Book Reviews

Introduction to Polymer Science and Technology

Eds. H. S. Kauffman and J. J. Falcetta

Wiley–Interscience, New York, 1977, pp. 613 + x, £20.65, $35.00

On receiving this book there was some surprise at the appearance of yet another work introducing the principles of polymer subjects, especially in view of the proved usefulness and deserved popularity of books like Rodriguez, Billmeyer, Cowie, Parker, Brydson, and Orgorkiewicz; however, on reading that the volume was used as an *SPE* textbook, an outstanding publication was expected. The editors, both active in the USA, in education and technology, indicate that it arose out of a wish to meet the needs of a number of short and upper-level courses in polymers, and their aim has been to present the material so as to be useful to those with relatively little technical background as well as to provide for the trained scientist or engineer. For this they co-opted a number of knowledgeable people, all from US research, teaching and industrial organizations (the authors include Mark, Goodman, Billmeyer, Gaylord, Geil, Sauer, Rubin and others) to contribute chapters relating to their expertise.

The result is a collection of monographs of varying length and depth and, judging from the references, which are rarely later than 1971, much of the text may have been written some years ago. In this review there is little room to discuss each of the eleven chapters individually. They deal with the organic and physico-chemical aspects, morphology, transition and relaxation phenomena, mechanical properties, and rheology, later with extrusion and injection moulding, and then with other fabrication processes: an average length of some 40–50 pages, although the chapter on mechanical properties understandably extends to over 120 pages and that on polymerization to some 80 pages. Apart from the references, each chapter contains a list of publications for further reading and, to assist use of the book for self-study, a number of questions for consideration.

While basic principles are generally well displayed and illustrated and clearly and logically discussed, it becomes obvious at times that some features which may be essential to a good all-round appreciation of recent developments are treated in a brief manner or even omitted altogether. For example, the book contains very little on the subject of elastomers and their technology (there is nothing on the chemistry of vulcanization) or on the equally important field of synthetic fibres (indeed, p. 488 says 'not discussed . . . because of its complexity'). Surprisingly, there are over 10 pages or so on stereoregular polymerization but little on depolymerization, while the technically important issues of polymer degradation under the influences of oxidation, heat or light are singularly neglected. Other practical areas which might have merited more attention are plasticizers, stabilizers and fillers, some mention of the newer polymers, e.g. nylon-12 and polyimides, film processing and biaxial orientation, polyurethane technology, and the operations of calendering and coating.

Apart from a few typographical errors (e.g. the initials of Carothers, Huggins and Melville require attention and the polyhydrocarbon pioneer was Pummerer, the footnote on p. 112 should relate to fractions in the *co*polymer and refer also to p. 293, on p. 75 *complications* of reactivity ratios probably means *compilations* of these data, AlR_3 not AlR_3 on p. 93, C. W. Bunn in refs. 39 and 45 on p. 299, etc.), the book is well produced and goes a fair way to meet the target set by the editors. It provides a basic text and guide for further study, is easy to read and follow, and useful to have, although one feels that apart from some specific areas it adds little more to the subject than is already provided for in some other textbooks available at a lower price.

R. J. W. Reynolds

Interfacial Synthesis Volume II: Polymer Applications and Technology

Eds. J. Millich and C. E. Carraher

Marcel Dekker, 1977, pp. xi + 546

This volume, as the title indicates, deals with the applicatons and technology associated with interfacial synthesis and is a companion to Volume I (reviewed *Polymer* 1978, **19**, 479) which is concerned with fundamental aspects of the subject.

The book may be conveniently divided into three sections. An introductory chapter by Oliver and Yen-Chen Yen reviews the commercial applications of interfacial synthesis, the two concluding chapters deal with the use of interfacial methods in the modification of natural polymers (Horio) and poly(vinyl alcohol) (Tsuda) whilst the main bulk of book (ten chapters – the work of fourteen contributing authors) discusses the use of interfacial synthesis in the preparation of polycarboxylic esters, polycarbonates, polyamides, polyesteramides, polyurethanes, polyureas, phosphorous-containing polymers and organometallic polymers.

The opening chapter on commercial applications indicates the background against which the title of this volume must be judged. As Oliver and Yen point out examples of the commercial use of interfacial synthesis are very few in number and despite the fame and apparent simplicity of the 'nylon rope trick' all commercial nylon-6,6 has been made by melt polycondensation. Much of this chapter is concerned therefore with the relative merits of interfacial synthesis in relation to other available methods for the production of polycarbonates and various polyamides. In the case of nylon-6,6 this provides an adequate demonstration of the economic advantage and therefore commercial supremacy of the melt polycondensation process. For the production of polycarbonates on the other hand interfacial synthesis possesses definite advantages and Oliver and Yen present the situation with commendable clarity and brevity thereby laying the basis for an extensive chapter by Hugo Vernaldken which deals with both the mechanism and synthetic versatility of interfacial preparation of polycarbonates.

As might be expected the book contains a substantial amount of material on polyamide synthesis both by polyaddition of carbon suboxide to diamines (Irena Daniewska) and the more conventional acid halide/diamine and related reactions (V. Z. Nikonov and V. M. Savinov). These chapters together with those on polyester amides (I. M. Panayotov), polyurethanes (T. Tanaka and T. Yokoyama), polyureas (K. C. Steuben and A. E. Barbabeo) and polycarboxylic esters (S. C. Temin) concentrate on the synthetic aspects of the subject. Only passing reference is made to the applications of this method of polymer synthesis to such fields as wool modification and microencapsulation (which are the most frequently recurring examples). Although the various aspects of the former topic are subsequently drawn to gather in the comprehensive chapter by Horio on the modification of natural polymers, it seems a pity that microencapsulation, a subject of growing importance in various commercial and biomedical areas, should be left in a fragmentary state and incidentally inadequately indexed.

This book is concerned predominantly with polymer synthesis on a laboratory scale and as such contains a wealth of valuable information. The chapters on the synthesis of polyphosphonate, phosphate and phosphite esters (Millich, Lambing and Teague) together with those on other phosphorous containing polymers and organometallic polymers (both by Carraher) are typical in this respect containing as they do a substantial amount of preparative and mechanistic detail illustrating potential usefulness rather than established technology. On the other hand the final chapter (Tsuda) gives an interesting account of the use of interfacial techniques in the conversion of poly(vinyl alcohol) in poly(vinyl cinnamate) and other photosensitive polymers now widely used in printed circuitry.

Inevitably with a book of this type compiled from the work of so many contributors a considerable diversity of approach is en-