

# Book news

## 1. USSR co-operation

*International Mining*, the London-based publication, has received USSR Government approval to publish a Russian language edition for circulation in the Soviet Union. The agreement forms part of a programme of co-operation between *International Mining* and the USSR technical journal *UGOL (COAL)*.

Representatives of *International Mining* and Quarto International Ltd, the magazine's publisher, travelled to Moscow in July to discuss a comprehensive technical and information exchange programme with the USSR mining industry. Talks were carried out with the three principle mining ministries: coal, non-ferrous, and iron. At the same time, *International Mining* signed a letter of intent to develop a similar programme with the ferrous and non-ferrous mining industries in co-operation with the *Gorny Zhurnal*, which is the USSR's leading publication on metal mining.

The programme is one of the first of its kind. As well as the Russian language edition, it includes the increase of *International Mining*'s circulation to USSR specialists, the regular exchange of technical information, and the preparation of articles by authors from the Soviet mining industry for publication in *International Mining*. *International Mining* will also publish a special edition focusing on the mining industry of the USSR.

The address of the London journal is as follows:

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## 2. Mintek publications

● *Special Publication* no. 11. World chromite resources and ferrochromium production, by M.H. Silk. 1988. 160 pp. South Africa R100 including postage; elsewhere US\$100 including postage.

● Chromite ore was discovered in the Ural Mountains of Russia during 1798–1799, shortly after Nicolas-Louis Vauquelin had isolated chromium metal from a mineral named crocoite (lead chromate).

● Chromite occurs widely throughout the continents of the earth and beneath the oceans. It is a member of the spinel family and has the ideal composition  $\text{FeO} \cdot \text{Cr}_2\text{O}_3$ , but it is seldom found in a pure state. Chromite is the basic raw material required by all sectors of the world's chromium industry.

● Chromite deposits are of two distinct types. In the Alpine or podiform variety, the ore occurs as lenses or strata enclosed in serpentine. In other deposits, such as the Stillwater Complex of Montana, USA, the Great Dyke of Zimbabwe, the Dufek Layered Intrusion of Antarctica, and the Bushveld Complex of South Africa, the chromite occurs in seams surrounded by mafic or ultramafic rocks that crystallized from magma intruded from the mantle of the earth.

● The USA was the world's leading producer of chromite until the mid 1800s, when it was superseded by Turkey. Since that time, large deposits have been discovered and exploited in various parts of the world, and today the USSR and South Africa are the most important producers. Some 21 countries rank among the world's major suppliers of chromite, and the strategic disposition of these resources has become a matter of vital concern to the non-Communist nations.

● Ferrochromium is produced by the smelting of chromite with carbon or silicon, and is a vital ingredient in the manufacture of stainless steel. Some chromite-producing countries manufacture ferrochromium for export, or for local use in the production of stainless steel, while other nations import chromite ore and convert it to ferrochromium as a means of earning foreign exchange.

● This publication traces the history of chromite discoveries from 1798 onwards, and describes the current situation in regard to chromite and ferrochromium production in each of the important nations involved in the world's chromium industry.

The following reports are available at R25 per copy to South African addresses and US\$25 to overseas destinations.

### ● Application Report 4

*The development and implementation of novel refining processes for the platinum-group metals (including the refining of anode slimes)*. 1988. 16 pp.

This report reviews the extensive programme of research and development conducted by Mintek, starting in 1967, to develop an indigenous South African base of technology on the refining of platinum-group metals.

The significant role played by the Analytical Science Division in developing analytical techniques suitable for the full spectrum of analyses from ores to pure metals in the parts-per-million to four-nines range is outlined.

The reasons for developing an unconventional refining route are given, and the major preparation and separation stages are described briefly.

A separate section of the report deals with the work done in the development of processes for the treatment of two different anode slimes.

The transfer of the technology is discussed, and the costs of the whole technical thrust are given, together with an outline of the benefits that have accrued to South Africa as a result of the work.

### ● Report M249D

*The acid activation of local clays including solid-liquid separation*, by P.M. Cole and G.F. Lahoud. First issued Mar. 1986, reissued Apr. 1988. 46 pp.

This report describes tests aimed at the acid activation of local bentonite clay in which a number of solid-liquid separation operations (vacuum and pressure filtration, centrifuging, and sedimentation) were investigated on a laboratory scale so that the most suitable equipment for solid-liquid separation could be selected and the consumption of wash water could be reduced by counter-

current washing.

It was found that, after 6 hours of leaching in aqueous sulphuric acid at a pressure of 400 kPa and a temperature of 120°C, unmilled bentonite was activated to a degree comparable with that of a standard activated clay.

