

# Book news

## 1. Reviews

● *Extraction metallurgy*, by J.D. Gilchrist. 3rd ed. Oxford, Pergamon, 1989. 431 pp. £50.00 (hard cover), £14.95 (soft cover).

**Reviewer: Prof. M.D. Brayshaw**

This third edition bears testimony to a work that contains much of value for lecturers, students, and practising metallurgists. It is a text worthy of attention by both novice and seasoned metallurgist alike. As a reference book, it contains much valuable and worth-while information, which can be accessed easily owing to its excellent 'Contents' and 'Index' sections.

The material is aimed, as the author explains in his preface, at providing 'students of metallurgy in universities and colleges with a comprehensive preparatory textbook on the production of metals from their ores'. This it certainly does. The material is sequenced very logically, beginning with a short historical introduction to metallurgy, followed by a description of the different types of ores, and continuing into the major items of ore-dressing, thermodynamics, reaction kinetics, slags, mattes, and fuels, and ending with extraction processes and procedures for the major metals won from the earth's crust today. The material is both rich and well-written.

Against this back-drop, the reviewer would like to add a few words of caution in regard to its use by lecturers and students. The book is aimed at the academic world, and is designed to be used as a text in introductory courses on extraction metallurgy. Lecturers may find the text a little bulky and hard to sift through for a course book, depending upon their own particular approach to teaching. It has been written in a fairly descriptive manner with few numerical examples given in the text itself. This may not be what is required for the class leader who wishes to create in his students an appreciation of an engineering approach to metallurgy, which is of major value today.

There is a marked emphasis on higher-temperature metallurgy, which no doubt bears testimony to the writer's extensive experience in this particular field. The richness of subjects such as thermodynamics (theory and applications), reaction kinetics, slags and mattes, and fuel technology demonstrate that the writer has a deep understanding of pyrometallurgy. The two final chapters, which are entitled 'Extraction Processes' and 'Extraction Procedures', cover the main pyrometallurgical techniques; this is largely a reflection of a historical tendency for designers to choose pyrometallurgy for the recovery of possibly two-thirds of the world's metals; however, it is disturbing to find that processes such as carbon-in-pulp, carbon-in-leach, and carbon-in-resin are not referred to at all. The chapter dealing with reaction kinetics lays the foundation for leaching as a unit process, as well as providing some basic rate theory for pyrometallurgical operations.

Apart from the more pyrometallurgically based chapters, there are two chapters dealing with ore-dressing, a short chapter that considers agglomeration, and another that treats instrumentation and control. The two chapters dealing with ore-dressing are, as would be expected in an

introductory book, fairly basic in content and descriptive in approach. These two chapters are seasoned with a little engineering theory of size distributions and classification, but there is a disregard for the more quantitative and mathematically based descriptions of, for example, comminution through the use of selection and breakage functions; there is further no comparison between this more-informed approach and the older, energy-based theory. Flotation is treated almost entirely from a chemical standpoint, with no reference, for example, to rate equations. There is a short chapter on process control that omits many of the more important aspects of this subject (even at this introductory level), e.g. feed-forward, feed-back, and multivariable control. There is also only cursory reference to the now widespread use of computers for the modelling of processes and for informed decision-making such as expert-systems techniques.

The solved problems in the text tend to form part of the text itself; that is, the author computes various albeit interesting characteristics within certain posed scenarios, but the intention to solve a particular off-met problem is not distinctly stated, nor is it particularly intended. Because the numerical parts of the text are not highlighted in any way, a reader would struggle to find a particular calculation of interest. There is an appendix dealing specifically with worked examples, but the emphasis is upon thermodynamic problems, and very little else is provided.

There are four appendices in total. Apart from one handling mainly thermodynamics problems, one treats conversion factors and values of physical constants, another provides screen- and sieve-aperture sizes, and the fourth gives world metals production for 1985.

There are a good many major headings, which divide the text into smaller, more digestible units within a chapter. However, the reviewer found that, in the less mathematical chapters, such headings were not frequent enough. This would tend to make the researching of a smaller sub-section of a major theme a little tiresome.

The author states in his preface that 'a more recent distinction between aspects of his subject which are of a chemical nature and those which are of a physical or engineering nature is artificial and to be regretted', but he does later acknowledge that the book shows bias toward the chemical rather than the engineering aspects of metallurgy'. A scan of the main text reveals that approximately 14 per cent of the material is mathematical in nature, and the majority of the mathematics concerns itself with standard thermodynamic expressions. Perhaps for a subject that is developing rapidly from an art to one that can now both be understood and characterized in terms of mathematical and engineering structures, this latter percentage does not reflect the modern trend strongly enough.

