

as adjectives, it is often not clear, except to the expert, what group of words is acting as an adjective to qualify a noun later on.

The only doubt that we have about the book is that it seems to make the writing of a paper almost impossibly difficult. The number of steps recommended is large; in an appendix 27 such steps are listed leading to the presentation of a manuscript. A new author may well be led to believe that his work cannot really be worth all this effort!

One chapter, however, that is of undoubted use is that on typing. This will be of great help to any typist who is relatively new to the task of preparing a satisfactory scientific manuscript.

Appendix 5 (*Expressions to avoid*) is well worth while studying. It is particularly interesting to see the words 'anticipate' and 'sophisticated' in the 'avoid' column, as these are so often used in the wrong sense.

On the whole, we think that the book should be used as a reference book rather than as a manual. In other words, we think that an author should prepare his work as he thinks best, turning to the book only when he is not sure what to do. Otherwise, he might find that he has spent so much time thinking about the presentation that he has forgotten about the contents!

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### Systematic materials analysis.

**Vol. 1.** Edited by J. H. RICHARDSON & R. V. PETERSON. Pp.xix + 363 Figs. 112, Tables 26. New York: Academic Press, 1974. Price £13.15.

This is a small and expensive book which is the first of a series. This one contains brief descriptions of nine techniques by nine different authors and a general introduction by the editors. The topics covered are:  $\alpha$ -particle spectrometry; Auger electron spectrometry; high and low-energy electron diffraction; the electron microprobe; electron paramagnetic resonance spectrometry; fluorometry; infrared spectrometry; liquid chromatography.

Each chapter outlines the principles of the various methods and gives simple

examples of the calculations required to take what is measured and convert it into the quantity required. The emphasis in this volume is largely upon structural determination and the identification and estimation of the elements present in the sample. The range of applications and the sensitivities obtainable are usually illustrated by examples. The references provided by each author will give the reader an introduction to the relevant literature for each chapter.

It is surprising that a series of such books containing a great deal of emphasis upon spectroscopy should not contain a general discussion of how the output of a spectrometer is related to its input. A discussion of instrumental functions and their deconvolution from the output would have produced a unifying basis for all these authors and helped the reader to make a more profound comparison of the techniques under offer. A similar criticism can be made of the disjointed treatment of diffraction in this book – no fundamental theoretical basis is set.

Since all of this material can be found in other books and review articles and since no coherent pattern is imposed upon the various contributions so as to give the book useful form then it cannot be recommended. In addition it is priced at an absurdly high level for the value of its contents.

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**X-ray diffraction procedures for polycrystalline and amorphous materials.** By H. P. KLUG and L. E. ALEXANDER. 2nd Edition. Pp.xxv + 966, Figs. 375, Tables 97. New York, London: John Wiley, 1974. Price \$34.95, £18.55.

When the first edition of 'Klug and Alexander' was published twenty years ago,\* it immediately became recognized as the standard work of reference in X-ray powder crystallography. Despite spectacular advances during the intervening years, particularly in the fields of diffractometry, line-broadening analysis

and the automatic collection and processing of data, the usefulness of the book as a basic text has hardly diminished. Nevertheless, the revised, enlarged and updated second edition should receive the universal acclaim accorded its predecessor. The essentially practical approach has been retained, with the inclusion of sufficient diffraction theory to meet the needs of the majority of diffractionists and ample references to satisfy those requiring a more detailed treatment. The revision has not in any way invalidated the authors' original contention that the book should appeal to those wishing to acquire a knowledge of powder diffraction techniques through their own efforts as well as being of use to workers with a formal training in the subject.

The introductory chapters, covering elementary crystallography, the production and properties of X-rays and fundamental principles of X-ray diffraction, needed little revision, though some new material has been incorporated. The section on standard X-ray sources has been extended and mention is made of high-intensity and microfocus tubes and isotopic sources. The information on commercial generators has been brought up to date and the section on monochromatization now includes details of balanced filters and the use of graphite monochromators. The only substantial alteration to the chapter on diffraction theory is an introduction to thermal (given as 'temperature' in the text) diffuse scattering (TDS) in the discussion of the temperature factor.

