

scopy to the characterization of minerals and related materials. It is based on a series of lectures presented during 1987–1988, but has been updated by the incorporation of more recent published material.

The author's objective of producing a monograph that offers students and research workers a basic background in Mössbauer spectroscopy combined with an overview of its wide ranging applications in earth sciences and related fields has largely been achieved. Almost 20% of the book is devoted to theoretical principles that are relevant to the study of minerals, and these have been presented in a logical and straightforward manner. This section provides the reader with the necessary background to understand the applications of the technique that make up the remaining almost 80% of the book.

Most of the applications are concerned with the use of ^{57}Fe Mössbauer spectroscopy for studying the geochemistry of iron-containing minerals. All of the various groups of iron-rich minerals are reviewed, including chapters on carbonates and sulphur- and phosphorus-containing minerals along with more extensive treatments of oxides and aluminosilicates, but no consideration is given to minerals containing other Mössbauer nuclei, such as tin. Other topics covered include applications to the characterization of amorphous phases, petrological and high pressure studies plus a small section on extraterrestrial materials. The final section deals briefly with environmental and archaeological applications of Mössbauer spectroscopy.

A major feature of the book is its large number of citations and it represents a valuable reference source for publications on Mössbauer spectroscopy of minerals. It does, however, have the feel of an extended review and much of the cited work is presented in an uncritical manner with the author largely avoiding discussion of controversies that surround the interpretation of many of these results. I also found the unconventional use of English in places rather annoying, a problem that could have been overcome by better editing by the publishers. Nevertheless, this volume represents a valuable contribution to the literature on the Mössbauer spectroscopy of minerals and can be recommended for purchase by any person or organization to whom the high cost is not a deterrent.

B. A. GOODMAN

Parnell, J., Kucha, H. and Landais, P., Eds. *Bitumens in ore deposits*. Berlin, Heidelberg and New York (Springer-Verlag), 1993 (ISBN 3-540-55621-4), x + 520 pp. Price DM 248.00. Special Publication no. 9 of the Society for Geology Applied to Mineral Deposits

This is the second opportunity that I have had to look closely at this book, and so this review is not limited to first impressions. The title is absolutely right; as its core theme, the book concentrates on the diverse occurrences of bitumens in ore deposits. It is a collection of 27 research articles written by a total of 50 authors, drawn together and edited by Parnell, Kucha and Landais (who contribute to just five articles), and these extend the scope of the book rather beyond consideration of bitumens alone. Consequently, the book will be of interest to those involved in studies of any hydrothermal or mineralising processes in which organic matter might become involved, and it will also be relevant to those interested in bitumen from the point of view of the petroleum geologist or organic geochemist/petrographer.

The book is divided into six subject areas: First, the problems of nomenclature and methodology are addressed, considering the special problems of dealing with organic materials using chemical analytical, optical and electron microscopic techniques. The importance of petrographic work is emphasised; after all, bitumens are sufficiently solid to yield textural and paragenetic information.

Secondly, Simoneit and Tiercelin *et al.* address the formation of petroleum in modern hydrothermal systems. This section provides an important review of the occurrence of petroleum within active systems; Simoneit highlights similarities and differences in comparison with 'conventional' reservoired petroleum, and Tiercelin *et al.* provide excellent photographic coverage of the East African Rift examples that they describe.

In a major section, five papers address bitumens in precious metal and mercury deposits. Topics covered range from descriptions of the occurrence of petroleum-bearing fluid inclusions through to graphite. Although the emphasis is on case studies, two papers in particular provide very valuable and copious sources of data: Pearcy and Burruss' description of the Cherry Hill gold deposits (California) and Peabody's description of the Californian mercury mineralization.

