

book gives the impression of having been rather hastily put together, with no consistent attempt at thorough checking or proof-reading. A few random examples:

On p. 49, ammonia is described as an oxidizing agent. Table VIII, p. 52, lists reagents required for microchemical tests; the text repeats the list word for word on the next page, where it is implied that Table VIII in fact lists the tests themselves. On p. 111, it seems unlikely, to say the least, that 'Riley . . . uses either "Specpure" titanium dioxide or an analysed sample of anatase for the preparation of sodium bisulphate'. On p. 124, a new automatic titration apparatus devised by the senior author is mentioned, and illustrated on p. 125; despite various promises in the text, the reader searches in vain for a description of its use. On p. 165, the equation given for the iodine-thiosulphate reaction is erroneous and does not balance. Mineralogists will be unhappy to see cryolite (p. 167) assigned the composition Na_3AlF_6 , and both molybdenite and wulfenite (p. 181) the composition MoS_2 . Such slips are legion, and an attentive reader could amass a considerable list.

Despite some interesting material, particularly in the sections dealing with membrane colorimetry and chromatography, it is a great pity to have to say that this book is so full of errors and omissions that beginners in analytical geochemistry would be well-advised to avoid it and go for guidance to the available alternative works treating the various techniques in greater depth. Further, and very considerable, drawbacks are that insufficient attention is paid to potential sources of error in all kinds of quantitative analysis, and that no account is taken, in the main, of advances made since the early 1960s. It is also a very expensive book for its size and contents, even for libraries.

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COES (L., Jr.). *Abrasives* (Applied Mineralogy Series, Vol. 1). Vienna and New York (Springer-Verlag), 1971. viii+177 pp., 51 figs., 52 tables. Price DM 51 (£6.46).

This is the first of a series of monographs on Applied Mineralogy. In a general preface to the series the publishers and editors outline the areas of technology and applied science that they include in this field: these range from refractories to pigments and from organic polymers to fuel for nuclear reactors. Although the main purpose of the series is stated to be to inform the engineer and technically interested scientist, the first volume will be of interest to mineralogists, and moreover sets a high standard for the rest of the series to follow.

A brief history of abrasive technology (4 pp.) is followed by five chapters on abrasive and polishing operations (28 pp.). Chapter 7 (6 pp.) is on natural abrasives other than corundum and diamond, i.e. quartz, fine-grained siliceous abrasives, and garnet. Alumina is treated in detail in Chapter 8 (29 pp.); the geology of corundum-bearing rocks is briefly described, but the main source of abrasive alumina is bauxite and the treatment of the raw material is described in detail. The petrology of fused alumina and its physical properties (hardness, mechanical and thermodynamic properties, thermal and electrical conductivity, and thermal expansion) and uses are then discussed, and the chapter ends with a description of alumina-zirconia abrasives. Chapter 9

(19 pp.) deals with silicon carbide in similar detail. Diamond and boron nitride are included together in Chapter 10 (27 pp.), though apart from some similarities in their synthesis, properties, and uses, they might well have been given a chapter each. The recovery of natural diamond is described in detail, but more information on the production of synthetic diamond would have been useful, and the chapter gives less data on the properties of diamond than Chapter 8 does on the properties of alumina, despite the greater scientific and technological interest of diamond. Chapter 11 (8 pp.) deals briefly with miscellaneous synthetic abrasives, including carbides, borides, and oxides. The final three chapters cover the theory of grinding (19 pp.), evaluation of abrasive products (13 pp.), and the chemistry of grinding (10 pp.). There is a good reference list (though only one reference later than 1968) and author and subject indexes.

No doubt a few errors or misprints are almost inevitable in a technical treatise but some of the errors in this book are distracting—incorrect refractive indices of quartz (which incidentally is described as a shexagonal-hemihedral-trigonal-trapezohedral!) on p. 34, incorrect thermal expansion of silicon carbide on pp. 74 and 86, incorrect heat of formation of Al_2O_3 on p. 57. Hardnesses are variously quoted as Knoop values, kg/mm^2 , and Mohs' values. From its context the list of silicates on p. 120 refers to minerals with Mohs' hardness greater than 8, though nearly all of them are less hard. The physical properties of an almandine quoted on p. 36 do not indicate the range of values to be expected of abrasive garnet. The table on p. 54 is badly set out—the lower half is very difficult to read. The mathematical symbol for 'parallel' is variously, and often incorrectly, printed throughout the book. However, these are in the main trivial errors and do not detract from the value of the book in bringing together the literature from a wide range of sources. If the future volumes in the series are as well produced as this one they will be of use to all mineralogists as well as to the specialist technologists for whom they are intended. B. C. M. BUTLER

PHILLIPS (F. C.). *An introduction to crystallography*. Edinburgh (Oliver and Boyd), 4th edition, 1971. ix+351 pp., 537 figs. Price £2.25.

The text has been made more coherent by incorporating three appendices from the previous edition, and a brief, clear introduction to coloured symmetry has been added. There is a distinct improvement in the typography, particularly noticeable in the better presentation of headings in the text and of the general index. The captions of figures also have greater clarity, but, unfortunately, in some cases the negative sign above crystallographic symbols is so thin that it is barely visible (fig. 146); it is omitted in figs. 153, 154, and 490 and misplaced in fig. 152. There is also an error in the formula in the caption of fig. 214. The drawings have been greatly improved; the lines are sharp throughout, some figures have gained by enlargement and others are better displayed by allowing more space, achieved by a slightly larger format and an increase of 11 pages. The very minor criticisms do not deny the enhanced value of this acknowledged lucid textbook. A. F. SEAGER