

even at approaching a million bits cycle times of $1\frac{1}{2}$ microseconds can be achieved. Small thin film memories can give cycle times of 0.3 microsecond. Lax describes research in the Lincoln Labs on high magnetic fields. Fields of the order of up to 400,000 gauss are expected to be produced. Nagamiya's review of the screw spin structure is of interest to those interested in ferromagnetism of rare earths and similar substances. Rodbell and Bean give a paper where magnetic transitions are treated like phase transitions. This paper should be of help to many people and clarify their ideas about ferromagnetism, antiferromagnetism and paramagnetism and transitions between these states. Kunzler gives an impressive paper of the recent progress of hard superconductors which can already be used for fields of about 100,000 gauss. The prospects of increasing this are quite bright.

Dealing with magnetic thin film memories and their properties, Ballantyne shows that the ideas proposed by D. O. Smith on magnetic domain wall storage and logic have been experimentally demonstrated. Wolf gives a fairly comprehensive paper on the electrodeposition of magnetic films. Since most previous work is concerned with evaporated layers this may prove interesting to many readers. Takahashi reports on beautiful experiments to investigate the uniaxial magnetic anisotropy in evaporated films and finds that the origin of this lies in defects in the films. Sato, Toth and Astrue have a nice contribution on Bitter patterns of single crystal films of iron and nickel and Thomas has an important theoretical model for non-coherent rotation in magnetic films.

There is a fair number of papers on the investigation of internal fields in ferromagnetics by means of the Mossbauer effect and nuclear magnetic resonance. A whole session consisting of eight papers is devoted to this subject.

Ferromagnetic and ferrimagnetic anisotropy and spin configuration are discussed in a session with 11 papers. Many conventional ideas such as the one-ion model are further elaborated and investigated. There is an interesting paper by Rado and Folen on magnetoelectric effects in antiferromagnetic materials which reports on the observation of a magnetic polarization proportional to an applied electric field in antiferromagnetics. Two effects are postulated both of which have been observed.

Two sessions on oxides deal with all aspects of the magnetic properties of spinels and other ferrites as well as metal oxides like chromium and vanadium oxides. Crystal preparation is described by a few authors for spinels, garnets and hexagonal ferrites.

There are a number of papers on soft magnetic materials and permanent magnets; of special interest may be a review paper by Adams on recent development in soft magnetic alloys. There is no corresponding paper on permanent magnet materials but new materials are described by Sallo and Carr, and de Vos, Velge, van der Steeg and Zijlstra. Meiklejohn gives an excellent review of exchange anisotropy quoting many examples of systems in which this has been observed.

The book is, of course, identical in appearance with any issue of the Journal of Applied Physics except that it is bound in hard covers and has an excellent subject and author index.

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The Story of X-rays from Röntgen to Isotopes.

By ALAN RALPH BLEICH. Pp. xiv + 186. New York: Dover, 1960. Price \$1.35.

This pleasant paperback—it is a new book, not a reprint—may fittingly be brought to the attention of crystallographers on the fiftieth anniversary of the discovery of X-ray diffraction. The author is a clinical professor of radiology in New York, and the book deals largely with medical applications, though industrial and other uses are not neglected, and there is a very timely chapter on the dangers of radiation, diagnostic and otherwise.

The crystallographer will not learn anything useful from the half dozen pages devoted to crystals. He will, however, be interested in 'Max von Laue's discovery that X-ray beams are refracted as they pass through crystals'. The value of the book lies in the fascinating story it tells of the early days of Röntgen's discovery, and the wide field it offers to awaken the interest of young people.

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Struktur und physikalisches Verhalten der Kunststoffe. Ed. by K. A. WOLF. Pp. 974. Berlin: Springer, 1962. Price DM 168.

This book is the first part of a two-volume work on the structure, physical properties and testing of plastics; this first part deals with structure and physical properties. It consists of 48 contributions covering a great range of aspects of the subjects dealt with, by 51 authors, all specialists in their own fields, and it covers most of those aspects of polymer science which are of physical interest and are based on physical rather than chemical methods. Practical test methods and procedures will presumably be dealt with in the second volume.

The contents are arranged in five sections: a short introductory survey (14 pages), five chapters on molecular structure (144 pages), seven chapters on states of aggregation and transitions (154 pages), seventeen chapters on physical properties and their experimental investigation (396 pages), nine chapters on the physical properties of multi-component systems (141 pages), and five chapters on the alteration of properties by various methods (108 pages). Many of these chapters give useful introductions to the subjects they deal with, but polymer science has grown to such enormous proportions that even in a volume of nearly 1000 pages the space allotted to each subject is hardly sufficient to include the bare essentials; most chapters give the impression of extreme compression, and one feels that the authors have found it difficult to do justice to their themes in the space available.

Other general impressions are that the contributions are very uneven in quality, as is inevitable in a symposium by many authors, and that the scheme of division into the sections mentioned above has led to a certain amount of overlapping. The chapter by O. Kratky on X-ray diffraction in the physical properties section, for instance, covers some of the same ground as the chapter by K. Ueberreiter on the crystalline state in the section on states of aggregation; and some other topics in

Ueberreiter's chapter reappear in other sections. However, partial overlapping is not a bad thing, and readers new to polymer science may sometimes be thankful to find some subjects treated from two or more very different points of view. On the whole, such problems have been well handled; there is enough overlapping to link up the many aspects without leading to serious waste of space.

