

book reviews

Thermoplastics Elastomers. A Comprehensive Review

*N. R. Legge, G. Holden and
H. E. Schroeder (Eds.)*

Carl Hanser Verlag, distributed by
John Wiley and Sons Ltd,
Chichester, UK, 1987,
vii + 574 pages, £77.20
ISBN 3-446-14827-2

This book is a timely and welcome addition to the literature of one of the fastest growing fields of rubber technology. Industrially based authors active in research and development of thermoplastic elastomers have contributed to a well designed set of reviews in the following subject areas: thermoplastic polyurethanes (Bayer); polystyrene-polydiene block copolymers (Shell); polyolefins (DuPont); elastomer-thermoplastic blends (DuPont); dynamically vulcanized blends (Monsanto); polyesters (DuPont); polyesteramides and polyetheramides (Dow); polyether block amides (ATOCHEM); ionomeric (Surlyn) (DuPont); applications (Shell); and hydrogenated block copolymers (Shell).

Academic contributors also provide a sound theoretical base in the book by writing on the following active research areas: anionic triblock copolymers; ionomeric systems; block copolymer theory; modelling elastic behaviour of S-B-S; interfacial activity; order-disorder transitions; chain conformation in block copolymers; model studies of segmented block copolymers; compatibilization of polymer blends; novel block copolymers; history of thermoplastic elastomer studies; and future trends.

A readable, informative book has resulted which is gratifyingly self-contained and well illustrated. Each chapter has been divided into subsections by title and within each subsection are listed keywords alphabetically with a page number for each. This technique avoids the confusion of a single universal term, such as 'hard segments', having many page reference numbers. The value of this book as a single reference source is thus much increased.

Most of the original research was carried out in the USA in its substantial industrial rubber research laboratories and hence the majority of authors are based in North America. The general editors are to be congratulated in obtaining from all contributors a clear, lucid, writing style without trade names and jargon dominating the text. A

pleasant style feature is the way polymer science principles are used to explain property trends in each of the elastomer series described.

Printing quality is excellent and the book is properly bound with a reinforcing spine. The price is high and hence presumably educational and company libraries will be the prime purchasers.

This is a good, well edited and designed book which brings together diffuse concepts and data in the thermoplastic rubber field and will be valuable to both research and application scientists and engineers.

C. Hepburn

(University of Loughborough)

Electrochemical Science and Technology of Polymers—1

R. G. Linford (Ed.)

Elsevier Applied Science, Barking,
UK, 1987, xii + 344 pages, £48.00
ISBN 1-85166-031-3

In the not too distant past polymers were prized (and not infrequently cursed) by electrochemists for their insulating properties and their electrochemical inertness. However, in recent years both ionically and electronically conducting polymers have become available and our understanding of the mode of action of polymer-modified electrodes has increased greatly largely as a result of the elegant work of Albery and Saveant. On a more practical level, it appears that the commercial coming of age of perfluoro ionomer membranes will lead to far-reaching changes in the chlor alkali industry. A good working knowledge of both electrochemistry and polymer chemistry is required for a proper understanding of the topics, and with this in mind two general introductory chapters are provided. The first of these serves as a brief introduction to the basic principles of electrochemistry including electrostatics. Although this is a complex subject no references are made to some of the excellent modern texts which are now available in this field. Chapter 2 likewise deals with the basic principles of polymer science which are then applied to the particular case of ion conducting solvating polymers in the next chapter. This is followed by way of a complete change by a chapter dealing with the application of electronically conducting polymers as electroactive materials in

batteries. Their high conductivities, reversible redox behaviour and total insolubility has opened the door to the development of potentially cheap secondary batteries capable of deep charge discharge cycling exhibiting specific energies as high as 300 Wh kg^{-1} . The number of electronically conducting polymers is still increasing and it is hoped that future volumes in this series will deal with the synthesis, structures, properties and uses of these interesting systems.

The major part of this volume is devoted to a comprehensive review of polymer-modified electrodes. No less than 597 references, mostly post 1980, are used to review a field of no less remarkable for the depth of its theoretical insights as it is potentially useful in its application to electrosynthesis, electrocatalysis and sensors to mention just a few of the topics covered in this outstanding review.

The last chapter is devoted to the preparation, structure-transport relationships and applications of perfluorinated ionomer membranes. Although these materials were developed originally for use in the chlor alkali industry, they are increasingly used in other processes and some wider discussion of their properties and uses would have been useful.

