wordy article on the synthesis of CdI_2 polytypes and measurements of their dielectric constants and the synthesis of PbI_2 polytypes and determination of their band gaps. Polytypes of SnS_2 and TiS_2 are also briefly treated. The article contains qualitative explanations of the observed phenomena and it is commendable that non-periodic polytypes are also discussed.

Growth and characterization of AgI *polytypes* (P. R. Prager). A concise special paper on a relatively new 'relative' of SiC and ZnS (the same structural principle), including transformations of its polytypes and investigation of some physical properties.

The volume contains a fair subject and compound index. A detailed listing of contents would, however, serve the reader better than a mere list of contributions and their authors. An Appendix containing a list of substances recognized to date as polytypic would greatly increase its inspirational value. But the editorial work is otherwise well done and the inevitable overlaps (especially in the preliminaries) are not disturbing. The staff at Pergamon have produced a handsome book – its quick publication outweighs the shortcomings accompanying the photoprint technique used here.

The book is dedicated to Professor A. R. Verma who certainly deserves this for his pioneering work in polytypism. It is a must for everybody interested in this field. But it is also highly recommended to non-specialized crystallographers as well as to solid-state physicists – so that they are aware of what can be encountered and how it should be handled.

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Synthesis, crystal growth and characterisation. Edited by Krishan Lal. Pp. 568 + xii. Amsterdam: North Holland, 1982. Dfl 160.00, US $68.00.

This book is based on an International School held in New Delhi for two weeks in October 1981. The principal sponsor was the International Union of Crystallography with help from UNESCO and ten Indian organizations. The 140 participants were clearly given an excellent opportunity to learn about a wide range of subjects.

The volume contains 26 contributions, of which the first (Verma describing his work from 1950) and last (Kothari on the relation of modern physics to the two millenia old Indian concept of Syadvada) could be read with benefit by anyone with a general interest in science. The other 24 contributions are aimed primarily at materials scientists or people with a need to understand some of the problems faced by workers on essentially electronic materials. The authors have, in general, assumed that their audience was composed of graduates with reasonably broad backgrounds but anyone with a degree in physics, chemistry or materials science should be able to follow all the arguments. Many of the contributions could be read with benefit by third year undergraduates. In this respect the contribution by Mooser on physics in microelectronics should be particularly commended. The pair of contributions by Goodenough and Roy on solar power sources taken together give a good account of what can and *cannot* be expected.

The remaining papers give an adequate account of crystal growth and other preparation methods. The paper by Majorowski on growth at high pressures is the best short (26 pages) account that I have read. In 50 pages Paorici says nearly everything that needs to be said about melt growth and in only 16 pages Tolksdorf gives an excellent account of the growth of oxidic materials from high-temperature solutions.

X-ray, electron and neutron diffraction are the topic of 11 papers. The ones by Segmuller (measurement of strains and stresses) and Ranganathan (the structure of grain boundaries) are particularly useful accounts.

Electrical assessment is covered by Nag in perhaps too little detail (14 pages seems scarcely adequate). The book also lacks any account of the now extremely important methods for determining concentrations of individual impurities. Thus perhaps the title should be *Materials Preparation, Physical Assessment and Some Applications of Electronic Materials.* With this restriction the book can be recommended as background reading or as a source of further reading (most contributors give excellent bibliographies). Few people will need individual copies but most technical libraries should have one.

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Crystal symmetry: theory of colour crystallography. By M. A. Jaswon and M. A. Rose. Pp. 190. Chichester: Ellis Horwood, a division of Wiley, 1983. Price £18.50, paper £8.50, US$14.70.

It is well known that the theory of symmetry, which was logically completed in the classic work of Fedorov and Schönflies, is the theoretical fundamental of crystallography. The profound spread of the concept of symmetry into animate and inanimate natural science and into the ongoing process of its various generalizations is typical of the contemporary period of the development of theory.

In mathematical crystallography, the antisymmetry (two-colour) theory, which was mainly worked out by Shubnikov and other Soviet authors, takes a conspicuous place. The theory of symmetry and an introduction to antisymmetry concepts are included in many courses in the natural sciences departments of Universities. However, there is no universal textbook in which symmetry theory is set out in the intuitive-geometric plan with the grounding of group theory and with a logical transition to the antisymmetry concept. This gap is partly filled by the major work, *Symmetry in science, art and nature*, by Shubnikov & Koptsik

(Plenum Press, 1974), which is, in effect, a combination of a popular science book and a serious study including the latest theories in this field. However, the first part of the Soviet authors' book, which is evidently intended for a wide readership, is written in too popular a style, while the second part, in contrast, is difficult to read or to understand without some knowledge of further antisymmetry publications. It is desirable, therefore, that there should be another book, written in a universally acceptable style, and addressed to students of the natural sciences, mainly crystallographers and physicists. This book, *Crystal symmetry: theory of colour crystallography*, by Jaswon, a Professor of mathematics at London University, and Rose, an expert in applied mathematics, fully meets these requirements.

