Book news

1. Book review

● *Respiratory protection – principles and applications* by B. Ballantyne and P. H. Schwabe (Editors). London, Chapman Hall, 1981.

(Reviewer: M. J. Martinson)

In the past decade, stringent legislation concerning occupational health and safety has been enacted in several First World countries and jurisdictions, and this trend has in turn stimulated the publication of an extensive literature on various aspects of work-related hazards. This book deals with the use of personal protective devices – notably respirators – to protect the wearer's respiratory system from harmful agents in the surrounding atmosphere, and as such seems to fill an apparent lacuna in the literature.

The book consists of 20 chapters contributed by an array of 23 specialist authors, and is subdivided into three main sections: basic principles (6 chapters), design and manufacture (8), and applications (6). Dr Ballantyne, the senior editor, has American affiliations, but his co-editor and all the other contributors are affiliated to British firms and institutions. A symposium held by three British institutions, in which most of the contributors participated, is said to have provided the stimulus for publishing the work.

The first section (basic principles) provides an admirable review of the biological effects associated with the inhalation of harmful agents, in which the chapter by C. N. Davies on the deposition and distribution in the lungs of inhaled particles can be singled out for special mention. Part 2 (design and manufacture) contains a useful review of design desiderata, but the chapters on advances in the engineering design and manufacture of respirators are perhaps somewhat parochial. In part 3 (applications) the chapter by R. M. Howie and W. H. Walton on practical aspects of the use of respirators in the British coal-mining industry contains a realistic review of the problems associated with the use of dust respirators in mines, and the authors' statement in the final paragraph of the chapter is equally applicable to South African mines:

> However, we believe that respirators can make a significant contribution to reducing risks to the health of miners, especially where dust conditions are 'difficult' and that their use in such circumstances could with advantage be more actively promoted. The present varied pattern of usage, bearing little relation to dust conditions or pneumoconiosis statistics, supports this view.

The corresponding chapter on the use of respirators in the asbestos industry is too closely linked to the relevant British regulations to be useful under South African conditions, but on the other hand the chapters on military respirators and inhalation hazards of fires contain material that might be of interest to South African mining engineers.

Curiously, the book does not include a chapter on the testing of respirators, but otherwise it can in general be recommended as a useful addition to the library of, say, a mine environmental control department.

2. New manual

● *Swedish steel manual, 1981.* Available from Jernkontoret, P.O. Box 1721, S–111 87 Stockholm, Sweden. SEK 85.

The 116-page manual (in English) accounts for the origin and development of the Swedish steel industry, present structure, production methods, exports, research and development of new products. The main institutions in the industry are also indicated. The various companies are given, with data on products, plants, turnover, capacity, number of employees, etc.

3. Publications of the Mineral Policy and Energy Sectors, Canada

The following reviews of the activity and developments during 1979 in respect of the chief minerals produced or consumed in Canada are now available. Prepared by members of the Mineral Policy and Energy Sectors staff, they are for sale at $1,00 per copy. Requests for copies should be addressed to Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada K1A 089.

- General review by L. Tibbo. 10 pp.
- Columbium (niobium) and tantalum by D. G. Fong. 6 pp.
- Sulphur by B. W. Boyd. 13 pp.
- Statistical summary of the mineral industry in Canada. 66 tables.
- Uranium by R. M. Williams. 16 pp.

4. Mintek reports

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

● **Report 2126**

The determination, by microwave techniques, of the interface between pulp and froth.

This report describes the application of time-domain reflectometry and a baseband-pulse technique to the determination of the position of the froth–pulp interface in a flotation cell. Details of the design are given, and a prototype is used to show the feasibility of the system on a plant.

● **Report 2129**

An electrode controller for submerged-arc furnaces.

The electrode controller is a new type of machine that controls the movement of the electrodes and the tap changers of the transformers on a submerged-arc furnace. The prototype unit of this electrode controller has been in operation on the no. 4 furnace at Ferrometals Ltd for some time with remarkable success.

This unit is more complex than the conventional type of electrode controller and is specifically designed to overcome many of the problems that are inherent in the use of conventional controllers.

The major part of the machine in terms of functionality

is a microcomputer, which is located inside the unit, and its hardware is based on a well-known range of commercially available hardware. The software (including the macro-assembler required to convert this software into machine code) and the operating system were developed entirely at Mintek since the software aids now commonly obtainable were not available when this machine was being built.

This report describes the development of the prototype of this new controller. Various aspects are covered, including the history of the project and discussion of the problems encountered with existing controllers, the development of the algorithm, the hardware, and the software of the prototype unit, its eventual implementation on the furnace, and finally the evaluation of its performance.

