possibility of derivation of the space groups from Lie groups as their discrete subgroups, as was done by Raghunathan (1972).

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Editorial note: A list of some twenty errata is supplied by the publishers with the book; a table listing other typographic errors is obtainable from the authors of this review.

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Acta Cryst. (1987). **A43**, 159

Diffusion in crystalline solids. Edited by G. E. MURCH and A. S. NOWICK. Pp. xv+482. New York: Academic Press, 1984. Price US $73.00.

This book focuses upon progress in diffusion research since about 1975, when the book *Diffusion in Solids: Recent Developments*, edited by A. S. Nowick and J. J. Burton, was published in the same series. It provides an update in an area where good textbooks and monographs have been missing for over a decade. As the editors state, a number of subjects have been selected that have reached a certain state of maturity - judged from a broad 'agreement on their scope and interpretation'.

The book contains eight chapters, each with a list of contents and references, one even with a list of symbols. The subject index is useful if information on specific materials is sought; some of the other entries do not serve the purpose of enlightening the reader on the subject.

In chapter 1, S. J. Rothman describes the experimental techniques for the measurement of tracer diffusion coefficients in solids, mainly inorganic materials. The reproducibility of a few percent reached by the sectioning technique is the result of a long, careful development.

Chapter 2 (by W. Frank, U. Gösele, H. Mehrer and A. Seeger) gives a detailed account of the mechanisms of diffusion in Si and Ge, including doping and oxidation effects on self- and foreign-atom diffusion.

In chapter 3, A. S. Nowick reports on the principles of atom transport in oxides of the fluorite structure, a relatively open structure which tolerates high levels of disorder (dopants and/or deviation from stoichiometry), with correspondingly complex diffusion properties.

Chapter 4, by H. Baker, deals with tracer diffusion in concentrated alloys, including intermetallic phases with the $B2$, $D0_3$ and $L1_2$ structures.

While chapters 2-4 are devoted to selected technologically important groups of materials, chapters 5 and 6 concentrate on special diffusion paths along dislocations and grain boundaries. A. D. Le Claire and A. Rabinovitch (chapter 5) describe the mathematics of the (continuum) analysis of diffusion in crystals containing dislocations, illustrated by some experimental results, while R. W. Balluffi (chapter 6, based on the 1982 Institute of Metals lecture) reviews the current knowledge of the structure of grain boundaries and experiments relevant to boundary diffusion, including the interplay of diffusional (atomic) and boundary motion.

Finally, chapters 7 and 8 report on Monte Carlo simulation of diffusion kinetics (G. E. Murch) and the statistical-mechanical treatment of point defect diffusion based on lattice dynamics calculations (G. Jacucci). These chapters illustrate the new developments which are possible with the use of large computers.

The book should be useful to all those who are interested in the current state of diffusion science.

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Acta Cryst. (1987). **A43**, 159-160

Creep of crystals. By J.-P. POIRIER. Pp. xiv+260. Cambridge Univ. Press, 1985. Price hardback £27.50, US$ 49.50; paperback £10.95, US$ 22.95.

Creep is the appearance of a plastic deformation (strain rate $\dot{\varepsilon}$) under the influence of an external stress σ at a given temperature T and a hydrostatic pressure P (which may all vary with time t). A general constitutive equation may read $\dot{\varepsilon} \equiv \dot{\varepsilon}(\sigma, y, T, P)$, where y is an internal state variable which may depend on ε, $\dot{\varepsilon}$, $\ddot{\varepsilon}$, ... and represents the microstructure of the sample produced along the total more or less complex deformation path. If y can be uniquely related to σ, $\dot{\varepsilon}$, T, P, then $\varepsilon(t)$ can be calculated, *i.e.* a mechanical equation of state exists. Geologists in particular, but also materials scientists, are interested in predicting $\varepsilon(t)$ for times t inaccessible in the laboratory and therefore much work is devoted to establishing the laws of plasticity where they can be observed in order to extrapolate with some reliability. The earth scientist is obviously in the most severe situation as characteristic time scales are in the range of millions of years.