The section on molecular structure seems to be a useful introduction to the world of macromolecules. Methods of measuring average molecular weight and molecular-weight distribution are succinctly dealt with by A. Peterlin; and there is a very large classified list of references to publications on the dependence of physical properties on these molecular characteristics, compiled by O. Fuchs. The chapter on molecular forces and molecular mobility by F. H. Muller is rather disappointing; it covers the theoretical ideas which have been developed in relation to small molecules, but their implications for macromolecules are considered only in a general qualitative way. Moreover, the chapter is marred by vague general statements about 'tendency to crystallize' in relation to chemical structure; one is left wondering whether this refers to melting point or rate of crystallization or proportion of crystalline material. These matters are much more satisfactorily dealt with in Ueberreiter's chapter on the crystalline state, which touches on crystallization kinetics, the growth of single crystals and spherulites, the detailed structure of crystalline regions, phase transitions, and melting. The feeling of over-compression is especially acute here; only a few crystal structures are mentioned (in five pages, in which over half the space is taken up by illustrations). It would have been better to leave out the few pages on basic crystallography (symmetries, systems and Bravais lattices) which serve little purpose in a book of this sort, to allow more space for polymer crystal structures. Even if this had been done, the space devoted to polymer crystal structures and to stereochemistry would still be inadequate. However, the concluding part of this chapter, dealing with melting, is less constricted; it gives a good survey of current thinking on the subject, especially on the relation of melting point to chemical constitution.

Almost every conceivable aspect of the structure and physical properties of synthetic polymers can be found in this book. Some of the more important and successful essays are those on dynamic mechanical properties by J. Heijboer, F. Schwarzl and H. Thurn, dielectric properties by M. Magat and L. Reinisch, infra-red spectroscopy by G. Schnell, and X-ray diffraction by O. Kratky. The last-named succeeds in conveying the essentials of experimental methods, the estimation of the proportions of crystalline and amorphous material, the effects of orientation in polycrystalline specimens, the interpretation of line-broadening and small-angle scattering, in 24 pages. Some branches of polymer science are developing so rapidly that the accounts here already seem out of date; H. A. Stuart's article on superstructures (spherulites and single crystals) and K. Schäfer's article on electron microscopy suffer in this way. One lively subject which has been seriously developed only within the last few years—light scattering in partly crystalline solids—is barely mentioned (in the article by W. Schultz on general optical properties).

The last two sections of the book cover some subjects

of considerable technological importance, such as polymer solutions (A. Peterlin), plasticizers (F. Würstlin), polymer blends (K. Schmieder), dispersions (J. Hengstenberg and W. Sliwka), fillers (H. Schumann), and ageing and weathering (P. Schneider). The final chapter is on the effects of high-energy radiation, by A. Charlesby and C. S. Grace; a great deal of interesting information is crammed into the limited space (28 pages).

This book will be of great value to anyone entering the polymer field, since it covers such a wide range of topics, mostly in an authoritative, if rather compressed, manner. The specialist who is already conversant with polymers will find it less useful, but even he could get a great deal out of it, not in his own special line but in other subjects with which he has perhaps only a nodding acquaintance. These remarks apply of course particularly to German-speaking readers.

The book is beautifully printed and produced, but surely even this high standard cannot justify the very high price. At this price, few individuals will buy it; they will have to rely on libraries.

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International Tables for X-ray Crystallography. Volume III. Physical and Chemical Tables. General Editor KATHLEEN LONSDALE. Volume Editors CAROLINE H. MACGILLAVRY and GERARD D. RIECK. Pp. xvi+362 and 44 figures. Birmingham: The Kynoch Press, for the International Union of Crystallography, 1962. Price £5.15.0; reduced price for individual crystallographers.

The General Editor of the International Tables has complained (*Acta Cryst.* (1962), 15, 730) of the slowness of reviews of Volume II, and in particular that no review has yet been published in *Acta Crystallographica*. There is a fairly obvious difficulty in arranging reviews of publications of this kind; the contents are so varied and so detailed that it is difficult to find a reviewer capable of undertaking the task, and secondly if one does find one he has probably written part of the book himself, and cannot be regarded as unbiased. In order to avoid a similar comment on the reviewing of Volume III. I propose to write a brief factual description, and then seek a competent reviewer, even though it should mean a delay of two or three years before a critical review appears.

Though entitled 'Tables', there is in fact much descriptive matter, always as much as is necessary to understand the uses of the tables, and sometimes considerably more. The main section headings are Examination and preparation of specimens, X-rays and their interaction with crystals, Measurement and interpretation of intensities, Interatomic and interionic distances, Texture and line-broadening analysis, Small-angle scattering, Protection against radiation injury, Dictionary of terms for Volume III, and Subject index for Volumes I, II and III. Most of these sections contain a wider selection of topics than one might imagine; for instance the first one contains not only the examination and preparation of