

Short Notices

Micromechanics of Flow in Solids

John G. Gilman

Pp 294 (McGraw Hill 1969) 144s

As one would expect from the author, this is a book devoted to the theory and uses of the dislocation model of plastic flow. What is so refreshing is that there is a unified approach to the subject of flow under stress that is reminiscent of the classic text on crystal plasticity by Schmid and Boas. The author claims that the book represents a personal selection of topics rather than a synthesis of other peoples ideas, the whole being held together by the introduction of time as an explicit parameter.

Dr Gilman considers first the two foundations of this subject, the observed elastic plastic behaviour of crystals under stress, and the geometry and structure of the dislocations which are responsible for plastic yield and flow; although his treatment of dislocation geometry is extensive it is very readable.

The next three chapters, which are devoted to the kinetics and dynamics of dislocation motion, include discussion of the effect of plastic strain on the population of dislocations and their structure, and the role of these lattice re-organisations on the macroscopic plastic behaviour as observed in the tensile, impact and creep tests.

Finally the author considers, by using the engineering concept of viscosity, the subject of flow resistance, in which either a decrease in the number of dislocations or their mobility reduces the rate of flow.

This book is strongly recommended to any students or research workers who are concerned with plastic flow in crystalline materials. It will appeal both to beginners and to those well versed in this fascinating subject.

R. A. F.

Fission Damage in Crystals

Lewis T. Chadderton and Ian McC. Torrens

(Methuen and Co. Ltd. 1969 85s)

This is a book written by physicists who are well-known in the research fields of radiation damage and electron-microscopy. The content is partly a review of the subject of fission fragment damage and track formation, and partly a description of

the work that the authors have themselves done; the authors have combined the two together very satisfactorily to produce a clear account of the present state of experimental and theoretical knowledge of this subject, which will be valuable to anyone involved in research on pure or applied aspects of irradiation damage. Initial chapters contain suitable descriptions of various general background ideas such as energy loss processes, collision cascades and methods of electron-microscopy and although in later chapters some of the topics such as damage in picrates and thiocyanates seem very specialised, they are treated so as to illustrate the general effects that can occur. Of special note are two chapters which consider the production of damage by electron excitation processes and relate the conclusions to the experimental data on the formation of damage and tracks given in previous chapters. The book is well produced, is 265 pages long with clear diagrams and photographs, and good references.

D. W. PALMER

Intermetallic Semiconducting Films

H. H. Weider

Pp x + 361 (Pergamon Press, 1970) 120s

The title of this book is misleading, implying coverage of films of all compound semiconductors. In fact the book is concerned entirely with III-V and mixed III-V semiconducting films.

The volume commences with a survey of preparation techniques, dealing mainly with vacuum deposition and chemical vapour phase growth. A short chapter on the structure of films is followed by a detailed survey of electrical and galvanomagnetic properties of specific compound films and a similar survey of their optical properties. A section on devices and applications includes galvanomagnetic devices, thin film transistors, field effect transistors, electroluminescent diodes and Gunn effect oscillators, and the book concludes with a chapter on measurement techniques comprising thickness and topographic methods, resistivity measurement techniques and a brief description of metallographic methods.

A general lack of introductory material and description of basic concepts renders this book unsuitable for the reader unfamiliar with this field, as does the presentation, which resembles

that of a technical review. However, there is a need for an up-to-date work on this subject and this volume provides a comprehensive source of references and information which will be of great use to those active in this area. A.F.W.W.

The Mechanical Properties of Matter

M. T. Sprackling

Pp 144 (English Universities Press Ltd, 1970) 26s

This is the second volume in the "Bridge series" which seeks to introduce the sixth form student to the type of work he will meet in his first year at University. The present volume begins with a coverage of the elastic behaviour of solids and liquids and includes some of the material currently taught in elasticity courses.