There have been relatively few major advances in photographic powder techniques since the publication of the first edition, aside from the field of low-angle scattering. Improvements to the parafocusing camera are detailed in Chap. 4, but more information on the alignment and use of these cameras would have been useful, in view of their increasing popularity in X-ray laboratories; as it is, the reader must refer to the cited literature for practical details. Microcameras and the use of fine-focus beams, and recent developments involving high- and low-temperature and high-pressure cameras also receive a fuller treatment in the revision of this chapter.

Chapter 5, which deals with diffractometric techniques and is one of the most useful in the book, has undergone a major revision. The geometries of diffractometers in common use are described and the authors discuss alignment considerations in some detail. There is, however, no mention of the

\* Review: H. S. Peiser. [*Acta Cryst.* (1955). **8**, 366].

factors governing the choice between an instrument whose axis is vertical and one with a horizontal axis, nor is the unsuitability of the latter for work of high precision and accuracy mentioned. The usual measures of line position and breadth are presented in a straightforward manner and the account of radiation detectors and associated counting systems includes the solid-state (energy-dispersive) detector. The chapter ends with useful practical information on such topics as specimen preparation, special techniques (involving high and low temperatures, for example), and the choice of experimental conditions to suit each particular application.

The admirable account of routine applications of powder methods, covered in Chaps. 6, 7 and 8, has been retained. Procedures for indexing monoclinic and triclinic patterns are now included, as is the use of computer programs to index patterns. The only addition to the section on identification is the use of computers to search the Powder Diffraction File. Considerable work has been carried out on the quantitative analysis of mixtures in recent years and accordingly the account of this topic has been extended. On lattice-parameter determination, the convolution-film method and likelihood ratio method have been added.

Chaps. 9, 10 and 11 incorporate material formerly shared between Chaps. 9 and 10 and are mainly concerned with special applications of powder methods. The authors have in fact undertaken a major revision of the important material

contained in Chap. 9. The first part is a thorough treatment of various methods for obtaining a pure diffraction profile, retaining the useful approximate methods discussed in the first edition and describing more accurate procedures developed since. The remainder of the chapter is devoted to the analysis of line breadth in terms of crystallite size and imperfections, and several illustrative examples are included.

The treatment of preferred orientation and texture (Chap. 10) is essentially unchanged, aside from an account of recent developments of the special instrumentation required for this work. The only new material in Chap. 11 (*Stress Measurements in Metals*) is the application of diffractometer techniques in this field and the selection of illustrative investigations.

Chap. 12 is devoted to radial distribution studies of noncrystalline materials and, as in the first edition, provides a good basic text for this important topic. The correction and scaling of intensity receives a fuller treatment and new theory is incorporated. In accordance with recent views, the section dealing with an estimation of the crystalline and amorphous fractions in polymers has been omitted. Perhaps the omission will discourage workers from making this dubious distinction.

The introductory chapter on small-angle scattering has been entirely omitted, partly owing to lack of space and partly because the authors feel that this topic is adequately dealt with else-

where. In the appendices, more recent tables of atomic weights (IV) and mass absorption coefficients (V) are given and the table of atomic and ionic scattering factors (VII) has been completely revised and extended. The extra appendix (X) gives the derivation of Warren's powder pattern theorem.

There are two other features which greatly increase the usefulness of the second edition. All sections and subsections are numbered, the layout of the contents list has been modified and the author and subject indexes have been extended, making it easier to refer to any particular topic. The second improvement is concerned with the cited literature. There are 134 general references and 1275 special references, placed at the ends of chapters to which they apply. In addition to being a complete basic handbook of powder crystallography, the second edition is thus an invaluable source for further reading. Appendix I tells how to design and equip a diffraction laboratory, but there is one serious omission. No laboratory specializing in powder diffraction techniques would be complete without a copy of the second edition of 'Klug and Alexander'.

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