

## BOOK REVIEW

**Developments in Polymer Photochemistry—1.** Edited by N. S. Allen. Applied Science Publishers Ltd, London. 1980. pp. 223. ISBN 0-85334-911-8. Price: £17.00.

This volume is the first of what is intended to be a series covering *all* aspects of polymer photochemistry. In his preface, the editor informs us that the book is aimed at research workers in industrial, government and university circles. Since various texts are available which deal with selected aspects of polymer photochemistry, the volumes in this series should provide most usefully a forum for the discussion of related aspects. Hence, the editor should have given more careful thought to the selection of topics to be covered in this, the first volume of the series. In fact, notwithstanding the general quality of the individual contributions, the book lacks continuity and is somewhat unbalanced with regard to content.

The text is divided into seven chapters each carrying its own bibliography. These vary in length, style and useful content. An adequate subject index is given.

In the first chapter, E. D. Owen gives detailed consideration to the processes of intermolecular energy transfer in polymers. Introductory concepts are considered before differences between resonance and exchange mechanisms are outlined. The contributions made by each mechanistic route to singlet-singlet and triplet-triplet transfer processes are covered. Emphasis is placed on selected polymeric systems in which energy transfer processes operate. Much of the content (26 pages, 47 references) is based on information which is somewhat dated and readily available elsewhere.

Chapter 2 (D. A. Holden and J. E. Guillet) deals with studies of polymer

structure and mobility as evaluated by luminescence spectroscopy. The up-to-date nature of the contents together with the clarity of presentation and discussion make this one of the highlights of the book. The contents, (42 pages, 147 references), cover all the major concepts including excimer fluorescence in macromolecules, the study of polymer chain dynamics using luminescence spectroscopy, the use of luminescence spectroscopy in the examination of intermolecular effects in polymer solutions, micro-Brownian motion as seen through depolarisation spectroscopy and studies of small molecule diffusion in solid polymers. However, the value of the contribution would have been greatly enhanced had the editor considered including a chapter on instrumental methods in this volume.

J. C. Arthur then presents his chapter on the photoinitiated grafting of monomers onto cellulosic substrates. Coverage of this currently important topic is condensed to such an extent (23 pages, 137 references) that the value of the chapter is somewhat diminished. Consideration is given to photoinitiated, free radical reactions in cellulose, cellulose degradation crosslinking processes and graft copolymerization reactions. The chapter is concluded with a short section dealing with processes and products.

Chapter 4 by A. Granton, D. J. Carr and D. M. Wiles contains details of the photo-oxidation mechanisms and kinetics of polyolefins treated from an essentially theoretical point of view. Little consideration is given to the consequences of such photo-oxidation in terms of changes in the physical and chemical properties of polymeric substrates. In mechanistic terms, emphasis is placed on the part played by the solid state environment in radical activity, and on the problems of drawing conclusions from liquid phase experiments. Nevertheless, such conclusions are used in considering the behaviour of radicals in the solid state. The chapter contains 31 pages and is supported by 84 references.

Chapter 5, (20 pages and 66 references), considers various aspects of the photodegradation and photoyellowing of wool. In presenting this chapter, C. H. Nichols gives us a clear insight into the mechanistic features with reference to those amino acid residues which are involved in the phototendering and photoyellowing processes. The account is well reasoned, even if condensed. Perhaps more could have been given on areas of protection against these ageing processes.

J. Griffiths, in Chapter 6 (66 pages and 145 references), discusses the photochemistry of azo dyes and related compounds both in solution and on polymeric substrates though the major proportion of the discussion concerns solution property characteristics. Considerations include the electronic structure and excited state properties of simple azo alkanes, arylazo compounds and more complex azo dyes. Particular attention is given to details associated with their absorption spectra and light emission properties. The approach is

essentially mechanistic. However, applied topics are given detailed treatment. These include photoreduction processes, photofading, photoisomerisation, photocyclisation and those photochemical applications of azo dyes which involve polymeric substrates.

In the final chapter, (27 pages and 75 references), N. S. Allen and J. F. McKellar discuss the structural influences of anthraquinone dyes with respect to their photostability. The chapter contains much of the work on this subject which has been carried out by the McKellar group in recent years. Attention is given to the stability to light of anthraquinone dyes when present on polymeric substrates (poly(ethylene terephthalate) and poly(hexamethylene adipamide)). Much of the content is concerned with the solution photochemistry of the dyes in question, though some attempt is made to relate this to the photostability of the dyes in synthetic polymers.

This reviewer feels that Chapters 3 and 5, though satisfactory in their own right, are out of character with the rest of the contents. If volumes of this type are to achieve their full potential, editors will have to apply greater skill and judgement in the manner in which chapters are assembled. Chapters 3 and 5 could have been left to another volume. The space saved in this volume could have been devoted to chapters on instrumental techniques and experimental procedure, especially in view of the readership the publishers wish to attract.

I recommend the book, though not wholeheartedly, to those already possessing a basic knowledge of polymer photochemistry. At the anticipated price, the text represents reasonable value for money.

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