Plastic deformation is considered as applied to metallic materials and the discussion is based on the behaviour of dislocations in the lattice. The chapter dealing with fracture of materials introduces the theoretical fracture strength and then considers some of the complex fracture modes such as fatigue. The final three chapters of the book are devoted to (i) the viscosity of liquids including the concept of the Reynolds number, non-Newtonian liquids and particles in liquids; (ii) the viscosity of gases and (iii) surface effects in which the author considers both the theory of surface energy and its measurement in liquids.

The book is attractively written and produced and will appeal to a wide range of students currently studying physics and chemistry who are thinking about University and technical college courses in the physical sciences and engineering. R.A.F.

The Science, Technology and Application of Titanium

R. I. Jaffee, N. E. Promisel (editors)

Pp 1202 (Pergamon Press, 1970) 360s

Perhaps titanium is one of the few technologically important metals which can still be covered in all aspects from science to application in one conference.

This book covers the proceedings of the London International Conference on Titanium held in May 1968.

The Conference sessions included (i) process-

ing of titanium and secondary fabrication; (ii) chemical and environmental behaviour; (iii) physics, thermodynamics and kinetics; (iv) deformation and fracture; (v) phase transformations and heat-treatment; (vi) alloys of titanium, and finally (vii) applications.

The Conference members must have reached a point of mental exhaustion with the number of papers presented on each day; at least one can put the book down and return later!

This book should be on the library shelf as it represents the most up-to-date collection of data on this material. R.A.F.

Crystallography and Crystal defects

A. Kelly, G. W. Groves

Pp 428 (Longman Group Ltd, 1970) 100s

As the title suggests the authors have written the book to fill the gap that exists between the texts on crystallography and those on lattice imperfections. The book gives the reader a thorough grounding in the classical theorems of crystallography, including an excellent treatment of crystal tensors. The theory of lattice imperfections (in particular the dislocation) is then built on the fundamentals established. As only an elementary knowledge of mathematics is required, and numerous questions with their answers are included, the book is eminently suitable for introductory undergraduate courses.

The book deserves to become a standard text for any introductory course on the theory of dislocations and point defects. R.A.F.

Gallium Arsenide—Proceedings of the Second International Symposium, Dallas, Texas, October 1968

C. I. Pedersen (editor)

Pp vii+244 (Institute of Physics and Physical Society, 1969) 125s

This volume comprises the transcript of 35 original papers, in the field of gallium arsenide devices and materials, presented at the 1968 International Symposium. These papers provide an up-to-date survey of the technology of this important electronic material, its applications

and foreseen applications being reflected in the device papers on lasers, spontaneous light emitters, microwave devices and transistors. The section on materials deals with vapour phase epitaxial growth, specialised topics on bulk material such as diffusion and precipitation in dislocation free material, and the rapidly developing technique of liquid phase epitaxial growth, which is shown to have reached the high purity and high mobility level of vapour phase material.

The specialised nature of this book must limit its readership to those working in the gallium arsenide or closely related fields, as such a conference proceedings includes no introductory material. An encouraging aspect of this symposium is the linking of the two disciplines of materials science and device technology in one volume and, while the device papers outnumber the materials papers by roughly two to one, a comparison with the 1966 symposium reveals a considerable increase in interest in the materials area over the two-year period.

A.F.W.W.

Multiple Beam Interference Microscopy of Metals

S. Tolansky

Pp 147 (Academic Press, 1970) 45s

This short monograph deals with the technique of interference microscopy, which because of its relative simplicity and low cost deserves much wider usage. The author has been actively engaged on the development of this technique for many years and writes with great authority and insight.

The initial five chapters of the monograph deal firstly with the theory of the method, including the theory of localised wedge fringes which give so much information about microtopographical features (with a resolution of 5 Å), and secondly with the various aspects of the experimental application of the method.

The remaining sections cover the application of the technique to a wide range of problems, such as the measurement of surface roughness, hardness measurements, thickness of thin films and the surface perfection of single crystals.

The monograph is clearly written and will be a valuable source of information for anyone who is considering using the interference method.

R.A.F.