Book news

1. Book reviews

● *Second International Conference on Hydrocyclones.* Cranfield (Bedford, MK43 0AT, England), BHRA Fluid Engineering Centre, 1984. £33.

Reviewer: R.P. King

This volume contains the 28 papers presented at the Second International Conference on Hydrocyclones, which was held in Bath (England) in September 1984. The format and presentation of the papers are similar to those of the first volume in the series, and this volume continues the series as an authoritative account of much of the research work associated with hydrocyclones that is being undertaken throughout the world. The volume was produced from camera-ready copy supplied by the authors, but the quality of reproduction is very high and both text and figures are legible throughout the volume. Although most of the work reported deals with the hydrocyclone as a classification device, important sections are devoted to liquid–liquid separations and heavy-medium separations.

Several theoretical papers attempt to establish the velocity field inside the hydrocyclone. Ever since Kelsall's pioneering work in this field, it has been realized that it is the velocity field that dominates the behaviour of particulate material inside a hydrocyclone. A few new measurements using laser doppler anemometry are presented, but no new major experimental study is described. The experimental work related to classification is somewhat disappointing, with most authors concentrating on very small cyclones (generally smaller than 100 mm) and very dilute suspensions—less than 1 per cent solids by volume. These conditions are not very important in industry, particularly the mineral-processing industry, and many of the results related to scale-up and predicted performance cannot be applied directly.

The application of the hydrocyclone to mineral beneficiation, particularly the de-ashing of fine coal, is a significant feature of this publication. South African work is described in a paper on the mechanism of separation in dense-medium cyclones by Dr T.J. Napier-Munn from the De Beers Diamond Research Laboratory and a paper on the dense-medium cyclone and cleaning of fine coal by Lathioor and Osborne, in which they review the historical development of the dense-medium cyclone as a beneficiation device for fine coal.

In spite of the rather academic tone of many of the papers, this constitutes an important volume, and will be of interest to all research workers who are currently active in the design and utilization of the hydrocyclone as a classification and separation device. On the other hand, industrial users of hydrocyclones will not find much in the volume to assist them in selecting equipment or designing hydrocyclone circuits.

● *Mineralogy for metallurgists—an illustrated guide,* by H.W. Fander. London, Institution of Mining and Metallurgy, 1985. £33.

Reviewer: H.V.R. von Rahden

This book attempts to bridge the interdisciplinary information gap between the metallurgist and the process mineralogist by providing a general text supplemented by 136 colour photomicrographs. Although, as the author points out, this is not a textbook of mineralogy, it covers such aspects as methods of study, metallic minerals, industrial minerals, mineral sands, tailings, slags and residues, and gangue minerals. The book, despite being restricted to 27 printed pages, provides the reader with a good overview of the very real problems facing all those who are connected with the beneficiation of various kinds of deposits.

The author makes the important statement that, ideally, all metallurgists should be able to perform their own mineralogical investigations on the plant. While this may be something to be aimed for, a lack of adequate undergraduate mineralogical training for metallurgists or a lack of equipment may well present real constraints to the practical implementation of such a scheme.

One regrettable omission from the book is that, in the section entitled 'Mineralogical Examination', no mention is made of the usefulness of modern image-analysing techniques for establishing the degree of mineral intergrowths and mineral proportions, in preference to the tedious manual point-counting techniques that are more commonly employed.

The text of the book is presented logically and clearly, but it is laid out in newspaper column format, rather than in the more conventional book form. This has the unfortunate consequence that words are frequently split in order to justify right-hand margins, a feature that this reviewer found most annoying.

The bibliography is rather restricted, and the references are somewhat dated. Also, it is surprising that no attempt was made to arrange the references in any logical order, either alphabetical or chronological. The bibliography would have benefited from the inclusion of a reference to Picot and Johan's *Atlas of Ore Minerals**, a new and comprehensively illustrated work on 369 ore minerals arranged in alphabetical order for easy reference.

The photomicrographs, although well described, are in themselves of poor quality. There is poor colour balance in the printing, and many are noticeably out of focus, reflecting badly on the photographer. In addition, many show signs of poor polishing technique in the preparation of the mineral sections, features of high relief and scratches being clearly visible and detracting from the quality of the final photographic image. To add to this, many of the photomicrographs of mineral grain mounts are either out of focus or have been poorly illuminated, which further detracts from the usefulness of this book as a reference work.

