

# book reviews

## Polymer Reaction Engineering

*K.-H. Reichert and W. Geisler (Eds)*  
VCH, Weinheim, 1989, 437 pages,  
£48.75  
ISBN 3527-28015-4

This welcome addition to the polymer literature represents the proceedings of the 3rd Berlin International Workshop on Polymer Engineering, held at the Technical University of Berlin in September 1989. The volume comprises 36 papers which have been reproduced from camera-ready manuscripts and as a consequence of this the style and quality of the papers is variable from author to author. The papers fall into two broad categories: modelling and simulation of specific polymerizations and problems encountered attempting to design and control polymerization reactors.

Articles dealing with real polymerizations cover the crosslinking kinetics of Sty/DVB and MMA/EGDMA, runaway phenomena in the batch polymerization of MMA, modelling of grafting in ethylene polymers, kinetics of precipitation in a terpolymerization, precipitation polymerization of acrylic acid, inverse emulsion polymerization of acrylamide, urethane oils, monomer reactivity ratios in aqueous polymerizations, polymerization kinetics of dimethyl diallyl ammonium chloride, segregation in a tubular reactor, simulation of microstructure and  $T_g$  of a random copolymer, the effect of chain transfer agents on vinyl chloride polymerizations, Ziegler-Natta polymerization of ethene, propene copolymerization in a bubble column, and the gas-phase polymerization of ethylene.

There are a number of articles dealing exclusively with numerical simulation and modelling. These articles serve to highlight the underlying theme of the applied models and simulations which is the need to make good process measurements if there is to be any hope of adequate control of the polymerization and the polymerization reactor. In this light the article by Thiele deserves specific mention for its attention to the mechanical design aspects of polymerization reactors. Harmon Ray's article on computer-aided design is a good overview of the area with a welcome emphasis on process monitoring. Moritz presents an enlightening discussion of the use of calorimetry for reactor control, reviewing

the use of bench-scale calorimeters and giving details of the use of a microcomputer-controlled laboratory reactor for semi-batch emulsion polymerization, but concluding that more research is needed before this technique can be applied to industrial reactors.

This book is limited in its scope by the nature of conference proceedings. There is a need for an authoritative text-book on polymer reaction engineering but this book is not it. Perhaps the general reader would have been better served if it had been called 'Proceedings of the 3rd Berlin International Workshop on Polymer Engineering'. For research workers in the field this is a very useful source for state of the art, rapidly published conference proceedings. Those requiring an introduction to the subject, in a textbook that is well structured and contains case-studies and worked examples, still have to wait.

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## Physics of Amorphous Materials

*S R Elliott*

Longman, Harlow, UK,  
1990, 481 pages, £19.95  
ISBN 0 582 02160 X

There must be many people who have thought about writing a book with this kind of title. The problem is that the field is an extremely complex one with so many unanswered questions and a wide range of expertise is needed to appreciate the subtleties, each of which tends to be rather a specialist area. To give a specific example, there are many who are primarily interested in the nature and origin of atomic structures while others are pre-occupied with, say, the electronic and transport properties which stem from the atomic structure, yet the two are in reality closely interrelated.

The author has a beautifully clear and light style which brings out the flavour of the subject in what is meant to be an introductory text, yet he touches on some of the really difficult issues such as the localization of electrons where complex theories abound. What I especially like

about this book is that the author understands the material he presents and unlike some authors he does not just reproduce the words to be found in the relevant research papers. He distills the most important information and a personal point of view comes through.

This is the second edition of the book, after a period of some six years in which there have been many developments. I think it fair to say (as a theorist) that we are really struggling to make quantitative theoretical progress on a number of fronts, but the combination of new or refined experimental techniques plus the modelling of structural, vibrational and electronic properties has clarified many issues and helped point the way in which theory should develop. The book has been rewritten to incorporate most important developments and a new edition is certainly timely. Perhaps one of the most valuable aspects of this book is that it spans a number of disciplines and will be useful and readable to many different types of scientist. It is also valuable as a source book and there is a pleasant juxtaposition of text with experimental or theoretical diagrams.

Not wishing to describe each chapter in detail, some indication of the scope of the book is necessary, and Stephen Elliott takes us right through from practical and theoretical aspects of the formation of amorphous materials to the various applications which have been found to date. En route, I found the section on the determination and modelling of structure well balanced, leading nicely into various aspects of atomic motion such as heat conduction and ionic conduction. The chapter on electronic properties gives a good overall picture of many important features of amorphous metals and semiconductors as an introduction to a detailed text like that of Mott and Davis. The chapter on 'defects' is mainly concerned with semiconductors but again it takes the reader into the heart of the matter with plenty of useful references.

I am clearly enthusiastic about this book which could be read by final year undergraduates and it is certainly the ideal book to put into the hands of a postgraduate just starting his studies to give an overall view of the breadth and interest of the subject.

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