The quality of reproduction is extremely good. The illustrations are clear and pertinent; they number on average one per 3,7 pages for the main text, which in some sections could profitably be increased for greater clarity and enjoyment. The illustrations themselves are of a very high

standard.

The referencing of the text is good, with a detailed index at the end, as well as a comprehensive contents section at the front. There are a total of 187 references to other pieces of literature, which will undoubtedly prove useful to a reader with slightly more advanced intentions.

- *Mineral processing in the United Kingdom*, edited by P.A. Dowd. London, Institution of Mining and Metallurgy, 1988. 223 pp. £25.00.

**Reviewer: Prof. M.D. Brayshaw**

It came as both a pleasure and a challenge for a resident of South Africa (with its volume and diversity of minerals) to review a book focusing on the beneficiation of ores from the sparsely endowed mineral chests of the United Kingdom. This volume bears testimony to those ever-resourceful and indomitable researchers and process engineers who have produced some excellent work in financially straitened and technically difficult circumstances.

It might well be argued by South Africans that the throughputs, grades and, indeed, types of deposit found in the United Kingdom are totally different from those found on the local scene and, accordingly, the methods employed to beneficiate them will be inappropriate to the solution of South African problems. However, a closer analysis of the papers in this collection reveals that a good proportion of the subject matter can reasonably be applied to our indigenous processing situation. One point that becomes evident on reading the text is that there is no limit to man's ingenuity in the minerals industry provided that a profit can be realized at the end of the day.

The material comprises a collection of fifteen papers delivered over two days at the University of Leeds, plus an opening address and a keynote lecture. The papers are arranged in the order in which they were presented during the conference, being divided into five separate sessions, but with no session titles. The subject matter can be divided under the following headings:

- (i) mineral types, i.e. coal, fluorspar, china clay, glass sand, tin, and iron ore;
- (ii) modelling and computer-aided design and operation, including stockpile design, expert systems, computer simulation, plant design for control, and mass-balance smoothing;
- (iii) unit operations, i.e. flotation, magnetic separation, gravity concentration, leaching, hydroclassification, de-watering, and grinding (only cursory references).

One paper describes the present processing techniques in England for china clays, while other works treating different mineral types concentrate on the changes made to flowsheets and equipment operation to improve product quality and reduce production costs. Another paper describes a fundamental design for the leaching of glass sands, and still another mulls over the rescuing of a promising technique for the past for the beneficiation of hematitic iron ores.

The papers dealing with the application of computers to mineral processing do not contribute much to what is generally known and practised in South Africa. The paper dealing with stockpile design could have some

interesting features for miners, and the various mathematical models for gravity-concentration equipment (mostly available as computer software) appear novel and should be helpful in South African tin concentration. The paper on plant design applicable to process control gives sensible advice for the matching of hardware to control philosophy, but the works discussing expert systems and mass-balance smoothing are neither new in principle nor in application to our home industry.

There is an excellent experimental study on the role of turbulence in the design of flotation cells. Another two papers are dedicated to the recovery of cassiterite fines using novel equipment (i.e. the multi-gravity separator). The work dealing with de-watering sheds some interesting light on flocculants, de-watering aids, and thermal drying that could prove useful to South African exporters having to content with high transportation costs.

The papers range in technical complexity from very descriptive (about 44 per cent) to moderately technical (about 40 per cent) to mathematical (about 18 per cent).

The material is generally easy and pleasant to read, although in some papers the work could be presented a little more clearly.

The quality of the reproduction and typesetting is very good, and the diagrams are both appropriate and excellent in quality.

The material is indexed only insofar as a list of the paper titles in the front of the book is concerned, and a subject index, which is normal for this type of publication, is not provided. However, there are many valuable references to other research articles at the end of each paper.

In conclusion, the book is most informative of work being done in the United Kingdom on the beneficiation of the ores found there, and describes some novel and original studies. It is not designed as a reference work, but it should be helpful to some specific cases of processing in South Africa, which have been indicated in this review.

## 2. Recent issues

- *Rock mechanics. Theory and applications with case histories*, by W. Wittke. Translated from German by R. Sykes. Berlin, Springer-Verlag, 1990. 1076 pp. DM 248.