Despite these drawbacks, the book can be read profitably by both the plant metallurgist and the practising process mineralogist. It could also be used at the undergraduate level for metallurgists and geologists to provide useful background information on mineral processing. In the final analysis, however, this book, although in some aspects very helpful, appears to have been written by a process mineralogist for process mineralogists, and accordingly falls short of its author's object of offering a mineralogical text suitable for

* Picot P., and Johan, Z. *Atlas of ore minerals.* Elsevier, Amsterdam, 1982. 459 pp.

metallurgists. This book, then, is hardly likely to inspire the average plant metallurgist to venture into the complex and specialized field of process mineralogy.

● *Coal in Canada*, edited by T.H. Patching. Quebec, The Canadian Institute of Mining and Metallurgy (CIM special volume 31), 1985. 135 pp. $59.

Reviewer: A.A. Snyman

In his foreword, the editor states the purpose of this volume as 'a reference volume on coal in Canada'. It consists of a series of papers covering a wide variety of topics relating to the subject, and is divided into seven sections: the first describes coal in a general way from historical and quality-classification points of view and as an international commodity; the next five sections summarize the geographical and geological settings of the various coal-bearing regions of this vast country, touching upon various mining and economic aspects; and the last section deals with certain aspects of the preparation, transportation, and production potential of coal in Canada. Safety aspects are also touched upon.

Coal was discovered very early in the history of European settlement in Canada, the first records dating from 1672 and concerning occurrences in the Maritime Provinces on the east coast. Geographically, the main coalfields occur on either side of the subcontinent; geologically, they are situated on the flanks of the great Canadian Shield or Craton, which is built up mainly of pre-Cambrian rocks. In age, the coals range from Carboniferous to Tertiary. The rank varies from lignitous to low-volatile bituminous, or even anthracitic in places.

The coalfields of the Maritime Provinces, Nova Scotia and New Brunswick, are Carboniferous in age, and the coal is medium- to high-volatile bituminous in rank. Some of the coal has coking properties, but the distance from the inland steel plants of Ontario and Quebec makes its use uncompetitive against coal from the better-situated fields across the border in the U.S.A. By South African standards, the ash content is low, i.e. about 5 per cent. Washed to an ash content of 2,8 per cent, the coal has a free swelling index of 7,5 at 36,2 per cent volatile matter. The sulphur content of the raw coal varies from 1 to 8 per cent.

On the other side of the sub-continent lie the great deposits of Saskatchewan and Alberta, which are mainly from Early Cretaceous to Tertiary in age. By far the greater part of the coal is lignitous to sub-bituminous in rank, but in Alberta the intense folding associated with the uplift of the Rocky Mountains has led to the formation of higher-rank coals, some having good coking properties. These coals are exported for metallurgical purposes, mainly to Japan. By far the greater part of the reserves consists of thermal coal of low rank with a calorific value of 14 to 16 mJ/kg. Smaller coalfields are found in the Cordillera region of British Columbia.

The total production for Canada amounted to 40,4 million short tons in 1980, nearly half of which came from Alberta (19,2 million tons). Substantial tonnages were produced in British Columbia (11,2 million) and Saskatchewan (6,6 million). The Maritime Provinces produced about 3,3 million short tons in 1980.

The main markets for Canadian coal are as follows.

- Most of the metallurgical coal, derived mainly from the mountain regions of Alberta and British Columbia, is exported to Japan and South Korea via Vancouver, which handles about 15 million tons annually.
- Large tonnages of high bituminous to lignitous coal are fed to thermal power stations in Alberta and Saskatchewan, mainly from captive mines.

The markets consist of supplies for electric utilities (55 per cent), export (42 per cent), and metallurgical purposes (3,3 per cent).

Mining is by underground and opencast methods, the latter being the more general, and includes some very large operations.

The chief problems besetting the coal industry are geographical. The main domestic markets are in the industrial regions of Ontario and Quebec, which involves rail transportation over long distances. The same applies to the exportation of coal from harbours on the west coast, which involves long haulages over sometimes very rugged terrain.

As a reference book presenting a general overview of the coal industry in Canada, this volume is a valuable addition to the bookshelf of any one interested in the subject. It is accompanied by an excellent map showing the main coalfields and the location of the principal mines and chief consumers, as well as the channels of movement from mines to markets.