The results obtained in this work indicate the most suitable type, dosage, and concentration of flocculant, and the best filter cloth and cake thickness for the various operations. Filter duties, moisture contents, and solid losses are given, and the consumption of wash water for displacement washing is compared with that for counter-current washing. It is shown that, with the aid of a simple washing-loss curve obtained from a single-stage batch experiment, one can accurately predict countercurrent-washing performance. Finally, a comparison is made of all the solid-liquid separation operations examined, which enables one to select the most suitable piece of equipment for specific plant requirements.

#### ● Report M250D

*The production of refined ferromanganese in a transferred-arc plasma furnace*, by A.F.S. Schoukens and M. Ford. First issued Mar. 1986; reissued Apr. 1988. 23 pp.

This report describes experimental work on the production and refining of medium-carbon ferromanganese in a d.c. transferred-arc plasma furnace.

Medium-carbon ferromanganese was produced by the simultaneous reaction of silicomanganese, manganese ore, burnt lime, and clay. The metals produced contained less than 1,5 per cent silicon and about 1,5 per cent carbon, and the manganese oxide level in the slag was below 25 per cent. The overall recovery of manganese was 95 per cent, while about 55 per cent of the manganese could be extracted from the ore.

A low-silicon medium-carbon ferromanganese (refined ferromanganese) was produced by the reaction of standard-grade medium-carbon ferromanganese with different manganese ores. Refining was achieved by the reduction of the silicon from 1,1 and 1,6 per cent in the initial metal samples to between 0,12 and 0,22 per cent in the processed metals.

#### ● Report M257D

*Extraction of gold from eastern Transvaal concentrates by roasting and cyanidation*, by J.J. Robinson. First issued Apr. 1986; reissued Apr. 1988. 55 pp.

Many of the sulphidic ores from the eastern Transvaal are refractory with respect to the extraction of their gold. In some cases this is due to the presence of graphitic carbonaceous material, which complicates the recovery of gold by virtue of its adsorption activity.

As part of a broad investigation into the methods of treatment for refractory ores, their mineralogy, and the extraction of their gold, the roasting characteristics of three concentrates from the Barberton area were examined.

Examination by electron microprobe and scanning electron microscopy showed that the gold in the concentrates occurred mostly in two forms: in very fine gold particles distributed within the arsenopyrite, and in a slightly coarser form loosely associated with the pyrite.

Direct cyanidation of the concentrates yielded gold ex-

tractions of from 16 to 30 per cent. After the concentrates had been roasted at temperatures of 650 to 700°C for 20 minutes with rabbling, cyanide extractions of gold varying from 86 per cent to over 90 per cent were obtained for different concentrates.

Microscopic examination of the residues after cyanidation indicated that gold was present as fine grains (limit of detection 0,02  $\mu\text{m}$ ) either at the ends of pores in solid particles, or in the pore walls or solid matrix of particles. These observations suggest that the undissolved gold escaped contact with the cyanide solution owing to its encapsulation by other minerals.

#### ● Report M267D

*The recovery of gold from backfill by gravity separation*, by R.N. Guest. First issued Jun. 1986; reissued Apr. 1988. 18 pp.

Gravity-separation tests on backfill material finer than 1 mm showed that up to 60 per cent of the gold could be recovered in a spiral concentrate of 20 per cent by mass of the feed. The highest recovery was obtained at a pulp density of 30 per cent solids. The use of a thicker pulp, containing 50 per cent solids, decreased the gold recovery by about 5 per cent. Treatment of deslimed material on the spiral did not increase the recovery.

A further 8 per cent of the gold was recovered from the material coarser than 1 mm crushed to finer than 600  $\mu\text{m}$  and upgraded on the spiral. Because this coarse material improves the stability of the backfill, it is suggested that it could be jigged in an attempt to recover some gold without reducing its particle size.

In January 1986, the capital cost of a plant to treat rod-mill discharge at a rate of 15 t/h was about R30 000, excluding tax and installation costs. The operating costs would be minimal.

#### ● Report M285D

*Autogenous milling of kimberlite*, by D.I. Hoyer. First issued Oct. 1986; reissued Apr. 1988. 11 pp.

Following the proposal that the crushing and scrubbing stages in the processing of kimberlite could be replaced by single-stage run-of-mine milling, a project was constructed to determine the autogenous milling characteristics of a sample of kimberlite from Orapa. Tests showed that the kimberlite formed into a competent grinding medium, well suited to autogenous milling.

Mintek's pilot test mill was fitted with 25 mm discharge grates, and was run in open circuit. The material larger than 1,7 mm was accepted as the final product, and the fines were rejected. The rejection ratio for material smaller than 1,7 mm was 89 per cent, and the energy consumed in the milling process was 7,8 kW·h per ton of total throughput. Examination of rounded pebbles from the mill load showed that about 83 per cent of the pebbles in the load were barren meta-granite. Tests showed that the pebbles would remain competent (i.e. they would not shatter) on scale-up to large-diameter mills.

A preliminary design for a production mill that could handle 100 t/h is given as an example of the design method, and some ideas are proposed for modifications to increase the throughput of the mill.