Book news

1. Mintek reports

The following reports are available from Mintek, Private Bag X3015, Randburg, 2125 South Africa. They are available at R25 (plus R3,25 GST) per copy to South African addressees, and US$25 per copy (including airmail postage) to addressees elsewhere.

There is also an annual-subscription scheme for reports —R400 locally (plus R52 GST) and US$400 (including airmail postage) abroad. The subscription covers all the unrestricted reports published between 1st April and 31st March of successive years, which usually amount to between 20 and 30.

Report M91D

A mineralogical investigation of samples from the Renosterkop tin prospect near Upington, by M.J. Southwood. First issued Jul. 1983, reissued May 1989. 16 pp.

Cassiterite mineralization at Renosterkop is confined to a small outlier of biotite-rich metaquartzite within Namaqualand pink gneiss. The median grain size of the cassiterite is 80 μm; from a mineralogical point of view, its liberation should present no problems.

The metaquartzite and the pink gneiss are of metasedimentary origin, probably derived from the denudation of an ancient stanniferous granite. The mineralization is hydrothermal. Tin was leached from the pink gneiss biotite, probably as alkali–oxyfluorostannate complexes. The ore-bearing solutions migrated upwards into the metaquartzite, with which they re-equilibrated. The resulting physicochemical changes led to the formation and precipitation of the cassiterite. Topaz and fluorite are the principal gangue minerals. A similar origin is envisaged for the minor quantities of associated copper–zinc sulphide mineralization.

Report M256D

The upgrading of Mamatwan manganese ores by heavy-medium separation, by P.W. Overbeek. First issued Apr. 1986, reissued May 1989.

An account is given of the attempted production of concentrates of high hausmannite content and assaying at least 44 per cent manganese by means of heavy-medium separation.

The washability of the ore was determined by various techniques, including the use of tetra-bromo-ethane and ferrosilicon suspensions, but consistent results could not be obtained. Heavy-medium separation tests on fines smaller than 6,0 mm showed that the production of the required grade of concentrate at recoveries in excess of 40 per cent of the manganese content of the feed was possible. Heavy-medium separation tests on run-of-mine ore that had been crushed to various sizes gave improved recoveries of manganese with an optimum ore feed size of 10,0 mm.

Confirmatory tests on ore crushed to various sizes, with only a single stage of concentration, gave similar results, and manganese recoveries of up to 60 per cent were obtained at the required grade of concentrate.

The treatment by conventional gravity-concentration techniques of fines smaller than 0,6 mm was not successful.

Report M299D

A mineralogical investigation of samples from the Eenzaamheid cobalt–molybdenum deposit, by C.D. de Nooy. First issued Jan. 1987; reissued May 1989.

The cobalt–molybdenum deposit on the farm Eenzaamheid, near Balmoral, is situated in gabbroic dykes in the highly altered quartzites and shales of the Pretoria beds in the Transvaal Supergroup. The mineralogy of both unmineralized and mineralized samples from the deposit was studied.

The main minerals in the host rock are tremolite, albite, quartz, and prehnite. Safflorite and molybdenite are the main ore minerals, with minor cobaltite, niccolite, and gersdorffite. The mineralization is associated with quartz- and albite-rich host rocks, whereas the tremolite- and albite-rich rocks are usually unmineralized. A cobalt content of 1,76 per cent and a molybdenum content of 0,20 per cent were determined by the chemical analysis of a representative sample.

Owing to the coarse-grained and interstitial nature of the ore minerals, the ore should be free milling, and liberation is expected at a fairly coarse grain size (about 0,5 mm). The cobalt minerals and the molybdenite should be easily concentrated by gravity methods and flotation methods respectively.

Report M301D

The evaluation of manganese metal powder by automatic image analysis, by E.J. Oosthuyzen. First issued Feb. 1987, reissued May 1989. 13 pp.

The Manganese Metal Company (Pty) Ltd exports electrolytically produced manganese metal to the USA, where it is used in the production of special alloys. Oxide layering, which occurs on some of the particles, is detrimental to the alloying process, and the extent of this contamination is determined at a laboratory in the USA as a quality-control parameter. Software, which allows this powder to be evaluated independently, has been developed for the image analyser at Mintek. The method involves the measurement of a number of attributes of the oxide layering.

The results obtained are compared with those of the US laboratory, and the reliability of the method used at the latter is shown to be questionable under certain circumstances, despite significant correlations between the two sets of values. In addition, a microscopic method that is simpler and more direct than the method used by the US laboratory is recommended.

Report M311D

Mineralogical and beneficiation studies of ore from Lutzputz, by R.N. Guest and C.T. Logan. First issued Mar. 1987, reissued May 1989. 13 pp.

Samples of ore from the southern and northern areas of the Lutzputz deposit were investigated mineralogically, and beneficiation tests for the recovery of copper, silver, and gold were carried out.

