

Book Reviews

Strong Solids

A. Kelly

Pp xv + 212 (Oxford University Press, 1966)
42s

This is a well written and carefully planned book from the same stable as A. H. Cottrell's *Theory of Crystal Dislocations* and it could prove as popular.

The book starts by examining the concept of theoretical strength giving examples of where this has been obtained. The role of cracks and notches in causing fracture well below the theoretical strength is dealt with in Chapter II, and Chapters III and IV outline the various ways in which dislocations influence the properties of crystallographic materials. Chapters II to IV do not contain any essentially new material,

but they do comprise a very readable outline of the principal phenomena that determine the strength of materials.

The most important chapters are V and VI, dealing with fibre reinforcement, a subject of great topical interest and one which the author has helped to pioneer. Chapter V deals with the basic principles of fibre reinforcement in various types of matrix, while Chapter VI describes some of the processes which have been used to make fibres and to incorporate them into a matrix.

This book provides an excellent introduction to and brief review of the subject of strong solids. It contains many valuable insights that will appeal to the experienced worker in the field as well as to the newcomer and it is very readable. These qualities should make it popular.

F. J. P. CLARKE

Electrical Conduction Mechanisms in Thin Insulating Films

Methuen's Monographs on Physical Subjects

D. R. Lamb

Pp xvi + 114 (Methuen, 1967) 25s

With the rapid development of "microelectronic" techniques during the last few years, the properties of thin films have assumed an importance which could not have been dreamed of by the physicists of the 1920's. The present volume deals primarily with the state of understanding – up to 1964 – of the possible conduction mechanisms which can account for the electrical behaviour of thin insulating films. The book, as its author intended, will be an excellent introduction to this subject for the postgraduate or final-year student. The manner of presentation, which throughout makes repeated comparisons between existing theory and experimental evidence, will also tell perceptive students much of the methods by which progress in understanding the physical properties of materials is usually expedited. In making these comparisons, the author has drawn attention both explicitly and

implicitly to a number of areas where further work is needed. In all of these respects the book is excellent. In the last chapter, a brief review is given of some of the devices, "thin film", "hot carrier", etc., whose operation depends on thin-film conduction. In a field as rapidly developing as this, it is seldom possible to get into print sufficiently quickly to be up to date, and this chapter is best only regarded as an indication of what was in prospect in 1964. Even at that time, the reviewer could have disagreed with some of the author's views however.

Only brief reference is made to the problems of materials preparation, which, in fact, determine the properties of the films which would be used in practical devices. Indeed, the practicability of devices is often determined entirely by these considerations. More could have been made of this aspect of the subject even within the terms of reference selected, for if one speaks of "traps" for instance, the reasons for their existence need to be understood. One needs further to understand, for example, the importance of sodium ions in determining the stability of conduction mechanisms in SiO_2 , or of the factors determining crystallite size in a gallium arsenide film, before one is able to predict what

its real electrical properties will be. These, however, are more the problems of interest to the "device" designer in 1967, and it must be stressed that the volume in question does not go beyond 1964. The above reservations apart then, the

author is to be congratulated in gathering together and critically examining the evidence, available up till that time, in a very readable form which will be of great use to both students and research workers alike. G. D. SIMS

Metallurgy of Aluminium Alloys

M. Van Lancker

Pp xvi + 488 (Chapman and Hall, London, 1967) £7

This is the first book that has attempted to deal with aluminium alloys in such comprehensive detail, and must be welcome to many on these grounds alone. Although, in the author's words: "The basic aim of the book is to explain, as clearly as possible, the reasons why the various metallurgical and technological operations must be carried out in accordance with very precise instructions, and what precautions must be taken at the various stages", some industrialists may find the climb from the opening paragraph of Chapter 1: "Its nucleus contains 13 protons and 14 neutrons . . ." a steep one. The path traverses crystal physics, the fundamental chemistry of production, and the detailed phase-equilibria considerations, thence through "Single Crystals and Bicrystals of Super-pure Aluminium and Alloys" (the title of a chapter), precipitation kinetics, recrystallisation and recovery, leading eventually into "Development from the As-Cast to the Worked and Quenched State" and "Mechanical Properties and Relationship to Structure and Texture". It goes on to deal with machining, welding, riveting, adhesive bonding, surface finishes and treatments, and corrosion.

Altogether, this is a very great achievement. None of the scientific issues is skated around,

certainly not the thermodynamic and kinetic aspects, and the presentation of the decomposition of solid solutions is particularly well done. There are places where knowledge on the fundamental mechanics of the aluminium crystal is either obscurely explained or just not brought home in the particular context; the development of textures, the mechanical properties of sheet, the metallurgical factors influencing (for example) high-temperature deformation and fracture generally are cases in point. But a vast field of knowledge has been scanned in the book and it would not be realistic to expect one particular subject, or set of subjects, to be given a treatment as detailed as it might receive within a differently slanted work. The important connecting theme here is that of aluminium, and anyone concerned with the metal, scientifically or technologically, will surely give this book a warm welcome. Academics and industrialists might even find themselves in agreement on this. The book incorporates some useful tables of data on aluminium alloys, with references and recommended reading linked with the chapters. On the whole, the reference part of the work is not as usefully comprehensive as one would have expected, bearing in mind the enormous amount of literature the author must have turned over in sorting out the present text. Nevertheless, this is an expert and important contribution to metallurgical publication.

A. J. KENNEDY