Poirier's book appears in the Cambridge Earth Science Series but is equally useful for materials scientists as it describes high-temperature deformation processes in metals, ceramics and minerals in the language and with the concepts developed mostly in the field of physical metallurgy. The crucial role of the development of the microstructure is thus not only squeezed into general phenomenological and thermodynamic relationships, but fully discussed in microscopic terms, *i.e.* dislocation motion and interaction, diffusion, grain boundary sliding, phase transformations *etc.* The most important models are clearly described and illustrated with examples for different types of material. In chapter 1, the rheological behaviour of solids is described in the form of constitutive equations which can be obtained in mechanical tests. Viscous behaviour, predominant at high temperatures, and the different types of creep are introduced for uniformly deformed samples; criteria for non-uniformity (*e.g.* shear localization) are also considered. Chapter 2 provides the necessary background in lattice defects - vacancies, dislocations, grain boundaries - and their mobility. Chapter 3 introduces the general phenomenological and thermodynamic formulation. In chapter 4, a concise and enlightening summary of dislocation creep models is presented, and it becomes clear that macroscopically observed creep laws can rarely provide key arguments in favour of any particular model: for a meaningful interpretation it is necessary to analyse the microstructure on all accessible scales. The effects of hydrostatic pressure and structural changes (polygonization and recrystallization) appearing at high temperatures are discussed in chapters 5 and 6, with particular emphasis on geological phenomena. Diffusion creep, superplasticity and transformation plasticity are presented in chapters 7 and 8, and chapter 9 gives a brief introduction to attempts to scale and classify materials properties in the form of deformation maps.

The unconventional interdisciplinary approach provides the reader with a very condensed but nevertheless clear and refreshing view of the very complex field of high-temperature plasticity. The book is intended for graduate and senior undergraduate students but can be recommended to anyone interested in high-temperature plasticity of crystalline materials. Up-to-date (1983) references and selected recommended texts for further reading are useful if more detailed information or insight is sought.

An unbiased colleague recently remarked that 'creep of crystals' seems a 'frightening idea'. Poirier's book could comfort him that creep has been around for quite some time and that it is challenging to deal with it.

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Acta Cryst. (1987). **A43**, 160

Books Received

The following books have been received by the Editor. Brief and generally uncritical notices are given of works of marginal crystallographic interest; occasionally a book of fundamental interest is included under this heading because of difficulty in finding a suitable reviewer without great delay.

Crystallographic computing 3: Data collection, structure determination, proteins, and databases. Edited by G. M. SHELDRICK, C. KRÜGER and R. GODDARD. Pp. ix + 314. Clarendon Press, Oxford, 1985. Price £25.00. A review of this book, by J. P. Glusker, has been published in the October 1986 issue of *Acta Crystallographica*, Section B, pages 522-524.

Theory of holors (A generalisation of tensors). By P. MOON and D. E. SPENCER. Pp. xix + 392. Cambridge University Press, 1986. Price £50.00.

Advances in X-ray analysis. Vol. 27. Edited by J. B. COHEN, J. C. RUSS, D. E. LEYDEN, C. S. BARRETT and P. K. PREDECKI. Pp. xviii + 579. New York: Plenum Press, 1984. Price US $69.50. These volumes, appearing with great regularity, record the proceedings of the annual conferences held in Colorado, USA, on the applications of X-ray analysis (diffraction and spectrometry). This volume relates to the 32nd of these meetings, which took place in August 1983. It contains some 70 papers, all of interest, by some 130 authors. The previous two volumes were reviewed by Beukes [*Acta Cryst.* (1983). **A39**, 823-824] (Vol. 25) and Nittono [*Acta Cryst.* (1985). **A41**, 110-111] (Vol. 26).

Dynamical properties of solids. Vol. 5. Edited by G. K. HORTON and A. A. MARADUDIN. Pp. vii + 500. Amsterdam: North-Holland, 1984. Price US $96.25, Dfl 250.00. This is the fifth volume of this continuing series, of which successive issues appear at very irregular intervals. Vols. 3 and 4 were published almost simultaneously six years ago and were reviewed then by Tegenfelt [*Acta Cryst.* (1980). **A38**, 751-752]. Since the first two volumes (on fundamentals and on applications of crystalline solids), the topics have become increasingly specialized. This volume has two parts, one on dynamical aspects of the Mössbauer effect, by B. Kolk, and the other on structural phase transitions in coupled systems, by Y. Yamada.

Polycrystalline semiconductors: physical properties and applications. Edited by G. HARBEKE. Pp. viii + 245. Berlin: Springer, 1985. Price DM 78.00. This book records the proceedings of the International School of Materials Science and Technology, which was held in Erice, Italy, in July 1984.