

CANMET

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for Mineral
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Technology

Centre canadien
de la technologie
des minéraux
et de l'énergie

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CATALOGUE OF CANMET PUBLICATIONS 1980/81

MINERALS AND ENERGY RESEARCH PROGRAMS
TECHNOLOGY INFORMATION DIVISION

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CATALOGUE OF CANMET PUBLICATIONS 1980/81

Publications and papers published or presented by
CANMET scientific and technical staff in 1980/81.

Compiled and edited by J.L. Metz
French translation by J. Collins-DeCotret

MINERALS AND ENERGY RESEARCH PROGRAMS
TECHNOLOGY INFORMATION DIVISION

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FOREWORD

This publication contains a comprehensive listing of various reports prepared by CANMET research and professional staff during, and in some cases before, 1980/81. Also included are research reports prepared by outside agencies under contract.

Section 1 provides titles and abstracts of reports prepared under the CANMET Report series. These are based primarily on fundamental or applied research conducted by or on behalf of CANMET and are intended for sale and general distribution.

Section 2 lists titles and abstracts of reports prepared as journal submissions and subsequently published in outside journals or periodicals.

Section 3 contains titles and abstracts of papers prepared for oral presentation to outside conferences and symposia and in some cases for publication in proceedings.

Section 4 lists divisional investigation and technical reports as well as literature surveys (including bibliographies and translations). Investigation reports describe the application of established procedures to problems submitted by individuals, industry or agencies outside CANMET. Technical reports describe results of a series of analytical determinations, test procedures, etc., along with interpretations and conclusions.

Section 5 contains titles of reports prepared by private research agencies under contract to CANMET describing studies on national mineral resources and energy supply and technology.

Section 6 covers reports describing research conducted by outside agencies supported financially by CANMET.

James E. Kanasy,
Chief,
Technology Information Division

CONTENTS

| | <u>Page</u> |
|--|-------------|
| FOREWORD | i |
| SECTION 1 - CANMET REPORTS | 1 |
| SECTION 2 - JOURNAL PUBLICATIONS | 5 |
| Mineral Sciences Laboratories | 5 |
| Energy Research Laboratories | 9 |
| Physical Metallurgy Research Laboratories | 10 |
| Mining Research Laboratories | 12 |
| Energy Research Program | 12 |
| Technology Information Division | 12 |
| SECTION 3 - ORAL PRESENTATIONS | 13 |
| Mineral Sciences Laboratories | 13 |
| Energy Research Laboratories | 16 |
| Physical Metallurgy Research Laboratories | 18 |
| Mining Research Laboratories | 19 |
| SECTION 4 - DIVISIONAL REPORTS | 21 |
| Mineral Sciences Laboratories | 21 |
| Investigation Reports | 21 |
| Technical Reports | 22 |
| Literature Translations and | |
| Literature Surveys | 23 |
| Energy Research Laboratories | 23 |
| Investigation Reports | 23 |
| Technical Reports | 23 |
| Physical Metallurgy Research Laboratories | 24 |
| Investigation Reports | 24 |
| Technical Reports | 24 |
| Mining Research Laboratories | 25 |
| Technical Reports | 25 |
| Energy Research Program | 28 |
| Technical Reports | 28 |
| Technology Information Division | 29 |
| Literature Surveys | 29 |
| SECTION 5 - CONTRACT RESEARCH REPORTS | 31 |
| SECTION 6 - RESEARCH AGREEMENT PROGRAM REPORTS | 35 |
| INDEX | 37 |

SECTION 1

CANMET REPORTS

The reports listed below are available at prices indicated from either Printing and Publishing, Supply and Services Canada, Ottawa, K1A 0S9 or CANMET Publication Sales and Distribution, Energy, Mines and Resources Canada, 555 Booth Street, Ottawa, K1A 0G1. Microfiche copies may be obtained from Micro-media Limited, Box 502, Station S, Toronto, Canada, M5M 4L8.

001

CANMET REPORT 79-23. Skeaff, J.M., Bale, C.W., Pelton, A.D. and Thompson, W.T. "Selection of ternary fused chlorides for the electrowinning of lead and zinc based on calculated thermodynamic properties"

Phase diagrams and base metal chloride iso-activity curves in the ternary fused salt systems LiCl-KCl-PbCl_2 , NaCl-KCl-PbCl_2 , LiCl-KCl-ZnCl_2 and NaCl-KCl-ZnCl_2 have been calculated by analytical techniques from the known thermodynamic properties of the appropriate binary systems. For the two ternary PbCl_2 systems, the calculated and experimentally measured phase diagrams were in agreement within experimental error; for the two ZnCl_2 systems the measured phase diagrams were in such serious error that the calculated phase diagrams are preferred. Temperatures and compositions of chloride electrolytes suitable for electrowinning lead and zinc are proposed from the iso-thermal sections of the phase diagrams and from iso-vapour pressure curves.

