materials applications of liquid crystals. This provides an interesting combination of viewpoints and a generally refreshing pragmatic approach to the subject. All the articles are well written, carefully prepared and extensively referenced.

The final chapter on liquid crystalline polymers directs the reader to one area of current growth in the liquid crystal field. Certainly new areas of applications for liquid crystalline systems will emerge in such diverse subjects as membrane separation, information storage, structural components, and catalytic activity and this book provides a sound spring board of knowledge from which these topics can be tackled. Anyone active in the field of liquid crystals should read this book and students entering the field should find it both lucid and instructive.

M. Mackley
(University of Cambridge)

The ICI Polyurethanes Book

G. Woods
ICI Polyurethanes and John Wiley and Sons Ltd, Chichester, 1987, 330 pages, £29.95
ISBN 0-471-91426-6

This book should appeal to a wide readership including people already associated or intending to become acquainted with product design, development and the manufacture of polyurethanes. However, the text will also be useful to a much wider range of reader, including those who merely wish to obtain more factual information about these polymers, possibly to those contemplating commercial production, and to lecturers who want to assess the current importance of polyurethanes. Many students will find the text both timely and readable, and readers, including potential manufacturers of polyurethanes in developing countries, will find the text both instructive and convincing.

The book reflects the long experience of George Woods, who has spent a large part of his career with ICI, particularly working with polyurethane foams, and who subsequently gained wide experience as a polyurethane consultant. The book is lavishly produced with numerous charts, diagrams of commercial processes, coloured photographic reproductions, and tables of useful properties of both monomers and polymers. The overall design and layout of the book is thus commendable and reflects the hard work of several people who helped George Woods, and whose assistance is gratefully acknowledged in the text.

The book commences with a review of the broad applications of polyurethanes, while in the next chapter the basic principles and methods of manufacture of polyurethanes are described. A more formal but straightforward description of polyurethane chemistry is presented in Chapter 3. Isocyanates based on diphenylmethane diisocyanate (MDI), and toluene diisocyanate (TDI), polyols, tertiary amine catalysts, chain extending, cross-linking or curing agents, blowing agents and fillers are described. The properties of many of the above reagents are also mentioned and this information is often conveniently gathered in tabular form. Typical flame retardant agents used in the polyurethane industry are described and listed, a fact which reflects some of the current concern about polyurethanes, and indeed all polymers, used for constructional and domestic purposes.

The next two chapters deal with current industrial procedures for manufacturing low and high density flexible foams, and microcellular elastomers, including typical formulations and moulding techniques. The reasons for the growing importance of Reaction Injection Moulding (RIM), and glass reinforced RIM systems (RRIM), are clearly presented, and typical equipment and applications are shown. Subsequent chapters deal in a similar authoritative way with commercially important rigid polyurethane foams and elastomers, as well as applications of less commercial importance.

There is a chapter in the book covering the health and safety associated with the particular hazards of handling the chemicals used for polyurethane production. Of particular importance are the analytical methods available for the determination of low concentrations of isocyanate vapour in air, and detailed references are provided in the text. There is also a chapter devoted to a review of the methods for determining the physical properties of polyurethanes. The test procedures may be involved with the raw polyurethane or with the final composite article, and typical tests are fully documented. There is also a timely review of the methods available for fire testing of polyurethanes both in their raw and final forms.

Towards the end of the book some practical advice is given for those newly engaged in the polyurethane industry. Included are lists of possible process faults, causes and suggested remedial action. This chapter, in particular, reflects the expertise of George Woods and many people associated with the polyurethane groups working at ICI.

The reviewer was impressed by the book which is ideally suited for the intended readership. The price of £29.95 is not unreasonable by today's standards and the book will rapidly be used by new manufacturers, particularly those relying on ICI knowledge and expertise.

M. H. George
(Imperial College of Science and Technology)

Polymer Microscopy

L. C. Sawyer and D. T. Grubb
Chapman and Hall Ltd, London, 1987, xiv+304 pages, £55.00
ISBN 0-412-25710-6

The stated objective of this text was to describe the basic microscopy techniques and specimen preparation methods applicable to polymers. This objective has certainly been fulfilled and in doing so the authors have produced a splendidly illustrated text which will serve as an excellent reference for the active polymer microscopist whilst also motivating other polymer scientists and engineers to explore the potential of the techniques.

The text starts with brief introductory chapters on polymer morphology, fundamentals of microscopy and imaging theory. The main substance, however, follows in chapters on specimen preparation and polymer applications. In the former, sections are devoted to methods such as polishing, microtomy, staining replication and etching. When dealing with applications the authors chose to concentrate on fibres, films and membranes, engineering resins, composites, emulsions and adhesives and liquid crystalline polymers. What I find particularly pleasing is that while acknowledging the enormity of the subject with comprehensive lists of references and summary tables, a clear emphasis is placed on comparison and evaluation of techniques and methods. Indeed, the last chapter of the text is on problem solving.

My one regret is the cost. It seems a terrible shame that a book as well presented and readable as this seems to be destined for the library of only the most specialized laboratory.

P. J. Mills
(University of Surrey)