properties and applications of solid materials'. As such, he notes that it overlaps (or encompasses) solid-state physics, materials science, metallurgy, ceramics and mineralogy. Crystallography and much of physical and inorganic chemistry could also be added to the list. It is, consequently, a difficult task to write a textbook which covers all of this.

However, as pointed out by H. S. Johnston in his foreword to the 1967 text, *Solid-State Chemistry* by N. B. Hannay, '[this branch of chemistry] is not a body of knowledge that must be covered but rather a set of methods of predicting chemical events'. And the methods are connected by a common viewpoint - the microscopic viewpoint - which emphasizes the atomic arrangement of the solid and relates the properties and behavior of the solid to this atomic arrangement.

It is the atomic-arrangement viewpoint that unifies West's new, thick (734 pages) introductory solid-state chemistry textbook. Most of the fundamental concepts and tools are introduced in the book's twenty-one chapters, along with a considerable amount of data skillfully incorporated as examples and applications. The first chapters are on physical methods: preparation of materials, various types of physical characterization, thermal analysis and X-ray diffraction. The methods of characterization are not covered exhaustively but extensively enough to show their potentials. Recent techniques such as 'magic angle spinning' solid-state NMR and EXAFS spectroscopy are included.

There is a series of chapters on crystallography, description of crystal structures and discussion of factors which influence crystal structure. Crystal structure determination is not covered. After this are chapters on crystal defects (particularly well illustrated), solid solutions, phase diagrams and phase transitions. Conventional models and terminology are used here and throughout.

The remaining 40% of the book emphasizes the more applied aspects of solid-state science. There are chapters on ionic conductivity, electronic conductivity and band theory, thermoelectric and ferroelectric effects, magnetic properties, luminescence and lasers, and individual chapters on glass, cement and refractories. There is a brief concluding chapter on organic solid-state chemistry which includes polymerization reactions in solids and electron-conducting polymers.

There are eight, short, somewhat orphaned appendices that contain a miscellany of techniques and data. If this information is extraneous to any of the chapters, then perhaps it could have been omitted altogether. Finally, there is a separate chemical formula index as well as a subject and author index and both appear to be quite detailed and complete.

Physically, the volume is attractively presented and largely free from other than trivial typographic errors. The illustrations are plentiful and informative.

The author's technique can best be demonstrated by consideration of a typical chapter. For example, in Chapter 13, he introduces the concepts and formulae of ionic conductivity in solids and establishes what constitutes normal behavior. Then he considers special-case 'fast-ion conductors' with specific examples described in considerable detail. This is followed by a discussion of means of measuring conductivity (perhaps too extensively as the detailed equations are considered at great length). Next is a discussion of specific, modern-day applications of fast-ion conductors including batteries, sensors and fuel cells. The chapter is concluded with a list of questions for the student and a fairly comprehensive bibliography on the subject.

The level of this text is introductory and largely non-mathematical although all relevant formulae are developed and used. The exposition of concepts, models and processes is clear but it is the author's approach, which emphasizes practical applications, that makes this text exceptional. This emphasis on the practical, a liberal use of anecdotes and well chosen, illustrative examples will successfully keep the student's interest and aid understanding. Frequent reference to possible future applications and intriguing research-topic suggestions should alert all readers to the opportunities in this burgeoning field.

W. A. DOLLASE
Department of Earth and Space Sciences
University of California, Los Angeles
Los Angeles, CA 90024
USA

Acta Cryst. (1985). B41, 455-456

Thermodynamics of silicates. By O. P. MCHEDLOV-PETROSSYAN, V. I. BABUSHKIN and G. M. MATVEYE. Pp. xvi+459. Berlin: Springer-Verlag, 1985. Price DM 250.00, US$98.00.

The crystallography of oxides in general and silicates in particular has long been accorded a special place in structural investigations on account of the number of unique structures which occur. Although these share certain common architectural features, it has proven remarkably difficult to predict the existence of new phases and create 'tailored' structures. Moreover, the structural elements present in poorly ordered materials, such as gels and glasses, have been elucidated only in part by crystallographic methods.

Thermodynamics forms a valuable complementary technique to crystallography inasmuch as it provides an independent method of analysing structural stability and order. Like crystallography, it requires perseverance in its application and suffers from certain limitations in the range and extent of its applicability. Very extensive applications to silicates are being made in Russia and Eastern Europe, and the authors, whose own contributions to the field are of great importance, are well placed to produce this book, the English-language version of which is welcome because it makes this body of information more widely accessible.

The book commences with an introductory chapter on basic thermodynamics and concludes with one on irreversible processes. It is in the introductory chapter that irritating mistakes are most apparent: formal thermodynamics has changed little in the past half-century, and many of the errors could and should have been eliminated. The reader whose native tongue is English will mentally change 'effect' to 'affect' (pages 2 and 3) and the scientist will be able to supply the missing equation at the foot of page 13, but other mistakes are more subtle and the beginner seeking an introduction to the thermodynamics of solids should be directed elsewhere.

