### *Journal of Applied Crystallography*

*Complete volumes, regular price per volume:*
Vols. 1–9 D.kr.425 ($71.00)

*Complete volumes reduced price for individuals:*
Vols. 1–9 D.kr.210 ($35.00)

*Single parts*
The price of single parts is as follows:
Vols. 1–9 D.kr.105 ($17.00)

### Orders

Orders for *Acta Crystallographica* and *Journal of Applied Crystallography* may be addressed to Munksgaard International Publishers Ltd, 35 Nørre Søgade, DK-1370 Copenhagen K, Denmark. Orders for complete volumes from subscribers in North America may alternatively be placed through Polycrystal Book Service, P. O. Box 11567, Pittsburgh, Pa. 15238, U.S.A.

### *Index of Crystallographic Supplies*

The Commission on Crystallographic Apparatus of the International Union of Crystallography is preparing a Supplement to the Third Edition (1972) of the *Index of Crystallographic Supplies*. The Commission would appreciate receiving names and addresses of all manufacturers and suppliers not listed in the 1972 Index. *This information should be sent to* Professor Reuben Rudman, Department of Chemistry, Adelphi University, Garden City, New York 11530, U.S.A.

## 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.*

**Dynamical properties of solids. Vol. 2. Crystalline solids, applications.** Edited by G. K. HORTON AND A. A. MARADUDIN. Pp. ix+536. Amsterdam: North Holland, 1975. Price U.S. $ 83.50, Dfl 210.00.

No one has yet attempted to write a book designed to replace *The Dynamical Theory of Crystal Lattices*, by M. Born and K. Huang, which was published in 1954, and it is unlikely that any individual will be so bold. As the editors of this volume point out, the dynamical properties of solids is an area which has seen tremendous advances in theory and experimental techniques over the past twenty years, and they have set themselves the task of making a coherent presentation of the subject that is 'authoritative, complete and entertaining', in three volumes. While I have some doubts about their entertainment value there is no doubt about the authoritative character and breadth of scope of the two volumes which have appeared so far. The first, in 1974, was sub-titled *Crystalline Solids, Fundamentals*'* and the third, when it appears, will have the sub-title *Crystalline and Non-crystalline Solids*. The ten chapters of the first volume had titles such as *Elements of the Theory of Lattice Dynamics, Phonons in Non-transition Metals, Self-consistent Phonons... Neutron Spectroscopy and Lattice Dynamics*. The emphasis was strongly theoretical, with only the last chapter written by an avowed experimentalist. The pattern is continued in the second volume, in fact no very clear division into 'fundamentals' and 'applications' can be discerned and one suspects that the order was to some extent determined by the order in which the authors completed their contributions. All the chapters of volume two are by theoretical physicists, but they have tried (with different degrees of success) to achieve a balance by including appropriate experimental results.

The seven chapters of this second volume with their authors are *Lattice Dynamics of Quantum Crystals*, T. R. Koehler; *Lattice Dynamics of Ferroelectricity*, N. S. Gillis; *Lattice Dynamics of Molecular Solids*, O. Schnepp and N. Jacobi; *Second Sound and Related Thermal Conduction Phenomena*, H. Beck; *Dynamics of Impurities in Crystals*, D. W. Taylor; *High-Concentration Mixed Crystals and Alloys*, R. J. Elliott and P. L. Leath; *Effects of Surfaces in Lattice Dynamics*, R. F. Wallis.

These two volumes, soon to be three, will be essential reading for anyone with a serious interest in lattice dynamics. Born and Huang, incidentally, was published at £ 2.75. Alas!

W. COCHRAN

*Department of Physics*
*University of Edinburgh*
*EH9 3JZ*
*Scotland*

**Crystal growth from high-temperature solutions.** By D. ELWELL and H. J. SCHEEL. Pp. vii+634, Figs. 179, Tables 54. London: Academic Press, 1975. Price £ 19.80.

This is an excellent book with a misleading title. It sounds as if it is just a book on the methods applied in a narrow field of crystal growth, but it contains much more: not only the question how, but also why to grow crystals from high-

* For a review of Vol. 1 of this book, see *Acta Cryst.* (1975). A31, 527.

temperature solutions is considered; not only the practice, but also the theory is presented and, last but not least, not only the problems that have been solved, but also those that are to be solved in the near future are dealt with.

High-temperature solution growth is defined to encompass growth from solutions between 300 and 1800°C, including VLS (vapour–liquid–solid) growth, excluding hydrothermal growth. Several of the methods discussed in the book are applied on an industrial scale to produce single crystals for various purposes: magnetic oxides, semiconductor devices, non-linear optical materials and gemstones.