Cat. No. M38-13/79-23E - 44 p
Canada \$3.25; other countries \$3.90

002

CANMET REPORT 79-26. Misener, D.C. "Summaries of CANMET research contracts 1978-79"

Summaries are provided of research undertaken by outside agencies under contract to CANMET. CANMET R & D is organized in a program-activity structure under an Energy Research Program and a Minerals Research Program. Information is provided according to this structure.

Cat. No. M38-13/79-26 - 85 p
Canada \$4.95; other countries \$5.95

003

CANMET REPORT 79-35. Abbey, Sydney "Reference materials - Rock samples SY-2, SY-3, MRG-1"

Two samples of syenite and one of gabbro were prepared as reference materials. Analytical data on the composition of the rock samples were reported for more than 100 laboratories from around the world. Analytical methods are described and procedures for deriving assigned values are detailed for both major and minor elements and for some of the more common trace elements.

Cat. No. M38-13/79-35E - 66 p
Canada \$4.00; other countries \$4.80

004

CANMET REPORT 79-36. Gransden, J.F., Price, J.T. and Leeder, W.R. "Cokemaking with Canadian medium- and high-volatile commercial coking coals"

Results and discussion are provided from an investigation into the quality of coke obtained from Western coking coals and from blends of Western and Eastern Canadian coking coals. Blending low-ash, high-sulphur Eastern coals with high-ash, low-sulphur Western coals produced cokes with chemical and physical properties suitable for the blast furnace.

Cat. No. M38-13/79-36 - 29 p
Canada \$2.25; other countries \$2.70

005

CANMET REPORT 79-39. Friedrich, F.D. "Fluidized bed combustion - An emerging technology"

Fluidized-bed combustion is identified as one of the most promising new technologies which has reached commercial demonstration in small sizes. The process, its advantages, disadvantages and potential applications are described. Current state-of-the-art is summarized and objectives and status of the federal fluidized-combustion demonstration program is reviewed.

Cat. No. M38-13/79-39 - 10 p
Canada \$2.00; other countries \$2.40

006

CANMET REPORT 79-40. Price, J.T. and Leeder, W.R. "Comparison of coke produced in different CANMET coke ovens - Part 2"

Results are compared from tests made in three different pilot-scale coke ovens to assess coking characteristics of coal. Each oven differs in construction and operates under different conditions. Two of the ovens at Ottawa had coking chambers of 310 mm and 460 mm and one at Edmonton of 310 mm. Coke ASTM hardness factor, apparent specific gravity, mean size, and coking pressure were similar for the Ottawa and Edmonton 310-mm ovens but differed systematically for the 460-mm oven. Coke yield was similar for the Edmonton 310-mm and the Ottawa 460-mm ovens, but was slightly higher in the Ottawa 310-mm oven.

Cat. No. M38-13/79-40 - 12 p
Canada \$2.00; other countries \$2.40

007

CANMET REPORT 79-41. "Catalogue of CANMET publications 1978/79" (English and French)

A compilation is presented of publications and papers prepared by CANMET scientific and technical staff during 1978/79. Titles and abstracts of the CANMET Report series and papers for publication in outside periodicals or for presentation at conferences are given. Divisional investigation, technical and declassified report titles as well as those prepared by private research agencies under contract to and through financial grants by CANMET are provided.

Cat. No. M38-13/79-41 - 133 p
Canada \$18.50; other countries \$22.20

008

CANMET REPORT 80-1. Green, D.J. and Wheat, T.A. "Sodium beta- and beta"-alumina ceramics: Powder preparation"

To develop ionically conducting materials for potential use in energy storage and conversion systems, powders of sodium beta/beta"-alumina were prepared by solution spray freezing-freeze drying and solution spray drying techniques. After drying, powders were in the form of spheres with their physical structure depending on the drying process. The powders were found to have high surface areas after decomposition and to form a mixture of the beta and beta" phases at ~1250°C. During calcination the powders tend to agglomerate but the spherical nature of the dried powder still persists. The calcined spheres were found to be complex aggregates of very fine crystals. The powders were shown to be prone to sodium loss at temperatures above ~1300°C.

