a description of the viscoelastic properties of poly-

Conference Announcement

**Microcalorimetry of Macromolecules:
20th Microsymposium on Macromolecules**
Institute of Macromolecular Chemistry, Hevrovský Square 2, Prague
6–Petřiny, Czechoslovakia, 16–19 July 1979

The Czechoslovak Academy of Sciences, Institute of Macromolecular Chemistry is organizing a conference on Microcalorimetry of Macromolecules, to be held in Prague in July 1979. The microsymposium will review the potentialities of microcalorimetric methods in the study of macromolecular systems with synthetic and natural macromolecules. The topics to be discussed will include: heat capacities of macromolecules in bulk and in solutions; phase transitions and structure of amorphous and crystalline phases; structure in solution; heats of physical and chemical changes; calorimetric methods and instrumentation; quasistatic and dynamic measurements. The programme will consist of about 8 invited lectures and 50 contributed papers. For further details contact: P. M. M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Hevrovského náměstí 2, Prague 616–Petřiny, Czechoslovakia.

electrolyte complexes, prepared either from mixtures of homopolymer bases and acids, or from mixtures of copolyanions and copolycations.

The final chapter in the book is concerned with configuration-dependent properties of ionic polymers. In this context a brief treatment is given of the use of excluded volume theories for predicting polyelectrolyte dimensions in solution, followed by a discussion of the effects of ions on the elasticity of polymer networks through changes in chain configuration. The ultimate section in this chapter looks at the dependence of polyelectrolyte solution viscosity on molecular weight, concentration and solvent environment.

The detailed discussion and analysis given in this volume makes it a valuable and comprehensive source of up to date information, both for experienced research workers in this field, and for those new to it. Apart from a few minor printing errors the book is clearly written and presented.

P. R. Hornsby

Developments in PVC production and processing: I
(Edited by *A. Whelan and J. L. Craft*)
Applied Science Publishers, London, 1977, pp. x + 231, 76 Ill, £12.00

This book comprises ten articles by British authors on developments in the chemistry, compounding and processing of rigid and flexible PVC. Chapter 1 describes the pattern of usage of PVC, and notes the effect

of economic and other factors on the growth in consumption. Perhaps inevitably, there is some overlap between Chapter 2, which discusses developments in polymerization technology, and Chapter 3, which is concerned with the toxicity of vinyl chloride monomer. It is encouraging to note that VCM concentrations have fallen dramatically at all stages of manufacture, following the publication of the medical evidence. Chapter 4 attempts the difficult task of surveying novel additives for PVC, including plasticizers, fillers and stabilizers, and leads on to Chapter 5, which describes equipment for continuous compounding. The remaining chapters review developments in processing technology, in the areas of cellular PVC (Chapter 6); blow moulding (Chapter 7); coating of wire and cable (Chapter 8); manufacture and use of rigid PVC pipe (Chapter 9); and calendaring (Chapter 10).

The picture that emerges is of a mature but still expanding industry, responding to an increasing demand for PVC by increasing the scale and efficiency of its operations. The most significant technical change in recent years has been the reduction in VCM levels. Elsewhere the emphasis is on refinement and improvement rather than on major changes.

The book is aimed at plastics technologists who already have some knowledge of the industry. Some familiarity with the chemistry and processing of polymers is assumed, especially in the earlier chapters. Readers wishing to learn more about the developments discussed will find an extensive list of references at the end of five of the chapters. However, three chapters give no references at all: the absence of journal and patent references detracts a little from the value of these reviews. In other respects this book provides a useful survey of current trends in the industry.

C. B. Bucknall