The book consists of ten chapters. After an introduction there is a chapter on the history of crystal growth from solutions which reads like a thrilling novel. Ch. 3 on solvents and solutions considers briefly the thermodynamics and extensively the chemical equilibria and complex formation in solutions. Useful attention is given to the properties of practical solvents. Ch. 4 on nucleation and on the theory of crystal growth is a fine introduction to the subject that could be used separately for a graduate course on crystal growth. Ch. 5 treats quite generally the influence of growth conditions and impurities on crystal habit. It ends with an extensive documentation on six important substances. Ch. 6 deals with morphological stability and closely related subjects such as constitutional supercooling, facetting and solution flow, including temperature and stirring programming. In Ch. 7 (154 pp.) the experimental techniques are extensively described in a systematic way. First, techniques for seeding, for producing supersaturation and for avoiding spontaneous nucleation, then the technology (furnaces, temperature control and programming, crucibles, stirring) and finally some special techniques. Ch. 8 describes separately liquid-phase epitaxy. Ch. 9 deals with problems that arise after the crystals have been grown: characterization (chemical analysis, inhomogeneities, optical methods and X-ray methods, defect determination). It ends with a proposed standard for routine characterization, which would need quite an investment of apparatus, but which would probably pay off in the long run. Ch. 10 gives a table of about 1400 entries with data of HTS-grown crystals.

The literature is almost exhaustively covered, the chapters contain references to many reviews and even older mineralogical literature is not neglected. When a disagreement appears in the literature the authors sometimes give their own opinion, sometimes give both (or more) views. There are instances where a reader would wish to have more guidance from the authors, as, for example, in the discussion on the habit of yttrium garnets (p. 227), where the Tatarsky paper settles the issue. In a few cases the theory appears at unexpected places. For example, it is better not to hide the important problem of distribution coefficients in Ch. 7 (techniques), but to place it in either Ch. 3 or 4. Misprints are very rare and not disturbing. The presentation is very good on the whole, although some reproductions are not clear. The book is worth its price.

In their preface the authors state that 'the book is designed to become the standard reference work in the field of crystal growth from high-temperature solutions'. Will it reach that goal? I think it will.

P. HARTMAN

*Geologisch en Mineralogisch Instituut der Rijksuniversiteit*
*Garenmarkt 1 B*
*Leiden*
*Netherlands*

**Growth of crystals**, Vol. 9. Edited by N. N. SHEFTAL' and E. I. GIVARGIZOV. Pp. x+329, Figs. 261, Tables 23. New York and London: Consultants Bureau, 1975. Price $42.00.

This ninth volume in the already well-known series *Growth of Crystals* contains the translation of the *Rost Kristallov* conference held at Leningrad in May 1969, immediately after the Fedorov memorial meeting. According to N. N. Sheftal's introductory address the scope was restricted principally to the mineralogical aspect of crystal growth, which indeed appears from the fact that most compounds dealt with have crystal structures that occur also in nature.

V. B. Tatarskii starts with a survey of the few papers devoted by E. S. Fedorov to crystal growth phenomena. It is comforting to read how even such a great scientist as Fedorov sometimes went astray in his explanation of observed phenomena.

The papers are divided among six sections: hydrothermal (11 papers) and diamond (3 papers) synthesis, solution growth (3), flux growth (11), melt growth (17), vapour growth (14) and theory (4). An appendix contains a memorial paper by N. N. Sheftal' to Academician A. V. Shubnikov, a paper on the equilibrium shape of potash alum crystals by N. M. Shchagina, one of the last studies made under Shubnikov's guidance, a closely related paper by N. N. Sheftal' on the limiting shapes of single crystals of Rochelle salt and potash alum, while finally N. N. Sheftal' pays a tribute to Academician N. V. Belov on the occasion of his 80th birthday.

What to say about these papers seven years after they were presented and four years after they appeared in print? The quality of the papers is rather variable. Many of them just contain data that are still useful, but several lack information on data that must have been available and which information would have added greatly to a better understanding of the reported results. For example, in an interesting paper on the hydrothermal growth of calcite seeds the composition of the medium is not given. Most papers describe extensively the surface morphology of the synthesized crystals, which is as it should be at a Fedorov memorial conference, but measurements are rare. It is interesting to see how some papers were the nuclei of important work that is now in progress or that has been published recently. To mention a few examples: the study by E. I. Givargizov on the VLS growth of Ge and Si whiskers, the morphology of cyclohexanol crystals growing from the melt by D. E. Ovsienko *et al.* and the growth of diamond by V. P. Butuzov *et al.* Other papers are still important because of the intriguing results presented, as for example the work by T. G. Petrov on anomalies in the growth rates of KCl at various temperatures and constant supersaturation.

Every crystal-growth scientist will find something of interest in this volume, but one wonders why it did take so many years to prepare this book, especially since the Russian edition of the tenth *Rost Kristallov* conference has already appeared. Finally a few specific remarks must be made. The translation seems to be very good, but growth hummocks are usually called growth hillocks. As a result of the double transliteration several names of even well-known non-Russian authors contain spelling errors. Finally, E. D. Dukova is well known for her work on the crystallization of β-methylnaphthalene, but she never worked on quartz as the title suggests.