Cat. No. M38-13/80-1E - 43 p
Canada \$2.95; other countries \$3.55

009

CANMET REPORT 80-3E. Soles, James A. "Petrography in the evaluation of aggregates and concrete"

This paper briefly reviews petrographic and related test procedures used to study aggregates and concrete, summarizes conditions and reaction processes which may cause their deterioration, describes characteristic features of known reactions, and discusses the problems faced and techniques employed to inhibit deterioration of concrete structures in various environments.

Cat. No. M38-13/80-3E - 14 p
Canada \$2.00; other countries \$2.40

010

CANMET REPORT 80-5E. Wilson, H.S. "Assessment of an expanded clay lightweight aggregate in structural concrete"

Results are given of an assessment of the physical and mechanical properties and durability of an expanded clay lightweight aggregate according to ASTM specifications. It was found that concrete containing this lightweight aggregate should not be exposed to freezing and thawing because of its poor durability.

Cat. No. M38-13/80-5E - 11 p
Canada \$1.50; other countries \$1.80

011

CANMET REPORT 80-6E. Steger, H.F. "Certified reference materials"

This catalogue describes the certified and provisional reference materials that may be purchased from CANMET through the coordinator of the Canadian Certified Reference Materials Project (CCRMP). Where possible, source, chemical composition, recommended values of the certified elements, and price are given for each available material.

Cat. No. M38-13/80-6E - 30 p
Canada \$2.25; other countries \$2.70

012

CANMET REPORT 80-7E. Quon, D.H.H. and Bell, K.E. "Release of lead from typical Canadian pottery glaze formulation"

This report describes the results of a study to assess the instability of typical Canadian pottery glazes under conditions simulating domestic use. Initial leach tests of three base glazes prepared from four commercially available frits showed that the lead release from these glazes was very sensitive to compositional variation.

Cat. No. M38-13/80-7E - 17 p
Canada \$1.75; other countries \$2.10

013

CANMET REPORT 80-8. Blouin, A. "Metals terminology/La terminologie des métaux"

An English-French glossary containing some 30 000 terms relating to physical metallurgy was compiled from such sources as dictionaries, glossaries, reference and text books and other industry-related literature to meet the need for a comprehensive reference and source of information made urgent by the current national emphasis on bilingualism and the requirement to disseminate information in both official languages. Researchers, writers, editors, translators and others involved in metallurgy will benefit from this essential reference source.

Cat. No. M38-13/80-8 - 625 p
Canada \$24.95; other countries \$29.95

014

CANMET REPORT 80-9E. Steger, H.F. and Bowman, W.S. "SU-1a: A certified nickel-copper-cobalt reference ore"

A 332-kg sample of nickel-copper-cobalt ore, SU-1a, from the Sudbury region, Ontario, was prepared as a compositional reference material to replace the similar certified ore, SU-1, of which the stock was exhausted. Based on a statistical analysis of contributed data the following recommended values were assigned: Ni - 1.233%; Cu - 0.967%; Co - 0.041%; Pt - 0.41 µg/g; Pd - 0.37 µg/g; and Ag - 4.3 µg/g. Values are reported for gold, iridium, rhodium, osmium and ruthenium.

Cat. No. M38-13/80-9E - 25 p
Canada \$1.95; other countries \$2.35

015

CANMET REPORT 80-10E. Steger, H.F. and Bowman, W.S. "DL-1a: A certified uranium-thorium reference ore"

A 338-kg sample of uranium-thorium ore, DL-1a from Elliot Lake, Ontario, was prepared as a compositional reference material to replace the similar certified ore, DL-1, of which the stock was exhausted. A statistical analysis of contrib-

uted data gives a recommended value of $0.0116 \pm 0.0003\%$ for uranium and $0.0076 \pm 0.0004\%$ for thorium. Information is also presented on the state of secular equilibrium of DL-1a and on its Ra-226 content.

Cat. No. M38-13/80-10E - 15 p

Canada \$1.50; other countries \$1.80

016

CANMET REPORT 80-11E. Winer, A.A. and Wang, S.B. "Mineral insulation - A critical study"

This report describes a project to produce mineral insulation which was successfully done on an experimental scale at CANMET. The various furnaces used in producing mineral wool are illustrated in detail.

Cat. No. M38-13/80-11E - 25 p

Canada \$2.00; other countries \$2.40

017

CANMET REPORT 80-12E. Collings, R.K. "Mineral waste resources of Canada, Report No. 4 - Mining wastes in the Atlantic Provinces"

Background information is provided on waste rock and mill tailings in the Atlantic Provinces. Data on the occurrence, mineralogy, petrography, and physical and chemical characteristics of waste from 17 operating mines are presented in tabular form for three principal types of mines - metal, non-metallic or industrial mineral, and coal. Potential uses for these wastes are given along with relevant research.

