range of measurements which can be made with the PN4200 by fully utilizing this transparent contact. The PVS accessory consists of a spectrometer, motor driven optical head, signal processing electronics and a software data collection and processing package.

The PN4200 with the PVS accessory can be used for: (1) Determination of band gap in the active region of laser diodes used in both the optic fibre communications and video/compact disc industries. (2) Aluminium profiling of laser diodes, HEMT structures and many optoelectronic devices. (3) Determination of minority carrier diffusion length.

Polaron Equipment Limited, 53–63 *Greenhill Crescent, Watford Business Park, Watford, Herts WD*1 8*QS*

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X-ray Microanalysis Standards

Polaron Equipment announce the availability of a set of X-ray microanalysis standards for SEM and electron microprobe systems in the semiconductor industry.

These high-quality reference standards can be supplied individually or in the form of multi-element blocks to suit a wide range of different instruments. All standards are polished to a $\frac{1}{4}$ μm diamond finish, are carbon-coated to prevent charging in the electron beam and are supplied with full certification and a location map for standard identification.

A Faraday cage, for accurate specimen current measurements, is optionally available on all mounts.

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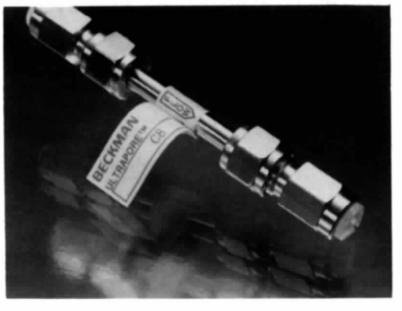
New Column for Protein/Peptide Applications

Beckman Instruments, Inc. introduce the **Ultrapore-C8 HPLC column** for fast high-resolution chromatography of proteins and peptides. Surface characteristics of the Beckman Ultrapore-C8 column are enhanced by exhaustive end-capping, thus ensuring a minimal non-specific interaction and high mass recovery. It is especially suitable for isolation and purification of biomolecules in protein structural studies.



A spherical 5 μm silica backbone provides the column with high mechanical stability over a wide range of mobile phases and flow rates. The short 75 mm column length ensures fast separations and high sample throughput. Because it is stable, good mechanical strength is compatible with a wide range of solvents, including organic modifiers and detergents. The high-resolution column is easy to clean and offers a long usable life.

Beckman Instruments, Inc., 2500 *Harbor Blvd, Fullerton, California* 92634, *USA*

Book Reviews

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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.

Current topics in materials science, Vol. 11. Edited by *E. Kaldis*. Pp. ix + 453. Amsterdam: North Holland, 1984. Price US $96.25, Dfl 250.00. Available in USA/Canada from Elsevier Science Publishers, 52 Vanderbilt Ave, New York, NY 10017, USA.

Four reviews are contained in this book. Chapters 1 and 2 treat garnets, chapter 3 iron borate, and the fourth chapter lanthanum hexaboride.

Chapter 1 by P. Görnert & F. Voigt is entitled *High temperature solution growth of garnets: theoretical models and experimental results*. About one third of this chapter describes concepts which are treated in most text books on physical chemistry. Several closely related aspects of solubility are treated separately although the thermodynamic approach would have allowed a more unified approach. Readers trained in classical physical chemistry will find it disturbing that the authors ascribe a relationship, first derived by van't Hoff, to Arrhenius. The 'Arrhenius equation' is connected with kinetics, not with thermodynamics. The main part of the chapter is concerned with various aspects of growth of garnet crystals. The use of induced striations is reviewed in some detail and liquid-phase epitaxy and related subjects are treated extensively. The authors have collected a large number of observations on growth of garnet crystals which are otherwise scattered over a large number of papers. Thus the review serves a useful purpose.

The second chapter, *Substrates for epitaxial garnet layers: crystal growth and quality* by D. Mateika, also treats garnet systems. Here the emphasis is on the experimental aspects of crystal growth of bulk (substrate) crystals. Apparatus developed in the Philips laboratories in Hamburg is described in detail. Persons who are interested in constructing or improving equipment for crystal growth can find much valuable information in this article. The author reviews results from a large number of experiments on various garnet systems. Our knowledge of the crystal chemistry of oxide systems is usefully expanded by the results obtained by Mateika and his colleagues. The care taken in systematically varying each parameter and measuring its influences on crystal growth could serve as an example for students and others who enter the difficult discipline of advanced crystal growth technology.

The third paper is by R. Diehl, W. Jantz, B. I. Nolàng & W. Wettling and carries the title *Growth and properties of iron borate*, $FeBO_3$. Ferric borate is one of two compounds, the other being FeF_3, which are both magnetically ordered above 300 K and also transparent in parts of the visible spectrum. Such crystals open up new areas for magneto-optical research. The chapter begins with a detailed review of the crystal structure and of other crystallographic properties of $FeBO_3$. Next, a number of phase diagrams of interest for crystal growth are discussed, followed by a thorough discussion of the possibilities of preparing large single crystals of $FeBO_3$ by vapour transport methods. The morphology of a number of crystals is described. About half of the chapter is devoted to a description of the magnetic properties of the compound. Spin waves, elastic and magnetoelastic properties are treated as well as magneto-optical and several other properties. One might expect that this interesting compound would have found technical applications. The authors state, however, that to their knowledge $FeBO_3$ has not yet been used in a working technical device.

