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.

Acta Cryst. (1982). A**38**, 173

Advances in liquid crystals, Vol. 4. Edited by G. H. BROWN. Pp. xiv + 210. London: Academic Press, 1980. Price £15·80, US $28.00.

Since the issue of the first volume of this series in 1975, the study of liquid-crystal characteristics and structures has been carried on at a more and more important pace.

This volume is divided into four chapters. The first one is very important and contains many details (75 pp.) of flow phenomena. It gives scientists particularly interested in this field of modern physics a complete review of the studies carried out on the subject (288 references, mostly relating to studies carried out in the last ten years). The author, F. M. Leslie, a mathematician, considers the unique vector field continuum theory, due to himself and J. L. Ericksen, which allows the study of flow phenomena in liquid crystals. A few notions about other theories are given, in particular those of Sero & Bulygin and Lee & Eringen. The problems of viscometry and propagation of perturbations (periodic waves and front waves) are dealt with on the basis of these theories. Some other topics are reviewed such as thermally induced movements or the effects of variable magnetic fields. Some theoretical predictions are compared with experimental results.

The second chapter studies the effect of high pressures on liquid crystals. S. Chandrasekhar & R. Shashidhar describe different equipment and techniques of experimental effects of pressure on mesophase transitions (optical transmission, DTA, NMR, volumetric method). Clapeyron's law $dP/dt = \Delta H/T\Delta V$ is analysed for two compounds, PAA and PAB. A very marked odd/even effect is shown (in five homologous series) regarding the nematic–isotropic transition. Varied aspects of mesomorphism induced by pressure are described: appearance of mesophases for non-mesogenic terms in a mesogenic series; change of a monotropic mesomorphism into an enantiotropic mesomorphism; disappearance of a mesophase under pressure action. A few other aspects are approached, such as the order parameter study and the pressure effect on the cholesteric pitch. A great number of diagrams illustrate this chapter, completed by 98 references.

In the third chapter E. T. Samulsky & D. B. Du Pré deal with polymeric liquid crystals. By considering macromolecular and supramacromolecular structures, these authors show how polymers can produce liquid-crystal-type ordering. Onsager's and Flory's theories are explained concisely. The thermotropic and lyotropic phases of many compounds such as polyesters and polyethers (Th), polyamides, polypeptides and nucleic acids are studied in detail (66 references).

The last chapter, due to R. Schaetzing & J. D. Litster, deals with light scattering by liquid crystals. Light scattering as an experimental tool to investigate the properties of condensed matter has undergone a renaissance since the invention of the laser. The authors recall some important notions relating to universally accepted methods such as Rayleigh and Brillouin diffusion. The isotropic phase is studied first; the transition between an ordered and an isotropic liquid phase of a liquid crystal is characterized by the presence of short-range order in the isotropic phase. Then the diffusion linked to the different nematic thermotropic phases and their transitions is analysed. This chapter continually draws a parallel between diffusion theories and experimental results through various bibliographical references (178).

P. MARSAU
M. COTRAIT

Laboratoire de Cristallographie et Physique Cristalline
Université de Bordeaux 1
Faculté des Sciences
351 *Cours de la Libération*
33405 *Talence*
France

Acta Cryst. (1982). A**38**, 173–174

Chemical physics of solids and their surfaces, Vol. 8. Senior reporters M. W. ROBERTS and J. M. THOMAS. Pp. x + 250. London: The Royal Society of Chemistry, 1980. Price £48·00, US $130.00.

This volume of the *Specialist Periodical Reports* reviews, in the first four chapters, surface effects and surface characterization methods in theory and by numerous examples. The following two chapters are focused on planar defects in non-stoichiometric inorganic crystals and the final contribution deals with organic solid-state chemistry.

The present state of the subject of *The adsorption and absorption of hydrogen by metals* for platinum, palladium, rare-earth and titanium intermetallic alloys is reviewed in the first chapter by R. Burch. Attention is drawn to the nature of absorbed hydrogen, adsorption/absorption transitions, mechanisms of absorption, and structural modifications in alloys This part ends with the existing theoretical models of the binding of adsorbed and absorbed hydrogen.

The second article, by J. P. Jones, describes *Some developments in field emission techniques and their application* to surface studies. A brief summary of the practical and theoretical operating principles of field electron and probe hole microscopy is followed by a description of their application to work function measurements, adsorption studies, *etc.* The section on field emission spectroscopy describes the principles and some experimental aspects. The application to the study of clean metal surfaces and adsorption effects shows its contribution to recent progress in the understanding of the electronic properties of surfaces.

In pursuit of surface topography, by C. S. McKee, discusses the wide range of analysis techniques to pursue the structural aspects of the surface. Theories and mechanisms of electron, photon, neutron, ion, atom and molecule probing are presented and numerous examples emphasize the

application of these techniques for the determination of geometric and electronic factors and effects of the 'active site'. This section is particularly instructive in giving a complete survey of the variety of surface topography characterization.