2. Recent publications

● *South Africa's mineral exports: an outlook for 1985 and 1986.* Johannesburg, Minerals Bureau, Sept. 1985.

This forecast of South Africa's minerals in unprocessed and beneficiated form is given in three sections: mineral export sales of South Africa for the period 1982 to 1984 and forecasts for 1985 and 1986; mineral export sales for South Africa and Transkei, Bophuthatswana, Venda, and Ciskei for 1985 and 1986; and export sales of beneficiated mineral products for all these countries for 1985 and 1986.

● *Tin and its uses* no. 145. Greenford (England), International Tin Research Institute, 1985.

This issue contains articles on the following: tinplate in electronics, tinplate packaging, tinplate for paint cans, the North American Tinplate Conference, developments in organotin chemicals, and a review of the research being undertaken at the Institute.

● *The story and uses of aluminum.* Washington D.C., The Aluminum Association, 1985. 16 pp. No charge.

To commemorate the discovery in February 1886 by Charles Martin Hall of a workable electrolytic process for the production of aluminium, the Aluminum Association has produced an attractive booklet dealing with the history, uses, and processing of aluminium in its various forms.

3. Canadian publications

Requests for copies should be addressed to: Canadian Government Publishing Centre, Supply and Services

Canada, Ottawa, Canada, KlA 059, accompanied by postal money order payable to the Receiver General for Canada. Postage stamps cannot be accepted. Prepayment is required.

● Mining and mineral processing operations in Canada, 1984. *Mineral Bulletin* MR 203. $6.

The Operator's List is a compilation of information relating to mines and processing facilities in Canada. This information was obtained primarily, as in previous years, by means of a questionnaire sent to all the companies concerned.

● Manganese—an imported mineral commodity. *Mineral Bulletin* MR205. $6.

This report on manganese—a mineral used in Canada mainly as a ferro-alloy in the steel industry and to make batteries—looks at one of the relatively few raw materials for which Canada is currently totally dependent on imports. It is the fifth in a series aimed at an assessment of possible problems in obtaining supplies of selected non-fuel minerals, to provide background information for government policy, which might involve such actions as guiding research that could lead to less dependence on external sources.

● Metallugical works in Canada. Primary iron and steel 1985. *Mineral Bulletin* MR 206. $6.

This bulletin lists in detail the facilities, productive capacities, products, and other information relating to the companies that comprised the primary iron and steel industry in Canada at 1st January, 1985. There are separate sections on the steel pipe and tube industry, and on the iron powder and ferrite industry.

● Canadian mines: perspective from 1984. *Mineral Bulletin* MR 207. $6.

This bulletin reports on the results of a joint federal–provincial undertaking aimed at monitoring, on an annual basis, the supply systems for the most important mineral commodities being mined in Canada. Concise overviews are presented of the Canadian reserves situation, of the supply capability on the basis of current reserves alone, of recent commitments for bringing new mines on-stream, and of the level of exploration and discovery.

● Mineral exploration in Canada—questions and answers for the non-expert. *Mineral Bulletin* MR 208. $6.

This bulletin is meant to answer queries that an interested non-expert might have about mineral exploration. It provides brief answers to a series of questions that might be posed by a politician, a financier, or any interested member of the public.

● Catalogue of mineral statistics—Federal and Provincial publications and surveys in Canada. MRI 85/1. No charge. (Obtainable from Micromedia Limited, 144 Front Street, Toronto, M5J IG2 Canada, in microfiche or hard cover.)

This was compiled from questionnaires used in a survey of companies in the mineral industry and publications, produced from the information received. The questionnaires and publications were submitted to the Publication Task Force of the Federal–Provinical Committee on Mineral Statistics by committee members.

4. Mintek reports

The following reports are available free of charge from the Council for Mineral Technology, Private Bag X3015, Randburg, 2125 South Africa.

● **Report M206**

The determination of uranium(VI) by flow-injection analysis.

A method is described for the direct determination of uranium(VI) in waste waters and acid leach liquors by use of a flow-injection procedure and spectrophotometric measurement with 2-(5-bromo-2-pyridylazo)-5-diethylaminophenol (bromo-PADAP).

The interference effects of several commonly occurring elements were studied. The calibration curve is linear over concentrations of uranium(VI) from 0,5 to 20 mg/l, and the precision obtained on a synthetic leach liquor was 0,019 (relative standard deviation).

The procedure is rapid and convenient, and up to 40 samples can be analysed in an hour.

