Crystallographers

This section is intended to be a series of short paragraphs dealing with the activities of crystallographers, such as their changes of position, promotions, assumption of significant new duties, honours, etc. Items for inclusion, subject to the approval of the Editorial Board, should be sent to the Executive Secretary of the International Union of Crystallography (J. N. King, International Union of Crystallography, 5 Abbey Square, Chester CH1 2 HU, England).

Dr **P. J. Wheatley**, Department of Physical Chemistry, University of Cambridge, England, has resigned as a Co-editor of *Acta Crystallographica* with effect from the end of 1980 and Dr **T. J. Hamor,** Department of Chemistry, University of Birmingham, England, has been appointed to succeed him, along with Dr **S. Jagner** and Dr **B. T. M. Willis,** whose appointments have been announced previously.

Dr **H. Yakel,** Metals and Ceramics Division, Oak Ridge National Laboratory, Tennessee, USA, has been appointed as a Co-editor of *Journal of Applied Crystallography* with effect from the beginning of 1981. Professor **J. B. Cohen** will continue as a Co-editor until the end of the Twelfth General Assembly and Congress of Crystallography in Ottawa, August 1981.

Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.

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Сегнетоэлектрические пленки сложных окислов металлов. *Ю. Я. Томашпольский, Г. Л. Платонов.* Стр 200. Москва «Металлургия» 1978. (**Ferroelectric films of metallic complex oxides.** By *Yu. Ya. Tomashpolsky* and *G. L. Platonov.* Pp. 200. Moscow: Soviet Metallurgy, 1978). Price 1p 70k.

This book sets out to systematize the various studies carried out on ferroelectric films, at least up to about 1976, as judged from the list of references at the end.

The authors begin by explaining in the first two chapters the methods of preparation and characterization of thin films, and then go on to discuss crystallite and atomic structure. This forms a useful but not particularly extensive summary of what is known to date about the structures of ferroelectrics, although, perhaps, undue stress is placed on the value of Fourier maps to decide whether order – disorder or displacive models of the structures are relevant. It is well known just how hard it is to make such a distinction, particularly in non-centrosymmetric materials such as $BaTiO_3$ or $PbTiO_3$, where correlations between the positional parameters abound. Nevertheless, the structural descriptions given by the authors are welcome, as far as they go.

There follows a good exposition of the configuration of domains showing the effects of lattice mismatch, a discussion of dielectric properties, particularly in connection with $BaTiO_3$-based materials, and the effects of crystallite size.

Finally, a very brief digest of the pertinent theory is given followed by a summary of known ferroelectric thin films with their methods of preparation and properties.

Generally it is quite a useful book for graduate students, research workers or possibly for those in the thin-film industries.

A. M. GLAZER

Clarendon Laboratory
Parks Road
Oxford
England

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Current topics in materials science. Vol. 3. Edited by *E. Kaldis.* Pp. ix+691. Amsterdam: North-Holland, 1979. Price US $ 112.25 Dfl 230.00

It is a daunting task to edit a continuing series of volumes on such an ill-defined topic as 'materials science' and to maintain a standard which makes the series useful, if not invaluable, to many workers in the materials field. The series edited by Kaldis started well, but in Volume 3 it seems to have got out of hand; the topics are very diverse (as the editor admits) and some are easily long enough to warrant publication as a separate text book. Thus Volume 3 is really three volumes in one:

(i) 288 pages on *Basic mechanisms in the early stages of epitaxy* by Kern *et al.*;

(ii) 197 pages on *Materials aspects of solar cells* by Bachmann;

(iii) a selection of shorter articles completing the almost 700 pages of the book.

Instinctively one looks for up-to-date reviews which are concisely informative on topics which are of general interest in continuing series publications. If more explicit detail is required one would prefer a specialized text book dealing with the subject. In the present case, one doesn't necessarily wish to purchase 288 irrelevant pages if one wishes to catch up on the latest situation in solar cells. It is reassuring that the editor indicates in the preface that future volumes will be shorter.

An additional feature of Volume 3 is a lack of a balance in both the length of the articles and in the depth of the subjects. One is forced to quote again the very detailed article on epitaxy by Kern (which is written in the very extensive classical mode) and to compare it with the necessarily terse and superficial 12 pages by Carruthers on *Optical fibreguides for lightwave communications.* From the practical viewpoint – which seems to be the overwhelming consideration in physical science these days – it would appear that the importance of a subject from the device viewpoint is inversely proportional to the length of the article.

It is with greater pleasure that one can comment on the review on solar-cell materials by Bachmann. Not only is this article competent and comprehensive it is also well written and readable. It contains no less than 1071 references, which should make it a useful information source for many readers. It is also topical, and in view of the current importance of alternative energy systems throughout the world, justifiably lengthy. The author is clearly *au fait* with most aspects of solar-cell theory and technology, and covers not only conventional Si homojunction cells, but heterojunction, Schottky-barrier and electrochemical cells. Although the article is stated to have been updated in 1978, no obvious omissions from its coverage can be detected.

Returning yet again to the article on epitaxy by Kern, this is clearly a major work and is a very complete coverage of a specialized area in which theory and practice have yet to amalgamate. It is perhaps unfortunate that the systems studied (predominantly metals on rock salt) do not bear much relationship to industrially important epitaxial systems. The article suffers badly from inadequate translation. The style is very terse, and coupled with grammatical inaccuracies and ambiguities arising from convoluted phraseology, one is in danger of learning a lot of new words rather than science.

The remaining articles are more of the length to be expected in a series of this kind. They are generally informative and

readable and cover a range of topics which should be of interest to many workers in materials. The first is an article by Haas on *Localisation of electrons*, which deals with the important task of relating the electronic structure of atoms, molecules or atomic arrays with physical properties. Such topics as phase transitions, metal/insulator transitions in oxides and lattice distortions are discussed in terms of electron orbits and localisation of electrons in bonding.