The Lutzputz deposit is considered to be of hydrothermal origin, and was formed, probably under amphibolite-facies conditions, on a major active shear zone. Samples

from the northern area contain more chalcopyrite, quartz, biotite, and chlorite, and less tetrahedrite and magnetite, than samples from the southern area.

Gold, which is present mainly in grains of electrum between 2 and 40 μm in diameter, which are almost invariably included in tetrahedrite or chalcopyrite, appears to occur in greater amounts in the samples from the southern area than in those from the northern area. Most of the silver occurs in tetrahedrite, which has an average silver content of 2 per cent, and copper is present in tetrahedrite and chalcopyrite in the southern area, and in these minerals and in enargite–luzonite in the northern area.

The mineralogical investigations indicated that the recovery of the major sulphide minerals should ensure high recoveries of gold and silver. However, the intimate intergrowth between gangue and sulphides in the samples from the southern area suggests that, even if the material were ground to finer than 75 μm, up to 10 per cent of the sulphides would be likely to remain locked in the gangue minerals.

Bench-scale tests showed that the ore from the southern area responds more favourably to flotation than that from the northern area. A combination of the two types of ore, in the ratio that could be mined, was floated successfully. A recovery of 80 per cent of the copper was obtained at a concentrate grade of 20 per cent. The recoveries of gold and silver in this concentrate were about 50 and 70 per cent respectively. This preliminary investigation indicates that it is likely that gold, silver, and copper could be recovered economically by the flotation of a mixture of the two types of ore.

Report M314D

The beneficiation of a sample of magnesiam calcrete, by L. Jonker. First issued Apr. 1987, reissued May 1989. 13 pp.

A sample of magnesian calcrete was found to contain 27 per cent amorphous silica and 23 per cent crystalline silica. Amorphous silica and dolomite are potentially valuable products, which are used as industrial fillers, and methods for the separation of three products—crystalline silica, amorphous silica, and dolomite—all in a very pure form, were therefore investigated.

The sample was initially treated by hammer milling and classification, and attrition milling and classification. The results were poor, the silica content of the smallest size fraction, less than 38 μm, being 16,7 per cent. Further classification to less than 5 μm reduced the silica content to 6,7 per cent, which is still unacceptably high. It was concluded that the silica is too finely divided for efficient separation by classification.

Flotation tests to separate the siliceous material from the dolomite were not successful, and more development will be needed to make flotation an economically viable procedure.

Wet milling followed by screening and hydrocyclone separation proved to be a very successful procedure for the production of a crystalline silica fraction and dolomite and amorphous silica in close association, although neither could be obtained in a pure form. However, the drying costs associated with a wet process are high, and the subsequent re-milling that is needed would also render the project uneconomic.

A dry process based on the same principles as the wet process was then developed in which the dolomite was milled with acetic acid as a grinding aid and classified into three products with a Vortec Air Classifier. The products were not as pure as was desired, but they are marketable as a filler for plastics and allied materials. This process is therefore economically viable.

Report M369

The determination, by flow-injection analysis, of thiocyanate, by E.A. Jones and M-J. Hennings. Jun. 1989. 7 pp.

A description is given of a flow-injection technique that is suitable for the determination of thiocyanate. The method uses a single carrier stream of nitric acid containing iron(III) nitrate. Thiocyanate reacts with the iron(III) to give intensely red-coloured complexes of iron(III) thiocyanate, which are determined spectrophotometrically at 480 nm. The method is applicable to solutions containing thiocyanate in the range 10 to 200 mg/l, and the relative standard deviation is 0,007 at the 100 mg/l level.

Report M389

A spectrophotometric method for the determination of zinc by flow-injection analysis, by D.E. Barnes and E.A. Jones. Jul. 1989. 15 pp.

The report describes the development of a simple and reliable method for the rapid determination of zinc in solutions from the resin-in-pulp process. The method is based on a flow-injection procedure with spectrophotometric detection. Large differences in the sample matrix, with particular reference to pH value and cyanide concentration, do not affect the method adversely. The samples are diluted by dialysis before being injected into the flow-injection manifold. The membrane of the dialysis unit is able to withstand strongly acidic and basic solutions such as are typical of hydrometallurgical plants. When use is made of two sample loops of different volumes in the injection valve, a large dynamic range can be covered. The working range of the method is 0,2 to 60 g of zinc per litre, and 40 determinations can be carried out in an hour. The relative standard deviation of the method is better than 0,02, and the results correspond well with the results obtained by atomic-absorption spectrometry. The method lends itself to automation because of its simplicity and the robust nature of its components.

The laboratory method is detailed in an appendix.

2. Recent publications

● *Pumps—principles and practice.* Available from K. Myles & Associates CC, P.O. Box 2212, Northcliff 2115. ≈ 200 pp. R99 including GST.

The book contains technical information compiled by leading authorities in the pumps and fluid-handling industries, and covers the basic fundamentals of pump operation and construction, with special reference to pump applications, components, and ancillary equipment.