● **Report M207**

Some flotation characteristics of gold.

The results of laboratory tests show that particles of free gold considerably smaller than 10 μm are readily floatable with thiol collectors, and that the recovery of gold is not significantly affected by standard gangue depressants.

The recovery of gold from poorly floating gold-bearing material can be increased by the use of strong thiol collectors of the mercaptan or trithiocarbonate type.

● **Report M208**

Internal standardization in atomic-emission spectrometry using inductively coupled plasma.

The principle of internal standardization has been used in quantitative analytical emission spectroscopy since 1925 to minimize the errors arising from fluctuations in sample preparation, excitation-source conditions, and detection parameters. Although modern spectroscopic excitation sources are far more stable and electronic detection methods are more precise than before, the system for the introduction of the sample in spectrometric analysis using inductively coupled plasma (ICP) introduces significant errors, and internal standardization can still play a useful role in improving the overall precision of the analytical results.

The criteria for the selection of the elements to be used as internal standards in arc and spark spectrographic analysis apply to a much lesser extent in ICP-spectrometric analysis.

Internal standardization is recommended for use in routine ICP-simultaneous spectrometric analysis to improve its accuracy and precision and to provide a monitor for the reassurance of the analyst. However, the selection of an unsuitable reference element can result in

misuse of the principle of internal standardization and, although internal standardization can be applied when a sequential monochromator is used, the main sources of error will not be minimized.

- **Report M209**

Surface-chemical and mineralogical properties relevant to the flotation of talc and other layer silicates.

Certain physicochemical and mineralogical properties of different talc and pyrophyllite samples were measured to show whether differences in floatability could be related to these properties. An indication of the expected hydrophobic nature of the samples was obtained by X-ray-diffraction measurements. The various samples were characterized by measurement of their zeta potentials, contact angles, suspension stability, and flotation behaviour in small-scale flotation cells. All the talc samples proved to be highly floatable and therefore only small differences in recoveries were observed. However, there was some indication that the suspension stability was related to the X-ray-diffraction measurements of the hydrophobic nature of the samples. No trends were observable from the zeta potentials and contact angles measured.

Magnetic separation

Unlike other unit operations in ore-dressing, magnetic separation receives comparatively little attention during a metallurgist's formal education. Consequently, metallurgists and plant personnel generally acquire only a smattering of knowledge on the subject, and many of them have had little opportunity of studying the principles of magnetic separation.

As this is a situation that could well be rectified, the Council for Mineral Technology (Mintek) is organizing a combined school and symposium at which, for two days, experts in the theory of magnetic separation and manufacturers and users of equipment will present their views. This blend of theoretical instruction and practical experience will enable metallurgists and plant personnel to appreciate the value and usefulness of the techniques.

The Colloquium on Magnetic Separation in the Mineral Industry, which is to be held on 30th and 31st January, 1986, is aimed not only at those with little or no knowledge of the subject; even technical people already involved in magnetic separation should derive a great deal of benefit from the Colloquium.

The subjects to be covered include the following:

- The physical principles of magnetic separation
- Generation of magnetic fields (permanent magnets, electromagnets, superconducting magnets)
- Review of magnetic-separation techniques
- Practical application to the mining industry (gold, base minerals, industrial minerals)
- Applications in other fields (coal desulphurization, waste-water treatment, nuclear industry, medicine).

A number of experts in the topic will be taking part, and there will be an exhibition of equipment by suppliers.

Mintek will arrange a tour of its ore-dressing facility at the end of the second day's proceedings, so that interested delegates can view the research and development work done at Mintek on magnetic separation.

Persons interested in attending should write for full details to

The Conference Secretary (C.32)
Mintek
Private Bag X3015
Randburg
2125 South Africa
Telephone: (011) 793-3511
Telex: 4-24867 SA.

Hydrometallurgy

HYDROMETALLURGY '87, organized by the Society of Chemical Industry (Solvent Extraction and Ion Exchange Group), is to be held in Manchester from 7th to 10th July, 1987. It will follow the format of the international HYDROMETALLURGY meetings held in 1975 and 1981.

Emphasis will be placed on the application and practice of chemical and engineering principles, and on new technology that is close to commercialization.

Papers are invited on all aspects of hydrometallurgy including leaching, solution preparation and treatment, solid–liquid separation, bio-processes, solution purification—solvent extraction, ion exchange, membrane processes—electroprocesses, etc.