Another compound of potential usefulness is described in chapter 4 by M. M. Korsukova & V. N. Gurin who write on *Single crystals of lanthanum hexaboride: preparation, properties and applications*. Lanthanum hexaboride and rare-earth hexaborides in general have remarkably low work functions and high thermal and electrical conductivities. Such compounds should be eminently well suited

as thermionic and field emission cathodes. LaB_6 cathodes are, however, not yet optimally developed. As is often the case with potentially useful solid-state materials much research and development work has to be done before complete control of the material properties can be obtained. The authors review the part of the La–B phase diagram which is of importance for synthesizing LaB_6 and next consider methods for producing single crystals of the compound. Vapour phase growth, zone melting and solution methods have all been used. Apparently, no method appears to be better than any other. The results indicate that it is difficult to obtain samples which give reproducible results for important physical parameters. Good single crystals used as cathodes appear to give better brightness than W (six–ten times better) and a much longer lifetime. If (or when) production of LaB_6 crystals with controlled and optimal properties becomes a routine matter they will outcompete other materials for producing high density electron beams.

The chapter on lanthanum hexaboride is much shorter than the previous ones and it appears to be a little out of context with them. It would have been preferable to have a volume dedicated to insulating magnetic materials alone. However, anyone who has tried to extract manuscripts from colleagues knows how difficult it is to get manuscripts delivered for a fixed date, and an editor must often make the best he can of the material available.

Professor Kaldis is to be congratulated on being able to get so much material on important compunds collected in one volume.

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Current topics in materials science, Vol. 12. Edited by *E. Kaldis*. Pp. vii + 483. Amsterdam: North Holland, 1985. Price US $101.75, Dfl 275.00.

This volume treats a great variety of subjects and several of them may not be familiar to many readers of the *Journal of Applied Crystallography*. As the reviewer is a crystallographer writing for crystallographers, he necessarily concentrates on those subjects which are of obvious crystallographic interest. The review may therefore not do justice to the scientific merits of the volume.

Chapter 1 by K. Sattler is entitled *Metallic, ionic and van der Waals clusters*. It presents results in microcluster research. Molecular beams are produced in *e.g.* double cells and size distributions of clusters are analyzed by mass spectrometry. Apparently, the beam fluxes are not large enough for complementary electron diffraction studies which could otherwise give interesting structural information. Although the subject seems to be fairly remote from crystallography, it may have some bearing on surface phenomena and on nucleation processes which could be of interest for the study of crystal growth mechanisms.

The next chapter is by R. Kern on *Metastable phases in the bulk and on substrates*. This is a rather short review, 35 pages, and may be too short. At least in one place (p. 98) some lines are obviously missing. Otherwise, the author gives a very stimulating account of kinetic and other properties of metastable phases. Stabilizing and destabilizing agents are considered, and a number of chemical systems are discussed. Examples are given which show that epitaxial growth and structural metastability are interrelated.

The third chapter is called *Vapour pressure investigation of P–T–X phase equilibria and non-stoichiometry in binary systems*. It is written by J. H. Greenberg & V. B. Lazarev. About one third of the 83 pages is a fairly elementary introduction to a thermodynamic description of *P–T–X* phase diagrams of binary systems. The general description gradually deals with more and more complicated systems, and the remaining part of the chapter, about 50%, deals with selected narrow regions in the phase diagrams of the systems Zn–P, Cd–P, Cr–Se, Cd–As and Zn–As. The authors deal with a number of compounds of nearly stoichiometric composition like Zn_3P_2, CdP_2, Cr_2Se_3 and some arsenides. They describe how they are able to determine small deviations from stoichiometry using vapour pressure measurements and, when possible, by determining the composition of the vapour. This chapter gives a useful review of the physical chemistry of several potentially useful semiconducting compounds.

The fourth chapter could have been published as a book on its own. It comprises 267 pages and is entitled *Mechanical properties of brittle materials – Modern theories and experimental evidence*. The authors are W. Pompe, H.-A. Bahr, G. Gille, W. Kreher, B. Schultrich & H.-J. Weiss. The chapter is divided into six subchapters dealing with theoretical foundations, modern testing methods, thermal stress cracking, strength of ceramics, strength of cemented carbides, and strength of thin films and coatings. Crystallographic and mechanical properties of materials are undoubtedly interrelated, but very few crystallographic concepts are directly involved in the discussions. Stress–strain relationships are dealt with extensively, but they are not in general related to structural concepts. Phase transformations are considered briefly in the section on ceramics.

The reviewer thinks that this last chapter will mainly appeal to crystallographers who also have a strong background in mechanical engineering. He does not feel qualified himself to offer an opinion on the scientific quality of this chapter.

The preceding volumes in this series have all contained abundant material of interest to crystallographers, but the reviewer thinks that rather few crystallographic departments would consider this particular volume a must, in spite of its other scientific merits.

In order to end this review in a more positive way, it should be remarked that this volume, like the previous ones, is very well produced. The printing quality is high and the figures and photographs are clear and distinct.

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