BOOK REVIEWS

Emulsion Polymerization and its Applications in Industry

by V. I. Eliseeva, S. S. Ivanchev, S. I. Kuchanov and A. V. Lebedev

translated from Russian by S. J. Teague, Consultants Bureau, New York, 1981, pp. 225+xv. US Price $49.50

The appearance of this book will be welcomed by all who have an interest in emulsion polymerization and polymer latices, whether they work in an academic environment or in industry. The great merit and usefulness of this book is that it provides a convenient summary of emulsion polymerization and certain aspects of latex science and technology from the Russian viewpoint. It is well-known that Russian workers over the years have made significant contributions to the fields of emulsion polymerization and polymer latices, especially in the area of the emulsion polymerization of polar monomers. Hitherto, much of this information has been inaccessible to English-speaking scientists and technologists who cannot read Russian. We now have a convenient summary of this hitherto inaccessible work in English. However, it must not be supposed that this book is confined to Russian contributions to the subject; it also reviews contributions from the West. In particular, its coverage of the Smith–Ewart theory is particularly comprehensive.

The book is in two parts. The first comprises three chapters which deal respectively with the emulsion polymerization of the non-polar monomers, quantitative aspects of emulsion polymerization, and the emulsion polymerization of polar monomers. The second part comprises five chapters which deal with the emulsion polymerization of various types of monomers, and with certain aspects of the science and technology of the latices which are obtained as the end-product of the reaction. The emulsion polymerizations dealt within this part of the book are those of butadiene and comonomers, styrene, vinyl acetate and comonomers, acrylic monomers, and chloroprene and comonomers. Some reference to industrial aspects of these emulsion polymerizations is made. Thus it is that this second part of the book contains sections which deal with aspects of production and application technology, as well as with the more fundamental aspects.

As is apparent from the heading of this review, several authors have contributed to this book; indeed, it appears from the preface that some seven authors in all have been concerned with the writing of the various chapers. The style is remarkably uniform for a multi-author work.

Each chapter concludes with a substantial bibliography. However, it is these bibliographies which reveal the principal defect of the book, namely, that it does not refer to contributions which have appeared later than about 1975. The book as a whole must therefore be regarded as being out of date in certain important respects. A further criticism is that the coverage is restricted to aqueous emulsion polymerizations and latices. The translator is to be congratulated on having produced a readable text; however, the present reviewer is not competent to comment upon the accuracy of the translation. Regrettably the book has no index.

D. C. Blackley

Poly(tetrahydrofuran), Polymer Monographs No. 8

P. Dreyfuss

Gordon & Breach, 1981

This book is one of a series, each volume of which is devoted to a polymer of commercial and scientific significance. All aspects of the subject, from polymerization kinetics to processing and engineering applications, are meant to be covered to some degree, and seminal references are given which allow the reader to pursue his specialized interests to depths greater than these slim volumes can provide.

Poly(tetrahydrofuran) (polyTHF) is a polyether which has excited the interest of academic and inductrial scientists for many years. It is prepared exclusively by the cationic ring opening polymerization of THF, and conditions have been devised under which the polymerization exhibits 'living' characteristics, i.e. where no termination or transfer reactions occur. Such conditions are comparatively rare in cationic systems, and their simplifying effect has allowed the kinetics and mechanism of THF polymerization to be studied to levels deeper than those of any other similarly polymerizable monomer. Moreover, because the polymerization may be carefully controlled, it is comparatively easy to prepare mono- or difunctionally terminated polymers, and these in turn may be further reacted to make industrially important block copolymers, such as polyurethane and polyester thermoplastic elastomers, as well as more exotic varieties still to find commercial utilization. This synthetic aspect is well covered in the text.