Further information will be supplied, on request, by

The Conference Secretariat
Society of Chemical Industry
14 Belgrave Square
London SWIX 8 PS
England.

THE SOUTH AFRICAN INSTITUTE OF MINING AND METALLURGY

REFERENCE BOOKS IN THE INSTITUTE SECTION OF THE LIBRARY OF THE CHAMBER OF MINES OF SOUTH AFRICA
List No. 3

The Institute has concluded an agreement with the Chamber of Mines whereby the Chamber Librarian will establish and maintain a section in the library for the Institute.

Books that are published by the Institute or received for review are placed in this library, and lists of new books are published in this *Journal*. The first two lists appeared in the February and May, 1985, issues, and the third list is published below. Books that have been reviewed in the *Journal* are indicated, together with the month of issue.

Apart from a few exceptions, these books can be borrowed by members through the inter-library loan scheme.

If you have suitable books that you would care to donate to the library, please contact our publications secretary.

SAIMM: SYMPOSIUM SERIES

No. 6 – Rockbursts and Seismicity in Mines
Edited by N.C. Gay and E.H. Wainwright
ISBN 0620 06708X; 363pp; 210×295mm; illus; hard cover; index; 1984
Review: August 1985

AUSTRALASIAN INSTITUTE OF MINING AND METALLURGY

Darwin Conference, 1984
ISBN 0 909520 836; 434pp; 180×245mm; illus; index; 1984
Review: August 1985

Extractive Metallurgy Symposium
ISBN 0 909520844; 377pp; 180×245mm; illus; index; 1984
Review: September 1985

Gold, Mining, Metallurgy and Geology—Regional Conference
205×290mm; illus; 1984
Review: September 1985

Ventilation of Coal Mines
Edited by A.J. Hargraves
ISBN 0 909520 62 3; 333pp; 175×240mm; illus; 1983
Review: October 1985

ELSEVIER SCIENCE PUBLISHERS

Gravity Concentration Technology
By Richard O. Burt
ISBN 0-444-42411-3 (Volume 5); 605pp; 170×245mm; illus; hard cover; index; 1984
Review: August 1985

Mechanics of Oil Shale
Edited by Ken P. Chong and John Ward Smith
ISBN 0-85334-273-3; 603pp; 145×225mm; illus; hard cover; index; 1984
Review: July 1985

THE INSTITUTE OF METALS—U.K.

Perspectives in Metallurgical Development
ISBN 0 904357 71 6; 337pp; 215×300mm; illus; hard cover; index; 1984
Review: July 1985

Physicochemical Properties of Molten Slags and Glasses
By E.T. Turkdogan
ISBN 0 904357 54 6; 516pp; 160×240mm; illus; hard cover; index; 1983
Review: September 1985

Metallurgical Applications of Magnetohydrodynamics
Edited by H.K. Moffatt and M.R.E. Proctor
ISBN 0 904357 60 0; 345pp; 210×290mm; illus; index; 1984
Review: September 1985

THE INSTITUTION OF MINING ENGINEERS—U.K.

Management Information—Managing for Improvement Volume 2
210pp; 210×295mm ; illus; index; 1983
Review: September 1985

OTHER PUBLICATIONS

Geostatistics for Natural Resources Characterization—Parts 1 and 2
Edited by G. Verly, M. David, A.G. Journel, and A. Marechal
ISBN 90-277-1746-X (Part 1); ISBN 90-277-1747-8 (Part 2); 1092pp; 160×240mm; illus; hard cover; 1984
Review: April 1985

Magnesium—The International Perspective
By Peter King
ISBN 0 903199 69 6; 155; 210×300mm; illus; 1983
Review: April 1985

Black Sands
By I.W. Morley
ISBN 0 7022 1633 X; 278pp; 140×220mm; illus; hard cover; index; 1981
Review: August 1985

Johnson Matthey Chemicals—Catalogue Sales 1984–85
By Johnson Matthey
413pp; 150×210mm; index; 1985
Review: September 1985

Mineral Processing Technology—3rd Edition
By B.A. Wills
ISBN 0-08-031159-8; 629pp; 145×210mm; illus; index; 1985
Review: September 1985

Corporate Policies for the 1980's in the Steel Industry
By Patrick Genevaz
257pp; 225×300mm; illus; 1985
Review: September 1985