Moving to seven papers on uranium-thorium deposits, Landais provides a general but comprehensive review of associated occurrences of

bitumen, with compositional data for uraniferous bitumens. After a pair of papers describing the geology of the Grants uranium region (New Mexico) and the Oklo reactor system, Nagy provides a comparative overview of occurrences of bitumen in the Witwatersrand, Elliot Lake and Oklo deposits, providing abundant data and valuable references. Elliot Lake is revisited by Mancuso *et al.*, the overall result being a set of contrasting papers covering related material in a rather pleasing and complementary way. This section is completed by consideration of thorium-bearing nodules in the Irish Basin, and a description of reduction spots.

Base metal and manganese deposits provide the next location for bitumen hunters, with five papers. Spirakis and Heyl kick off with a very thorough and stimulating review of MVT ore-forming processes, stressing their belief in the importance of the role of thiosulphate as a transporting ligand which is readily reduced by reaction with organic matter. The papers which follow are largely case-history based, ranging from Greenland through China to the European Kupferschiefer.

Finally, the value of bitumens in exploration for metals and hydrocarbons is addressed in four papers. Curiale's examination of the metal contents of bitumens is particularly valuable, providing many data (especially for V and Ni). Parnell examines the occurrence of ore mineral inclusions within bitumens in the Irish Carboniferous, and the role of radioactivity (as a consequence of the presence of U and Th) is examined as a cause of hydrocarbon polymerisation and as a means of dating bitumen genesis.

Overall, as might be expected for a multi-author volume of this type, its value is rather patchy. At best, the reader is provided with a convenient source of reviewed information (including sometimes copious data), and a lead into the literature. With my own bias, I found eight papers (occupying 40% of the pages) which would make me want to put the book on my shelves and use it for reference purposes. I would recommend the book without hesitation to those who are entering this field, and I would make it compulsory reading for those who work on MVT, precious metal, U/Th and Hg mineral deposits. It is expensive for individual purchases but should be recommended widely for libraries. As would be expected, the quality of production is generally good. Consistent with the importance of microscope work, the standards of photography are good, and some colour photomicrographs are included. However, a number of line drawings (especially of gas chromatograph traces) have

faded away to become scarcely legible. There is a pleasing consistency in style, which is remarkable considering the diversity of origin of the material.

D. A. C. MANNING

Bakoń, A. and Szymański, A. *Practical Uses of Diamond*. Warsaw (Polish Scientific Publishers PWN Ltd.) and Chichester (Ellis Horwood Ltd.) 1992. 248 pp. Price £49.00.

Aimed mainly at diamond technologists, this book contains useful data summarised for tool manufacturers and for other users of diamonds in industry; and there is also a brief chapter on diamond jewellery. The diagrams, tables and graphs are particularly helpful. The variety of practical uses of diamond, both natural and synthetic, arise from the extreme physical properties of diamond: the hardest known substance, having the highest thermal conductivity, as well as possessing a large refractive index and high dispersion. For a material which varies so much from specimen to specimen and even within the same crystal, this condensation of information can however give the wrong impression. Birefringence is not necessarily stronger in Type I (which contains nitrogen) than in Type II diamond; and Type IIb (semiconducting) diamond is not "very pure" since it contains boron. Natural diamond cubes and rhombic dodecahedra are rarely flat-faced.

The authors have bravely attempted to cover nearly every aspect of diamond technology within the compass of a small book, but with the result that many terms and ideas are left unexplained. The average reader would need some prior knowledge to understand fully the scientific sections. Disjointed snippets of information have produced a somewhat halting style, but it is possible that some fluency has been lost in translation. It is a pity that, on every occasion, three- and four-fold axes of rotational symmetry are referred to as 'ternary' and 'quaternary' rather than as triad and tetrad axes respectively, that 'vortex' has been used instead of 'vertex' and that 'diamond ferrous' has been printed instead of 'diamondiferous'.

The book's greatest asset is the bringing together of information on both Eastern and Western technology; and there is a valuable list of 223 references, although not all the authors have been given. There is a useful compilation of synthetic products from all over the world (South Africa, USA, Japan, Europe and the former Soviet Union), but the colour plates would have been