Knowing that the author had gained an international reputation through her academic studies on the mechanistics of THF polymerization, I had been initially concerned that this aspect, which has been effectively dealt with in reviews, would be given undue prominence. In the event I was pleased to find the book to be well structured, with a nice balance achieved between the minutiae of mechanistics on one extreme and the technology of industrial processes on the other. The result is a monograph which is generally informative and, in certain areas, authorative. It should be of great value to scientists who research on, and engineers who make use of this polymer and its derivatives. To my knowledge this is the first time that the great mass of data on poly THF has been assembled, categorized and analysed and, as one active in synthesizing new polymeric materials involving polyTHF, I found it a very instructive, if humbling experience to view my efforts with the context of this broad framework.

The book is very clearly written, and the arguments are logically developed. The solitary piece of unnecessary confusion occurs on page 96 where an apparently straightforward if complicated kinetic scheme is embellished with a 27 line explanatory caption which I found completely indigestible. Despite this minor carp, however, I think that this monograph will rapidly and deservedly become the sourcebook of information on polyTHF, and I recommend it to all scientists working in this important area.

D. H. Richards

Polymer Latices and Their Applications

Ed. K. O. Calvert

Applied Science Publishers, London, 1982 pp. 262+xi. £18.00

The appearance of this book is to be welcomed, because, notwithstanding the industrial importance of the subject, there has been over the years a dearth of publications which deal with latices as an important physical form in which polymeric substances can be obtained and applied. This book has been written by a team of authors drawn mainly from the United Kingdom latex-producing and latex-using industries. Inevitably it suffers from some of the disadvantages to which multi-author works are prone, such as uneven level of treatment and overlap of subject matter. Nevertheless, it will be of great value to all who require a broad survey of current industrial practices concerning polymer latices. This survey is especially useful because it has been produced by a group of scientists and technologists who are themselves working in the latex industry. The book can be criticized in that much of the treatment of the subject matter is superficial, although the coverage as a whole is comprehensive. However, the information given in the book itself can usefully be supplemented by following up the references which are given. Readers of this journal who use the book may be disappointed to find that neither the technological nor the physico-chemical fundamentals of the subject are dealt with to any significant extent.

After a general introduction to the subject of polymer latices come two chapters which deal respectively with natural and synthetic latices. There is then a chapter which surveys latex specifications and test methods. Then comes a succession of chapters which deal with the various applications for polymer latices. The application areas covered are carpets, binders, adhesives, paints, dipping processes, moulded latex foam, and 'diverse' applications. In the latter category are included applications such as latex thread, rubberized hair, latex casting processes, leatherboard manufacture, applications of latices in admixture with cement and bitumen, and applications to tyre-cord dipping. The concern is exclusively with aqueous latices. The treatment of the subject is generaly

up-to-date. Chapters which the present reviewer found especially interesting include those devoted to the application of latices to carpets, to latex paints and to adhesives, and the chapter concerned with latex dipping processes. The chapter dealing with latices in carpet manufacture is particularly useful in giving a timely survey of current practices in what is undoubtedly one of the major areas of application for polymer latices at present.

One disappointment to the present reviewer was the absence of any discussion of possible new and potentially significant applications for polymer latices, such as applications which seek to exploit the large polymer-aqueous phase specific surface area of latices, and applications which seek to exploit the electrical dissymmetry which is present at the interface between polymer and aqueous phase in the case of electrostatically-stabilized latices. Nor is any reference made to the efforts which have so far been made to exploit for medical purposes the absorptive and binding potentialities of the large area of polymer–aqueous phase interface which is present in latices. Another disappointment is the inadequate treatment of artificial latices and their potentialities. However, in spite of these criticisms, this book can be commended as a broad and authorative survey of many of the important aspects of modern latex technology.

D. C. Blackley

Plastics vs. Corrosives

R. B. Seymour

J. Wiley & Sons, New York, 1982

'Plastics vs. Corrosives' is a volume in the SPE Monograph series, and an updated and expanded version of the classic 'Plastics for Corrosion Resistant Applications' (1955). It contains the following fourteen chapters:

—Introduction;
—Fundamentals of plastics;
—Physical properties of polymers;
—Relationship of molecular structure to chemical resistance;
—Effect of solvents on polymers;
—Tests for corrosive resistant coatings;
—Testing of plastics for chemical resistance;
—Protective coatings;
—High solids composites, plastisols, pastes, powders and caulking composites;
—Faoms, castings and plastic mortars;
—Polymeric linings and thermoplastic and structures;
—Reinforced plastic pipe tank and structures;
—Selection guide: typical thermal and physical properties of commercial plastics;
—Selection guide: chemical resistance data for typical commercial plastics.