It is a useful reference work for engineers involved in the design, construction, and operation of pumps and pumping systems in the mining, processing, food, petrochemical, civil, and agricultural industries.

● *Standard handbook of hazardous waste treatment and disposal*, edited by H.M. Freeman. Bergano Book Co., P.O. Box 190, Fairfield, CT 06430, USA. 1120 pp. US$130.

This volume presents state-of-the-art technology in hazardous-waste management, site cleanup, disposal, and treatment alternatives. It addresses the various types and categories of hazardous waste; the various technologies for waste treatment; and land disposal and remedial action. It covers all the new, approved sampling and analysis techniques, and special waste topics and issues.

● *Quality control handbook*, by J. Juran and F. Gryna Jr. Bergano Book Co. (address as above). 4th ed. 1536 pp. US$125.

This updated and revised edition offers, in ready reference form, the know-how developed in industry for achieving better quality at lower cost. New sections on quality, quality support operation, and service industries are included, along with discussions covering such other important areas as the economics and specification of quality; the organization, acceptance, assurance, and control of quality; statistical control methods; and policies and objectives.

● *Refractories in the manufacture and transport of pig iron.* Verlag Schmid GMBH, P.O. Box 6609, 7800 Freiburg, West Germany. DM 100.

This volume contains the complete papers of the International Colloquium on Refractories, which was held in Aachen in 1988.

● *The user-computer interface in process control*, by W.E. Gilmore, D.I. Gertman, and H.S. Blackman. London, Harcourt Brace Jovanovich Ltd, 1989. ≈ 312 pp. ≈ $29.

In modern process-control rooms, the operator's task is to monitor and control a complex and often hazardous process. This task is often accomplished by interacting with one or more CRT workstations. Unfortunately, the application of human-factors engineering principles and guidelines to the design of this new technology has all too often been inadequately addressed, or in some cases simply overlooked. The contents of this handbook were developed to furnish designers with essential guidelines that can be applied to the design of the interface between operator and CRT workstation, including the design, review, evaluation, and operational test of colour-graphics workstations for process control.

● *Aluminium alloys—contemporary research and applications*, edited by A.K. Vasudevan and R.D. Doherty. London, Harcourt Brace Jovanovich Ltd, 1989. ≈ 676 pp. ≈ £90.

This book discusses the structure and properties of current and potential aluminum alloys in terms of their structure (and structural transformations by new processing methods) and the relationship between structure and mechanical and other properties. The alternative materials that challenge aluminum are considered as well, since the challenge of new competitive materials is a strong influence on innovation. The book bridges the gap between current scientific understanding and engineering practice. It is an up-to-date reference that will be of use to researchers and advanced students in metallurgy and materials engineering.

3. TMS publications issued recently

The following publications are available from The Minerals, Metals & Materials Society, 420 Commonwealth Drive, Warrendale, PA 15086, USA (Telephone: (412) 776-9000, Telex: 9103809397, Fax: 4127763770).

● *Advances in magnesium alloys and composites*, by H. Paris and W.H. Hunt (eds.). 145 pp. $65.

The current development of magnesium alloys is detailed in this volume, as well as key technological barriers and challenges facing researchers in the future. State-of-the-art papers review magnesium alloys and their applications, and focus on topics such as corrosion, principles of alloy design, new ingot magnesium-alloy development, and the physical metallurgy and properties of RSP alloys and composites.

This volume is an excellent reference for researchers in the aerospace, automotive, light metals and composites industries.

● *Arsenic metallurgy—fundamentals and applications*, by R. Reddy (ed.). 515 pp. $104.

During the past decade, a number of technological advances have been made in the processing of ores containing arsenic; also, in disposing of arsenic by environmentally acceptable methods. Potential use of arsenic as an industrial metal has grown, especially in the semiconductor industry. This publication focuses on the research needs and industrial developments of arsenic metallurgy.

● *Casting of near net shape products*, by Y. Sahai (ed.). 700 pp. $155.

By focusing on both the practical and theoretical aspects of the major casting technologies for the production of ferrous and non-ferrous sheet-like products, this volume is a useful reference for researchers in this area.

● *Continuous casting of non-ferrous metals and alloys*, by H.D. Merchant, D.E. Tyler, and E.H. Chia (eds.). 360 pp. $90.

This volume reports on recent developments in non-ferrous casting that have led to dramatic improvements in product quality and productivity: 18 papers examine technological advances in the continuous casting of non-ferrous slab, strip, bar, and ribbon. Special emphasis is given to innovative techniques, theoretical analysis, metallurgical characterization, and structure–property relationships.

● *Dislocations and interfaces in semiconductors*, by K. Rajan, D. Ast, and J. Narayan (eds.). 210 pp. $75.

This reference work provides a co-ordinated materials-science perspective of interfaces in semiconductors, with particular emphasis on the role of defects at these interfaces. 30 papers offer experimental and theoretical viewpoints on a variety of topics in the areas of materials fabrication, processing, and properties.