The 190 pages of this book are divided into three logically balanced parts. The first part, *Crystallographic point groups*, contains four chapters: 1. Symmetry patterns; 2. Mathematical formulations; 3. Cubic symmetries; and 4. Colour point groups. There are clear, descriptive, group-theory interpretations of the theory of the 32 crystal classes and 58 Shubnikov classes, which are enumerated in international symbols and their stereograms in this part of the book.

The second part, *Space lattices*, consists of four chapters: 5. Lattice geometry; 6. Seven crystal systems; 7. Non-primitive unit cells; and 8. Translation groups. The geometry of two-dimensional and three-dimensional translation lattices, their properties and symmetry are described in this part. Also, the extension of the classical translation groups to the antitranslation groups by Belov's method is expounded. There are coloured illustrations of the classical and the two-coloured lattices, denoted by international symbols in the text.

The third part, *Space groups*, consists of six chapters: 9. Symmorphic (Bravais) space groups; 10. Screw axes; 11. Principal and secondary screw axes; 12. Glide planes; 13. The diamond glide; and 14. Space groups. This concluding part of the book contains not only the classical space groups, as can be seen from the chapter titles quoted, but also the theory of the Shubnikov space groups, generalizing them, and including direct derivation of the groups. For the sake of brevity, there is no list of the classical and Shubnikov groups themselves. But the book indicates, for each syngony, with what kind of lattices the crystal classes must be combined to obtain, first, all symmorphic space groups, and with what kind of lattices screw and glide groupoints (that is, the sets that result from the 32 crystal classes when their rotation axes and reflection planes are replaced respectively by all the various kinds of screw axes and glide planes) they must be combined to obtain all the nonsymmorphic space groups. In a similar way it is shown here how the list of all 1191 Shubnikov groups can be derived.

The book is written clearly; it has good illustrations and contains appendices with information on group theory and the mosaics of parquet symmetry groups, instructions for making a full list of the two-dimensional two-coloured symmetry groups, and other material, successfully supplementing the main text.

In our opinion, it would be necessary, in a book of this kind, to make reference to the original work of the Soviet authors in the field of antisymmetry and coloured symmetry, published over many years in *Kristallografiya*, and to mention without fail the book *Coloured symmetry*, by Shubnikov, Belov and others (Pergamon Press, 1964), which is the original text on the subject of antisymmetry and colour symmetry in English. Besides this, the title of the book is too broad: the universally accepted concept of colour symmetry in physical and crystallographic publications implies not only two-coloured symmetry, but many-coloured symmetry also. A more suitable title for this book would have been: Crystal symmetry: theory of two-coloured crystallography.

On the whole, however, the reviewed book is a good textbook for students of the natural sciences of various specialities, and for all such persons as wish to become acquainted independently with the theoretical fundamentals of symmetry and antisymmetry.

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Crystals: growth, properties, and applications. Vol. 9. **Modern theory of crystal growth. I.** Edited by A. A. CHERNOV and H. MÜLLER-KRUMBHAAR. Pp. 146. Berlin, Heidelberg, New York: Springer-Verlag, 1983. Price DM 88.00, US $38.00.

This is an excellent book with five well written and up-to-date contributions on different subjects of crystal-growth theory. It fills a real need for the advanced or theoretically inclined crystal grower. It is not a book for the uninitiated (beginner or student) in crystal growth, unless interested in the physico-mathematical approach to theoretical modelling.

The first chapter, *Structure of the solid–liquid interface* by A. Bonissent (21 pages) describes the structural and thermodynamic properties of the solid–liquid interface of elements. Bernal random packing of hard spheres, perturbation theory and computer simulations enable description of the resulting density profile and structure of interfacial layers. The specific interface free energy for {111} f.c.c. orientation is estimated. The presentation is lucid.

The second chapter, *Melting and solidification of epitaxial structures and intergrowth compounds* by P. Bak (19 pages) discusses the process of melting and solidification of up to 1·6 monolayers of noble gases on a graphite substrate where solidification is not expected to start from 2D nucleation in the classical sense, but will proceed more uniformly throughout the system as a second-order (commensurate–incommensurate) transition as a function of coverage and size ratio. This is followed by a study of the layer melting in 3D graphite intercalation compounds C_6Li, C_8Rb, $C_{24}Rb$ among others, and of the melting of structural 1D Hg chains in $Hg_{3-\delta}$ AsF_6. A theoretical discussion on the melting and solidification of epitaxial layers is also given.

In the third chapter, on *Microscopic theory of the growth of two-component crystals* (31 pages), W. Haubenreisser and H. Pfeiffer formulate a unified theory of crystal growth utilizing a master-equation approach for the purpose of obtaining rate equations in order to describe the growth of