Overall the book constitutes a useful compilation of material that is not readily available in any other form and should be of interest to polymer chemists, material scientists and electrochemists who wish to keep abreast of this rapidly developing field.

R. H. Dahm

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Polymer Surfaces and Interfaces

*W. J. Feast and H. S. Munro
(Eds.)*

John Wiley and Sons Ltd,
Chichester, UK, 1988, xii + 257
pages, £30.00
ISBN 0-471-91214-X

Although this book is based on the papers presented at the symposium on Polymer Surfaces and Interfaces under the auspices of the RSC and SCI at Durham in 1985, the individual articles manage to be both comprehensive and readable and are clearly intended to

inform the general reader rather than impress the specialist. A wide range of topics is covered and it is perhaps significant that three of the twelve papers are concerned with biomedical aspects. Of the remaining chapters, two deal with surface analytical techniques (Luminescence Techniques and SIMS), one with the plasma modification of polymer surfaces, whereas a further four chapters are concerned in one way or another with the interaction of polymers or resins with various substrates. Other less readily categorizable topics include multiphase polymer syntheses and Langmuir-Blodgett films. The editors and the individual authors are to be congratulated for producing a book of a uniformly high standard in which a large number of complex topics are presented in a concise yet highly readable form. Literature coverage is on the whole very good, many authors including references up to 1985. The book can be unreservedly recommended to chemists and materials scientists with an interest in adhesion, biomaterials, polymer dispersions and molecular engineering.

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Principles of Polymer Engineering

N. G. McCrum, C. P. Buckley and C. B. Bucknall
Oxford University Press, Oxford,
1988, xii+391 pages, hardback
£35.00; paperback £15.00
ISBN 019-856155-5

It is always of considerable interest to review a book which attempts a new synthesis of a subject area. In the present case, the authors have brought together many aspects of polymer science and engineering to provide a core text book

for students in engineering or materials science. The main thrust of the book is to the fabrication and mechanical properties of polymers with special regard to their engineering applications. The authors recognize from the outset that several parallel and interrelated objectives must be fulfilled. First, there should be a sound grounding in polymer chemistry and polymer physics. This requirement is met by several introductory chapters dealing with such topics as polymerization, chemical and physical structure, entropy elasticity, linear viscoelasticity, yield and fracture. Second, the student requires an introduction to fabrication and design. Three very substantial chapters, about one half of the total text, provide a comprehensive account of reinforced polymers, extrusion, injection moulding, thermoforming and many aspects of designing polymers for specific end-uses. Finally, it is recognized that a trained engineer must be able to make quantitative studies of every problem, if a genuine engineering application is to be satisfied. The student reading this textbook is therefore invited at every stage to test his understanding by very well constructed theoretical problems and by many worked examples.

I hope that in this summary of the contents and aims of this book I have conveyed its very detailed and comprehensive nature. One further important point should be made. There is a distinctly original flavour to the presentation of the subject matter which comes from the clever interweaving of fundamental science, practical technology and quantitative calculations. This provides a continuous challenge to the reader and the present reviewer found the book to be a very stimulating read. In conclusion, the authors are to be congratulated on a valuable contribution to the scientific literature and their textbook can be strongly recommended.

I. M. Ward
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Integration of Fundamental Polymer Science and Technology—2

P. Lemstra and L. Kleintjens
(Eds.)

Elsevier Applied Science, Barking,
1988, xviii+607 pages, £65.00
ISBN 1-85166-208-1

This book contains the texts of papers presented at the 2nd International 'Rolduc' Conference, held at the Abbey of that name in the Netherlands in April 1987. The object of that conference was to 'stimulate discussion between academic and industrial scientists and engineers' aiming towards a better 'integration of science and technology'; surely a very worthy aim. The book is organized, by subject, into eight sections: chemistry; chain-dynamics/conformation; thermodynamics/blends; networks/gels; crystallization; structure/morphology; rheology/processing; fibres/composites. There are 89 contributions in all, including both review articles and shorter contributions on specific research programmes. The authors come, as intended, from both University and Industry and it is reassuring to see how the interests and emphases of the two groups do, in fact, complement each other. Most (but not quite all) of the papers are clearly written; the review articles are all particularly helpful. There is an author index, and a clear list of contributions at the front, but I found the lack of a further subject index frustrating; for example, it is impossible to identify all papers on neutron scattering without reading every abstract. As is often the case, the price is a serious drawback to the purchase of this useful, but perhaps not essential, volume.

M. Hill
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