This book introduces the reader to the fundamentals of rock mechanics and to its application to economic construction in rock. Models describe the mechanical properties and the permeability of rock. Numerical methods for evaluating the stability of structures in rock are given to solve special problems related to tunnels, caverns, pressure tunnels, dam foundations, and slopes. Methods for testing the mechanical properties of rock are described. A number of case histories enable the reader to make use of the content in his or her own work.

- *McGregor's quick reference to the JSE*. Pretoria, Juta & Co., 1990. R39,95.

Hailed as the 'baby brother' to McGregor's *Who Owns Whom*, this latest addition to the McGregor library has been compiled to provide concise investment data that will enable the reader to act quickly. Produced in an easy-

to-handle format which is updated every six months, it ensures that the information is current—with easy-to-decipher graphs—to help keep readers in the picture with the share history and sector performance of each company.

- *McGregor's economic alternatives*. Pretoria, Juta & Co., 1990. 400 pp. R34,95.

This book dissects the South African economy past, present, and future with startling conclusions. It airs the views of men with clear, informed, and lucid suggestions for accommodating the economic and other aspirations of all South Africans. It offers wide-ranging, thought-provoking, and penetrating discussion on a subject that will decide the future of South Africa.

### 3. New journals

- *Journal of Materials Chemistry*, edited by A.R. West and J. Leader, and published two-monthly by The Royal Society of Chemistry (Blackhorse Road, Letchworth, Herts SG6 1HN, UK). £195 per year, starting in 1991.

International in scope, the journal represents an exciting and radical new publishing venture. It breaks away from the traditional divisions of inorganic, organic, and physical chemistry by recognizing the interdisciplinary nature of materials research. It will publish original new research in the shortest possible time, and will cover the synthesis, structures, properties, and applications of materials, particularly those associated with advanced technology. It will be supported by an international advisory editorial board consisting of some of the world's leading authorities on materials chemistry. It will also contain occasional state-of-the-art review articles on key areas.

- *New Materials World*, published monthly by Lawrence Cooklin (15 Selva Lane, Mill Hill, London NW7 3SS, UK). £180 per year.

At the present time, significant advances in materials are taking place in thousands of universities, research institutes, and corporate R&D facilities all over the world. This journal offers a monthly intelligence service devoted exclusively to reporting the latest innovations in new materials technology worldwide. It covers the full spectrum of advanced materials: metals, ceramics, polymers, composites, fibres, glass; it is international in coverage, with correspondents in North America, Europe, Japan, and the Eastern Bloc; it is purpose-written for the corporate executive, rather than for the specialist; and it stresses applications.

#### ● *Mendeleev Communications*

Also new for 1991 is this journal, which will be produced as a collaborative venture between The Academy of Sciences of the USSR and The Royal Society of Chemistry. For the first time the international chemical community will have rapid access to the very best of Soviet chemical research since the communications will be published directly in English. The journal will contain preliminary accounts of novel and significant results of wide general appeal or exceptional specialist interest, and will closely resemble its 'sister' publication, *Chemical Communications*. Further information and a free sample copy are available from The Royal Society of Chemistry at the above address.

### 4. Books from The Institute of Metals

The following were published recently, or are to be published soon, by The Institute of Metals, 1 Carlton House Terrace, London SW1Y 5DB, UK.

- *Illustrated case histories of marine corrosion*. 1990.

Prepared by the Working Party on Marine Corrosion, this volume contains an extensive introduction covering the theory of marine corrosion, the nature of seawaters, types of corrosion, and protective measures, as well as a discussion of materials used in the marine environment. The major part of the book is devoted to case histories of the marine corrosion of pipes, pumps, valves, and heat-exchangers.

- *Modern steelmaking methods*, by C. Moore and R.I. Marshall. 2nd ed. 1990.

Investigating the status of various steelmaking methods currently available throughout the world, the second edition of this monograph includes a new chapter on pre-steelmaking, which deals with hot-metal treatment between the blast furnace and the steelmaking unit, and will be of interest to both academics and metallurgists.

- *Grain boundary fractures*, by S.F. Pugh. 1991. 160 pp.

This is a study of the micro-mechanisms of grain-boundary fracture in metals and alloys. It is designed to assist in the elimination of batches of material that fail prematurely and in the development of stronger materials less likely to fracture in service, providing guidance for the fabrication and operation of highly stressed structures, and for the development of physical models of fracture modes to be used in engineering design and safety analysis.