crystallization kinetics in the design of basic modes of batch and continuous crystallization. Some of the problems associated with slurry handling and certain aspects of down-stream processing (pre-thickening, dewatering and drying) are also briefly considered.

The book is well written, a good number of worked examples offer useful guidelines for research workers, designers and industrial users. By today's standards it offers good value for money.

J. W. MULLIN

University College
Torrington Place
London WC1E 7JE
England

J. Appl. Cryst. (1985). **18**, 265

Industrial crystallization 84. Edited by *S. J. Jančić* and *E. J. de Jong*. Pp. xii + 498. Amsterdam: Elsevier, 1984. Price US $ 113.

The 105 papers presented at this 9th symposium, held under the auspices of the European Federation of Chemical Engineering Working Party on Crystallization in The Hague, are grouped into four main sections: *Fundamentals; Additives and impurities; Precipitation and melt crystallization; Design and operation.*

A keen interest is developing in the solid–liquid interfacial regions and in the bulk-solution phase. A variety of techniques is now being exploited, the most promising of which seems to be Raman spectroscopy, to gather evidence of the semiordered layer near the surface of a growing crystal. The existence of such a layer, which could serve as a growth unit reservoir or as a source of secondary nuclei, has been postulated by many authors for more than half a century, but it is only now that we appear to have the means of verifying it.

The metastable zone continues to attract attention and so do the problems of small crystal and size-dependent growth. The role of impurities in the crystallization process remains an active area of investigation and the industrial importance of this branch of study cannot be overemphasized. Slowly but surely we are approaching the point where we should be able not only to explain why certain effects operate, but also how to select the best habit modifier for a specific job. Theoretical studies from the worlds of crystallography and statistical mechanics are now being integrated to give a better understanding of the problems of crystal morphology.

Although inorganic systems substantially predominate over the organic as working substances in the papers presented at this symposium, it is in connection with the latter that some of the most interesting industrial developments are found, particularly related to crystallization from the melt. One such process, pressure-melt crystallization using pressures up to 3000 bar (1 bar = 10^5 Pa), appears to have considerable potential from an energy-saving point of view. Precipitation also looms large in the list of topics covered, and several papers dealing with alumina, sodium bicarbonate and calcium carbonate are of industrial relevance.

Mathematical modelling featured in several papers, usually with the object of providing better routes to crystallizer design and control. A step change in this branch of activity would be made if only the problem of on-line or *in situ* measurement and assessment of crystallization kinetics could be solved. This goal may not be far away.

The book is photolithographically reproduced, but it is very expensive.

J. W. MULLIN

University College
Torrington Place
London WC1E 7JE
England

J. Appl. Cryst. (1985). **18**, 265–266

Current topics in materials science, Vol 10. Edited by *E. Kaldis*. Pp. vi + 515. Amsterdam: North Holland, 1982. Price US $ 106.50, Dfl 250.00.

Five stimulating reviews of considerable interest are contained in this book.

In chapter 1, E. I. Givargizov, N. N. Sheftal and V. I. Klykov face the topic, crucial for solar cell research, of *Diataxy (graphoepitaxy) and other approaches to oriented crystallization on amorphous substrates*. The economic relevance of the subject is related to the fact that conventional methods of deposition of epitaxial layers on single-crystal substrates increase the price of solar cells. Perhaps diataxy could reach the goal of satisfactory oriented layer growth on amorphous substrates. Many problems remain unsolved in this field. Both fundamental phenomena in nucleation and growth of crystals and technical improvements in crystallization processes were used and were found to be important in overcoming the difficulties. 'Artificial epitaxy' or diataxy is discussed in detail together with more conventional techniques. It turns out that the role, for oriented crystallization, of close-packed crystallographic planes is understood, whereas that of the presence of a liquid phase (melt or solution) remains unclear as far as its mechanism is concerned. The experimental data and speculative analysis refer mainly to semiconductor materials as the most relevant in modern technology.

Chapter 2 (by E. I. Gerzanich, V. A. Lyakhovitskaya, V. M. Fridkin and B. A. Popovkin) is devoted to SbSI *and other ferroelectric A(V)B(VI)C(VII) materials*. The monograph widely treats the physical, chemical and structural properties of these ferroelectric, piezoelectric and semiconducting materials. For a long time crystal growth of such materials was not possible. Apart from the fundamental physics of these materials, their applications are also discussed: particularly in relation to the development of optical memory systems, electrooptics, non-linear optics and related disciplines. The list of references (more than 300) will be useful to any researcher in the field.

Chapter 3, by W. Albers, reviews the problem of *Non-stoichiometry of inorganic solids*. This is a fundamental topic both for chemistry and condensed-matter physics and finds its origin in the occurrence of native defects in compounds. The approach is from the point of view of thermodynamics. The subject is so wide that only the most important aspects of the problem are treated and the review is not, as declared by the author, exhaustive with respect to the enormous amount of experimental data published during the past decades.

In chapter 4, G. N. Papatheodorou discusses the *Spectroscopy, structure and bonding of high-temperature metal halide vapor complexes*. Emphasis is on the new techniques using high-temperature Raman spectroscopy (vibrational spectra) and absorption spectroscopy (electronic excitation spectra). Conclusions regarding molecular structures and the correlation of structure with thermodynamic properties are also reviewed. An outline of the importance of vapor complexes in current technology is given in the last section.

Gem materials, natural and artificial is the subject of the last review, by I. Sunagawa. In this excellent synthesis the author shows how gem research is a very active field of modern material science and how some techniques (*e.g.* high-pressure synthesis of diamonds) have now become traditional for other materials as well. With the exception of pearl, coral and a few organic gem materials, gemstones are principally natural minerals or mineral assemblages that have been used since prehistoric times. About 70 mineral