Chevrel-phase compounds (important because of their very high superconducting transition temperatures and critical magnetic fields) are discussed by Yvon. In common with other families of materials developed in inorganic materials in recent years, a surprising number of compounds in this category have been prepared, which are built up from simple M_6X_6 units to form complex structures and formulations, the relationship between which is not always obvious. I found this to be an interesting article with some useful accumulations of structural data.

Lastly, there is a somewhat specialized article by Stoyanov dealing with developments in nucleation theory for high and low supersaturations. The author claims to outline the basic concepts of nucleation, but much preknowledge is assumed, and it would not be recommended for the beginner. To some extent this section overlaps with the article by Kern, but nucleation problems which are more relevant to crystal growth of practical importance are dealt with.

To summarize, the volume is something of a miscellany. To try to indicate to whom the book would be particularly useful is difficult. The main parts of the volume would appeal more to the specialist as a source of references rather than to a newcomer wishing to acquire the necessary background to a particular field. It is to be hoped that future volumes in this series will not suffer from the defects of Volume 3.

E. A. D. WHITE
Post Office Research Station
Martlesham Heath
Ipswich IP5 7RE
England

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Current topics in materials science, Vol. 4.

Edited by *E. Kaldis*. Pp. viii + 596. Amsterdam: North-Holland Publishing Co., 1980. Price US $ 102.50, Dfl 210.00.

'Materials science' is a loosely-defined term, generally applied to the study of condensed phases, chiefly solid, and usually involving interdisciplinary activity in the fields of physics, chemistry and metallurgy. Previous volumes in the series, of which this is the fourth, have covered topics ranging from the growth and structure of protein crystals to *Metallic Glasses – a New Technology*.

The present volume continues in this vein, including articles on crystallization processes in two-dimensional adsorbed gas layers on graphite and in crystals of long-chain alkanes. There are nine chapters, and a listing of the titles will indicate the range. Chapter 1, *Miniature neodymium lasers*; 2, Eu^{2+} *fluorescence and its application in medical X-ray intensifying screens*; 3, *Materials for open-cycle MHD generators*; 4, *Applications of low-pressure plasmas in materials science*; 5, *Phase diagrams of electronic materials*; 6, *Interfacial tension and adsorption of metallic systems*; 7, *Two-dimensional phase transitions of simple molecules adsorbed on graphite*; 8, *Defect structure and growth mechanisms of long-chain normal alkanes*; 9, *Lanthanide oxides, structural anisotropy, physical and mechanical properties*.

With the possible exception of the paper by Bienfait on the two-dimensional phase transitions in adsorbed monolayers, all the contributions are closely tied to practical applications. For the most part, the literature is carefully reviewed, even when the major part of the data presented came from the authors' own laboratories.

In a few cases, such as the article on lanthanide oxides by Lejus & Collongues, the subjects covered were too broad for more than a perfunctory coverage of many topics, although the portion covering the authors' own work is well done, and the references will be useful to the reader. An article of twice the length would be needed for adequate coverage of all the topics.

The first two articles, by Huber and by Brixner, Bierlein & Johnson, were of particular interest to me because of some current research activities. Both are well done and give excellent starting points to readers wishing to go deeper into their respective fields.

Are these matters of interest to crystallographers? I believe that most crystallographers today are engaged in the study of crystals whose structure is of interest because of some significant physical, chemical or biological properties. In this sense 'materials science' contains a large component of applied crystallography.

With such a diverse range of subject matter, the editor and publisher are to be commended for their decision to hold down the size of the volumes, lowering the cost to individuals who will not wish to purchase the complete series, and minimizing the amount of unwanted material. For those having an interest in several articles in this volume, it would make a useful addition to their personal collections.

EPHRAIM BANKS
Polytechnic Institute of New York
Brooklyn
NY 11201
USA

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Handbook of semiconductors. Vol. 2. Optical properties of solids.

Edited by *M. Balkanski*. Pp. xiv + 633. Amsterdam, New York, Oxford: North Holland Publishing Company, 1980. Price US $ 122.00, Dfl 250.00.

This is the first volume to appear of a four-volume set comprising the complete *Handbook of Semiconductors* of which T. S. Moss is the overall editor. The other three volumes are *Band Theory and Transport Properties* (edited by W. Paul), *Materials Properties and Preparation* (edited by S. P. Keller) and *Device Physics* (edited by C. Hilsum). In this second volume the editor Minko Balkanski has chosen to subdivide the subject matter according to the physical phenomena involved in the interaction of photons with solids rather than having individual chapters alloted to each semiconductor. The nine chapters, all written by experts in the field cover (1) *Properties above the band edge* (Y. Petroff); (2) *N particle complexes* (G. A. Thomas and V. B. Timofeev); (3) *Semiconductor Surfaces* (R. F. Wallis and C. A. Sébenne); (4) *The effects of external forces – Electric fields* (D. E. Aspnes), *Temperature* (M. L. Cohen and D. J. Chadi) *and Pressure* (G. Martinez); (5) *Free carrier properties* (C. R. Pidgeon); (6) *Radiative recombination* (M. Voos, R. F. Leheny and J. Shah); (7) *Photoelectric effects* (Y. Marfaing); (8) *Phonon effects* (M. Balkanski) and (9) *Nonlinear properties* (D. S. Chemla and J. Jerphagnon).

The main emphasis throughout this volume is on a detailed description of the theory of optical properties in conjunction with a critical comparison with experimental results. Work up to at least 1978 is included in all chapters and current short-