● **Report 2131**

The separation of trace elements in manganese dioxide.

Separations from manganese are described for

(*a*) Al(III), Mo(VI), and Ti(IV), and

(*b*) trace elements in general.

In the first separation, a combined anion–cation exchange, the oxalate complexes are adsorbed onto the anionic BIO.RAD 1-X8 resin. V(V) and Al(III) are then eluted into a cation-exchange column from which they are eluted successively, Mo(VI) and Ti(IV) than being eluted from the anionic resin. In the second separation, up to 2 g of manganese is adsorbed onto BIO.RAD AG 50W-X8 resin, from which V(V) is eluted with dilute hydrochloric acid prior to the elution of Co(II), Cu(II), Zn(II), Cd(II), Fe(III), Fe(III), As(III), Sb(III), Mo(VI) W(VI), and Sn(II) with a mixture of 1 M hydrochloric acid, 80 per cent acetone, and 0,1 per cent hydrogen peroxide. Mn(II) is eluted next with a mixture of 0,75 M hydrochloric acid and 90 per cent acetone, after which the remaining cations are eluted with 4 M hydrochloric acid. Satisfactory recoveries ranging from 0,8 to 60 mg/l were obtained for 18 of the 21 elements tested.

After concentration by evaporation, final measurements were made by the use of atomic-absorption spectrophotometry, or direct-reading spectrometry with excitation from an inductively coupled plasma source. Comparative results were obtained with atomic-absorption procedures where the manganese was not separated. However, the separation procedure can reduce the time required for analysis by the direct method because it limits the number of dilutions necessary and eliminates the need for the use of the method of additions to compensate for interferences from manganese.

● **Report 2132**

The assessment of pellicular anion-exchange resins for the determination of anions by ion chromatography.

Because pellicular anion-exchange resins suitable for the determination, by ion chromatography, of anions with alkaline eluents were unavailable in South Africa at the inception of this work, an attempt was made to prepare such resins. In this study it is shown that the pellicular resins produced are more efficient than the surface-aminated resins used previously. The simultaneous separation and determination of five common anions is demonstrated. The method was applied to the analysis of uranium leach liquors, effluent samples, and a solid sample of ferric oxide (goethite).

● **Report M2**

The preparation of two reference materials of South African fluorspar.

This report describes the preparation of two South African fluorspars as international reference materials. The procedure for the selection of preferred values is outlined. Fourteen laboratories contributed to the analytical programme. One material has been assigned only one preferred value, whereas the other has been assigned five.

● **Report M3**

The platinum-group minerals in the UG-2 Layer of the Bushveld Complex at Maandagshoek 254KT.

An investigation of the platinum-group minerals and associated base-metal sulphides in a UG-2 core from a borehole that had been drilled near a dunite pipe at Maandagshoek 254KT showed that the platinum-group mineral species are represented mainly by intermetalloids. This mineral association differs from that of the normal types of platinum-group minerals found at other localities in the western and eastern Bushveld Complex, where the platinum-group minerals occur mainly in the form of sulphides. A study was therefore made of the platinum-group minerals in two additional UG-2 cores obtained from boreholes at some distance from the dunite pipe.

The principal platinum-group minerals found in the two 'normal' UG-2 cores from Maandagshoek 254KT are braggite, laurite, cooperite; an unnamed sulphide of platinum, rhodium, copper, and iridium or cobalt; and a few alloys (platinum–iron and palladium–lead). The discrete grains of the platinum-group minerals vary in size from less than 1 to about 44 μm, and occur along grain boundaries, in association with base-metal sulphides, in chromite, and in silicate gangue. The major base-metal sulphides, with a maximum grain size of 450 μm in the two cores investigated, are pentlandite, pyrrhotite, chalcopyrite, and pyrite. The grain sizes of the base-metal sulphides increase from the bottom to the top through the UG-2 Layer.

A comparison between the platinum-group minerals as observed in polished sections and the recoveries obtained by flotation shows that there are probably factors other than the modes of occurrence of the platinum-group minerals and base-metal sulphides that may affect the liberation and recovery of the noble metals.

Finally, it appears that the types of platinum-group minerals and base-metal sulphides in the UG-2 Layer at some distance from the dunite ore-bodies at Maandagshoek are similar to others found in the UG-2 Layer at other localities within the Bushveld Complex. The intrusion of these pipes resulted in an alteration of the original mineralogy in their vicinities and the formation of new associations.