The fourth part, *Imaging and microanalysis in STEM* by P. M. Williams, is a well illustrated review of scanning transmission electron microscopy for catalytic studies. The information on the instrumental aspects is followed by the description of STEM as an imaging and structural tool. The chapter ends with the microanalysis capabilities using energy-dispersive X-ray analysis and energy-loss spectroscopy.

In the article entitled *The formation and ordering of shear planes in non-stoichiometric oxides*, by C. R. A. Catlow & R. James, techniques for atomistic calculations are summarized which may contribute to the fundamental understanding of complex problems in inorganic shear plane structures. Thermodynamic and kinetic problems such as shear plane and point defect energetics, the ordering of extended defects, and the nucleation of shear planes are considered.

Non-stoichiometric crystals containing planar defects by R. J. D. Tilley gives a description of planar faults in inorganic compounds from the structural point of view. The crystal chemistry of various crystallographic phases containing planar faults is reported, tabulated and illustrated by structure models and high-resolution electron microscopic photographs. The author particularly emphasizes theoretical aspects in dealing with the questions 'why do planar faults form rather than point defects, what are the indices of the planar faults formed, and how do the faults interact and order?'

The final comprehensive report, *New trends and strategies in organic solid-state chemistry* by L. Addali *et al.*, outlines some of the authors' personal views on the subject of solid-state chemistry. The understanding of interaction modes of functional groups in defining molecular arrangements is applied in planning and execution of chiral polymer synthesis and purification of enantiomers. Further outlines are conformational isomorphism, host–guest and gas–solid reactions.

The contributions of the book are clearly written and are well illustrated. There are more than 800 references.

GERHARD KAUS

IBM Deutschland GmbH
German Manufacturing Technology Center
Dept 0836/7032-53
PO Box 266
D-7032 *Sindelfingen*
Federal Republic of Germany

Acta Cryst. (1982). A**38**, 174

Electrical transport in solids, with particular reference to organic semiconductors. By K. C. KAO and W. HWANG. Pp. xx + 663. Oxford: Pergamon Press, 1981. Price £50·00, US $120.00.

This volume is no. 14 in the *International Series on the Science of the Solid State*. It deals extensively with work on semiconduction, photoconduction, and luminescence. Of its seven chapters, one deals with charge-carrier injection from contacts, and three with space-charge currents and related effects. There is a subject index, and a bibliography, both valuable, but the lack of an author index is frustrating. When I wished to read the authors' treatment of Schmidlin–Roberts theory of localized levels, referred to in the bibliography, I had no alternative but to wade through the book from beginning to end. This is my only real criticism. The book is clearly written and well referenced, to 1977 inclusive. The last chapter deals with luminescence and includes a careful account of the neglected area of electroluminescence, where the authors have themselves researched.

The main area of experimental activity in organics is presently concerned with organic metals. This is probably only temporary, a balance of activity will be restored. It would be a mistake to imagine that the organic semiconductor and photoconductor field is worked out. In thirty years it has so far yielded only one really important industrial development, polyvinyl carbazole–trinitrofluorenone for photocopying. The reviewer believes that increased understanding will bring increased applications as in the classical areas of inorganic solid-state physics. This book forms an excellent textbook for postgraduates entering the research field to help in this endeavour.

D. D. ELEY

Department of Chemistry
University of Nottingham
Nottingham NG7 2RD
England

Acta Cryst. (1982). A**38**, 174–175

Topics in current physics. Vol. 25. Mössbauer spectroscopy. II. The exotic side of the method. Edited by U. GONSER. Pp. xii + 196, Figs. 67. Berlin: Springer-Verlag, 1981. Price DM 62.00, US $29.80.

There are many books available which describe the more conventional aspects of Mössbauer spectroscopy, but this volume is unique in that it concentrates on some of the more unconventional (or 'exotic') developments which are either taking place or are hoped for in the future.

Following a brief introduction by Professor Gonser, the first major chapter by Mössbauer, Parak & Hoppe gives an admirable description of an attempt to solve the long-standing phase problem in the structural analysis of biological macromolecules. It has been shown that measurements of the interference between gamma radiation scattered by Rayleigh (from electrons of all the atoms) and Mössbauer (from ^{57}Fe nuclei) mechanisms can, in principle, be combined with conventional X-ray diffraction data to solve structures with molecular weights of the order of 240 000 Daltons. The recent development of a two-dimensional position-sensitive proportional counter should overcome the inherent problem of a low radiation flux from the Mössbauer source by allowing the simultaneous observation of many reflections, and it seems likely that a practical demonstration of structure analysis could be achieved within the next decade.

The chapter by Pound is largely historical in that it gives a detailed description of the classic measurements at Harvard of the gravitational red-shift. However, the summary of possibilities for the future suggests that the technical difficulties associated with the ^{181}Ta and ^{67}Zn resonances