

# book review

## **Physics of Plastics: Processing, Properties and Materials Engineering**

*Arthur W. Birley, Barry Haworth and Jim Batchelor*

Carl Hanser Verlag, Munich, 1992, xxi + 528 pp., £24.80 (paperback) ISBN 0-19-520782-3

This textbook is a comprehensive practical guide to all aspects of plastics processing and properties. Although the reader is given a broad introduction to chemical and physical structure, the approach is essentially that of the practical engineer. There are extensive accounts of all types of plastics processing, including melt extrusion, calendaring, injection and blow moulding, thermoforming and production of fibre composites. The mechanisms of operation are clearly described and illustrated by diagrams of high quality, accompanied by simple introductions to the theoretical analysis of the processes under consideration.

The mechanical properties of polymers are also considered in three major chapters, dealing with behaviour in the melt, behaviour in the solid phase including viscoelasticity, yield of polymers and fibre composites and all aspects of failure. Further chapters provide a very useful introduction to electrical and optical properties including topics such as dielectric relaxation, electrical breakdown, light scattering and birefringence. The treatment is very much in terms of practical measurement, but there is some introduction to the physical principles involved. A final chapter deals with solubility and diffusion of gases and liquids, chemical resistance and flammability.

This book is intended to give an introduction to polymers for the industrial scientist, with its emphasis on technology, but providing an introduction to the underpinning science. It covers a tremendous amount of ground with great clarity of exposition. Most issues of any significance are discussed, and at a level which does not intimidate the reader. Each chapter has an excellent bibliography, with references covering the last forty years of the science and technology of polymers. Although the hardback edition is quite expensive, the paperback edition is very reasonably priced.

In summary, this book will be most useful as an introduction to polymer engineering, dealing with both processing and product performance. The emphasis is on engineering and to a somewhat lesser extent physics, although the relevant chemistry is also discussed as appropriate. The structure of polymers and the interpretation of properties of polymers are mentioned in an introductory manner. There is no very detailed mechanics, but an adequate discussion in terms of measuring viscoelastic behaviour, fracture, yield, etc.

The book will be very suitable for research workers in industry, research students in polymer engineering and all those seeking an introduction to polymer engineering. The style and content of this book have been very well thought out. New topics are introduced with great clarity, and the key underlying theory is stated without overwhelming mathematics. The authors are to be congratulated on achieving a major objective of producing a comprehensive but very readable introduction to the physics of polymer engineering.

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