The real value of the book lies in its central portions which review the applications of thermodynamics to compound formation and decomposition, melting and glass

formation and crystallization. The treatment accorded various aspects is uneven but reflects the authors' long involvement with the application of thermodynamic concepts to the formation and hydration of Portland cements and their environmental and degradative reactions. The tables and appendices give data on cements much of which is not readily accessible elsewhere. The authors have successfully pioneered a thermodynamic approach to those materials, but it is perhaps unfortunate that this exposition is a little out of date with respect to advances in other relevant areas, for example in determinations of phase equilibria in the relevant systems. Despite these shortcomings its exposition of the methodology of thermodynamics deserves widespread readership and its unique contents will ensure that it becomes a standard reference work in the field.

F. P. GLASSER

Department of Chemistry
University of Aberdeen
Old Aberdeen
AB9 2UE
Scotland

Acta Cryst. (1985). B41, 456

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.

Methods and applications in crystallographic computing. Papers presented at the International Summer School on Crystallographic Computing held at Kyoto, Japan, 18-27 August 1983. Edited by S. R. HALL and T. ASHIDA. Pp. ix+506. Clarendon Press, Oxford, 1984. Price £25.00. A review of this book, by Peter S. White, has been published in the November 1985 issue of *Acta Crystallographica*, Section A, p. 621.

Structure determination by X-ray crystallography. 2nd edition. By M. F. C. LADD and R. A. PALMER. Pp. xxii+502. New York: Plenum, 1985. Price US $39.50. This book was reviewed, when its first edition appeared in 1977, by G. B. Carpenter [*Acta Cryst.* (1978), B34, 1400]. The second edition does not differ from the first in general character (it still makes use of many examples, treated in close detail, and it still includes some 100 or so problems, and their solutions) but it has been judiciously expanded in selected parts. Thus, direct methods, previously covered in about 15 pages, now run to nearly 40 pages; a new section (10 pages) on Patterson search methods is included, and there are quite a number of new appendices. The nett effect is an increase of about 100 pages (25%). The corresponding increase of the price, $4.50 (13%), must surely be, in effect, a significant decrease, when eight years of inflation are considered. While all this is laudable, there will be some disappointment that the opportunity for up-dating was not better used. The four-circle diffractometer, now employed all over the world for hundreds of structures annually, is still confined to an appendix; synchrotron radiation is now mentioned but, despite its superlative value for structure determinations, especially for biological macromolecules, is given less than a page. However, this book is primarily a teaching text, addressed to beginners and raw research students, telling them how-to-do-it. Thankfully, the price is not now as much beyond their purse as it was before.

Optical mineralogy. 2nd edition. By D. SHELLEY. Pp. xvii+321. Amsterdam: Elsevier, 1985. Price US $37.50, Dfl 120.00. This book is the revised, expanded version of the author's original *Manual of Optical Mineralogy*, published ten years ago and reviewed then by G. Hornung [*Acta Cryst.* (1977), A33, 348]. This edition is some 50% larger than the first: more detailed attention is given to underlying theoretical principles; some step-by-step exercises are inserted; and there is a valuable (though highly condensed) new section of small-sized colour plates with commentary, as well as other additions, and updating. The price is still somewhat high.

Problems in inorganic and structural chemistry. By T. C. W. MAK, K. Y. HUI, O. W. LAN and W.-K. LI. Pp. viii+278. Hong Kong: The Chinese University Press. (Also available from European Book Services, Flevolaan 36-38, 1380 AC Weesp, The Netherlands.) Price US $11.50. Not a crystallography related text but an interesting book which could surely be useful in teaching, at honours level, in University chemistry courses. It covers orbitals, molecular geometry, crystal field, vibrational spectroscopy (not NMR), reaction mechanisms and also crystal structure, and it consists not of text but simply problems, and their solutions: about 30-40 in each of the ten chapters.

Biological regulation and development. Vol. 3B. **Hormone action.** Edited by R. F. GOLDBERGER and K. R. YAMAMOTO. Pp. xiii+312. New York: Plenum, 1984. Price US $140.00.

Phosphorus: an outline of its chemistry, biochemistry and technology, 3rd ed. By D. E. C. CORBRIDGE. Pp. x+761. Amsterdam: Elsevier, 1985. Price US $157.50, Dfl 425.00.

The chemistry of the metal–carbon bond. Vol. 2. **The nature and cleavage of metal–carbon bonds.** Edited by F. R. HARTLEY and S. PATAI. Pp. xiii+904. Chichester: John Wiley, 1985. Price £155.00.

The chemistry of the metal–carbon bond. Vol. 3. **Carbon–carbon bond formation using organometallic compounds.** Edited by F. R. HARTLEY and S. PATAI. Pp. xiv+489. Chichester: John Wiley, 1985. Price £98.00.

Tunable solid state lasers. Edited by P. HAMMERLING, A. B. BUDGOR and A. PINTO. Pp. viii+203. Berlin: Springer, 1985. Price DM 83.00.