The first chapters give an extensive introduction to the problem and insist on the structural aspects more related to the chemical resistance of plastics. After discussions in the following chapters on the effect of solvents and the tests for coatings and plastics the author has insisted on a series of important industrial products made of polymers.

The last two chapters provide very useful data regarding the thermal stability of plastics.

The volume is recommended to all professions who must make decisions on the selection specification and use of corrosion resistnat plastics as materials of construction.

D. Feldman

Molecular Motion in High Polymers

R. T. Bailey, A. M. North, R. R. Pethrick

415+xvi pp., Clarendon Press, Oxford 1981

The study of polymers is a growth area since they are rich in properties, with many different phases, and they are central in many technologies, and in other sciences. The size of a high polymer molecule places it intermediate to normal small molecules and to continuum materials, so that the study of an assembly of polymers by some tool characterized by a wavelength will yield results which need skill in detailed chemistry at the short wavelength end, and skill in continuum analysis and mechanics at the long wavelength end. One has a rich field of study even if one completely ignores the fine structure of a polymer, and regard it as a featureless chain characterized only by an effective step length and an effective interaction. On the other hand, properties in the glassy state and very high frequency measurement or effect, say fracture mechanics, also offers a rich but different field of study. Writing a book on the field is not easy, for a comprehensive treatment requires a library. The present book concentrates on molecular motion and provides a valuable survey of the aspects of motion and of the tools that study them. It is not definitive in its scope, but takes the reader through excellent outlines of each field leading him up to the point where the specialist literature can be tackled. The book starts with a straight-forward but essential discussion of vibrations and light scattering extending this to damped motion which are related to statistical theories. There then follows a series of studies of investigative techniques: dielectric, photo luminescence, viscoelastic relaxation, ultrasonic relaxation, n.m.r., e.s.r., mechanical relaxation, spectroscopic studies, neutron scattering and finally there is a chapter on diffusion controlled reactions.

The reviewer found the book eminently readable and can warmly recommend it both to established workers who want a comprehensive survey of polymer motions, and to the beginner graduate student who is faced with ferocious original papers or grossly over simplified reviews.

S. F. Edwards

Stress Analysis for Polymers (2nd Edition)

J. G. Williams

John Wiley and Sons, 1981, £24.50

This book gives a thorough, and for the most part very clear coverage of the analysis of stress and strain (Chapter 1), time independent elasticity and plasticity (Chapter 2), viscoelasticity (Chapter 3), bending problems (Chapter 4), axial symmetry in elasticity and plasticity (Chapter 5), stress functions (Chapter 6) and fracture mechanics (Chapter 7).

The most important changes in the book from the 1st edition have been made in order to expand the treatment of fracture mechanics—a subject in which Professor Williams is an acknowledged expert. This has been achieved by a division of the last chapter of the 1st edition into two substantial chapters on stress-functions and fracture mechanics respectively. As with the first edition I must admit to feeling slightly misled by the inclusion of the word 'polymers' in the title; there really is only a small fraction of the book which is specifically addressing polymer behaviour, and this is done mainly implicitly, *via* the topics of finite strain and time dependence. The reader is presented with a substantial amount of algebraic complexity based on idealised mechanical models which are perhaps only approximations to the behaviour of real polymers. No attempt is made to indicate the magnitudes of the deviations of the various types of polymers from more classical elasticity and plasticity.

This second edition contains several typographical errors, some carried through from the first edition, and others notably in the new chapter 6. Some problems for students working from this text may arise from these errors, and from the occasional changes of notation between the two editions and the recent major review of fracture mechanics by the same author.

Despite these criticisms I welcome this new edition which is undoubtedly an improvement on an already useful book. It fills an important gap in the literature available for teaching stress analysis to engineers.

R. A. Duckett