

# Book Reviews

## Dielectric Spectroscopy of Polymers

*P. Heading*

Adam Hilger, Bristol, 1977, 431 pp. £17.50

The dielectric properties of polymeric systems are of great commercial interest and a new book on the subject is always of interest. This particular book is valuable to all who study the electrical properties of polymers and it is written with emphasis on the relation between the dielectric properties and the molecular structure of the polymeric materials. It is a physical chemist's text, but should interest a general audience.

The first two chapters provide general introductions to the basic principles of dielectric spectroscopy and an account of structural transitions and molecular mobilities in polymers. These are followed by a chapter on the experimental techniques used to study dielectrics over the wide frequency range of d.c. to microwave frequencies. The remaining four chapters describe the dielectric spectra of pure polymers, of polymer compounds (a slightly misleading title, as this chapter includes the effects of various additives and the properties of other heterogeneous systems) and also the application of dielectric techniques to the study of cross-linking and ageing. An appendix gives relaxation maps for about thirty polymers.

The book is a reasonably advanced text more suitable for the graduate student than for the undergraduate, although the latter will certainly find sections of great value. The quality of some of the diagrams leaves something to be desired and some of the equations are misprinted. These should, however, present little difficulty to the discerning reader. This book contains much useful information and is a valuable contribution to the literature on polymeric systems.

*A. H. Price*

## Flame Retardance of Polymeric Materials, Volume Three

*Editors W. C. Kuryla and A. J. Papa*

Marcel Dekker, New York, 1975

The first chapter on polyurethanes by one of the editors of the series contains 462 references. There is however little attempt at a critical appraisal of this information and, in several cases in the tables, detailed descriptions of polymeric systems are given but the column headed flammability is blank. Although acknowledgement is made to three

proof readers there are still many lapses, thermal effects being measured on a 'colorimeter by Tian-Calnet'. On page 15 the author quotes results alleged to show that incorporation of flame retardants based on phosphorus render rigid foams less thermally stable. One wonders whether the editor allows for the fact that an efficient flame retardant may well volatilize before the polymer that it is protecting. It is however difficult to make any rational judgement on a table that purports to show that 25, 50 and 60% of the foam were all lost at an identical temperature.

The next chapter on acrylic moulding powders, castings and fibres contains 231 references and does show some evidence of critical review. It is a little surprising that the authors are unfamiliar with the word *Perspex*.

The third chapter has an interesting discussion of the effects of phosphorus on antimony oxide in flame retarded polymers and the final chapter on composites makes one or two useful points.

The book would have been quite useful had it been edited to a quarter of its present length.

*T. R. Manley*

## The Glass Transition and the Nature of the Glassy State

*Edited by Martin Goldstein and Robert Simha*

New York Academy of Sciences, New York, 1976, 246 pp. \$26.00

This book consists of the papers presented at a Workshop Conference held by the New York Academy of Sciences on December 10–12, 1975, together with transcripts of the

Discussion sessions. About half the text is devoted to the glass transition, but there are substantial articles dealing with secondary relaxations and cryogenic anomalies in glasses together with a final section of about 50 pages on the structure of amorphous solids. In the discussion of the glass transition comparable weight is given to the phenomenological and the molecular. There is also an excellent blend of papers on all glass forming substances including inorganic oxides, metal alloys, molecular liquids and polymers. For example, empirical aspects of the thermodynamics of the glass transition in inorganic and organic glasses and polymers are considered by Angell and Sichina. There are also critical discussions of equations of state for glasses (Simha) and the Gibbs–DiMarzio theory (Goldstein). This reviewer found the section on secondary relaxations particularly enjoyable, and warmly recommends a paper on the molecular origin of relaxations particularly enjoyable, and warmly recommends a paper on the molecular origin of relaxations in polymers (Heijboer) and a very comprehensive discussion of the glass transition and secondary relaxations in molecular liquids and crystals (Johari).

There follows a paper on thermal properties at low temperatures by Pohl and Salinger and a short theoretical contribution by Halperin. Finally, the section on the structure of amorphous solids considers the problem of order in amorphous inorganic solids before closing with some tantalizing speculations by Boyer on the structure of amorphous polymers.

In summary these articles represent a very wide range of interests and viewpoints. No common theme emerged, and this reviewer was left with the impression of many individualists intent on pursuing their own line, rather than the more coherent attack which exists, albeit in imperfect measure, in many scientific areas. In spite of this complexity of the subject matter the book is very well organized and can be recommended as a valuable review of the present state of the art.

*I. M. Ward*

### Conference Announcement

## Electro-optic and Dielectric Studies on Macromolecules and Colloids

Brunel University, Uxbridge, Middlesex, UK, 12–14 April 1978

A conference is being organized by Professor B. R. Jennings and Dr A. R. Foweraker of Brunel University, together with Dr C. Houssier (University of Liege) to be held at Brunel University in the spring of 1978. Topics are to include the theory, measurement and molecular interpretation of the changes induced in any of the optical or dielectric properties of molecular or biomolecular solutions, colloidal suspensions, liquids or liquid crystals when subjected to electric or laser fields. Related relaxation studies using methods such as T-jump, stopped-flow or flow orientation will also be welcomed. For further information please contact: Mrs. S. Dunster, Physics Department, Brunel University, Uxbridge, Middlesex UB8 3PH, UK.