Cat. No. M38-13/80-12E - 21 p

Canada \$1.95; other countries \$2.35

018

CANMET REPORT 80-13E. Collings, R.K. "Mineral waste resources of Canada, Report No. 6 - Mineral wastes as potential fillers"

Mineral wastes are available in large quantities throughout Canada. Most are of no interest as mineral fillers because of their remote location or impurity, but some are uniform in composition and close to filler markets. This report provides information on mineral fillers, examines a specific segment of that industry, and identifies a number of wastes that may have potential as alternative or supplemental material for use in specific products or applications.

Cat. No. M38-13/80-13E - 24 p

Canada \$2.25; other countries \$2.70

019

CANMET REPORT 80-14E. Gilmour, J. "The corrosion of welds in ice-breaking ships - A review"

This report briefly reviews the literature related to weld corrosion in ice-breaking ships. Two types of corrosion are described - weld metal attack and weld heat-affected attack. An in-house research project is proposed to assist the Canadian marine industry to understand and to minimize this problem.

Cat. No. M38-13/80-14E - 10 p

Canada \$1.25; other countries \$1.50

020

CANMET REPORT 80-15. "Catalogue of CANMET publications 1979/80"

Details of publications and papers prepared by CANMET scientific and technical staff in

1979/80 are presented. CANMET Reports, journal publications and oral presentations are listed with abstracts. Divisional investigation and declassified report titles are given as well as those prepared by private research agencies under contract to and through financial grants by CANMET.

Cat. No. M38-13/80-15 - 40 p

Canada \$6.00; other countries \$7.20

021

CANMET REPORT 80-16E. Quon, D.H.H. and Wheat, T.A. "Synthesis and characterization of potassium ion conductors in the system $K_2O-Al_2O_3-TiO_2$ "

As part of a program to develop ionically conducting materials for potential use in energy storage and conversion systems it was shown possible to produce highly reactive, homogenous raw materials having the general composition: $K_xAl_xTi_{8-x}O_{16}$ by doping freshly precipitated $Ti(OH)_4$ with soluble nitrates or acetates, followed by spray freezing and freeze drying. Using these materials establishes that the solid-solution limits for the formation of single-phase hollandite are from $x = 1.6$ to a value between 1.8 and 1.9. At higher values of x , a second phase, isostructural with $K_3Ti_6O_{13}$, is formed and at lower values of x , free TiO_2 is formed.

Cat. No. M38-13/80-16E - 28 p

Canada \$2.50; other countries \$3.00

022

CANMET REPORT 80-17E. "CANMET Review 1979-80"

This review presents highlights of the research and development carried out at or sponsored by CANMET in 1979-80. CANMET operates under a matrix management system in which its two research programs - Minerals and Energy - interacts with line management in planning, controlling and evaluating projects. This review is organized according to program structure rather than functional units, thus drawing together related research activities taking place in the various laboratories.

Cat. No. M38-13/80-17E - 65 p

Canada \$5.00; other countries \$6.00

023

CANMET REPORT 80-18E. Malhotra, V.M., Carrette, G.G. and Bremner, T.W. "Durability of concrete containing granulated blast furnace slag or fly ash or both in marine environment"

The high energy cost associated with producing cement demands that less energy intensive materials be investigated for making concrete, particularly because of the offshore gas and oil exploration activity in the Maritime Provinces. Fly ash and granulated blast furnace slag are two such less costly materials which are being assessed by CANMET to determine their performance in the marine environment of Eastern Canada.

Cat. No. M38-13/80-18E - 24 p

Canada \$2.00; other countries \$2.40

024

CANMET REPORT 80-19E. Collings, R.K. and Wang, S.S.B. "Mineral waste resources of Canada - Report No. 7 - Ferrous metallurgical wastes"

Technical data are presented on ferrous metallurgical wastes from various iron and steel producers in Canada. The types of waste, amount produced, physical characteristics, chemical analyses, and current and potential uses for iron-making and steelmaking slag are tabulated. Data on flue dusts and sludges from ironmaking and steelmaking are also given. Results are provided from X-ray diffraction analyses of selected samples of slags, dusts, and sludges.

Cat. No. M38-13/80-19E - 30 p

Canada \$2.50; other countries \$3.00

025

CANMET REPORT 80-21. Romaniuk, A.S. "English-French glossary of mining and related terms" and Slowikowski, I. "Glossaire française-anglais des termes miniers et du vocabulaire connexe"

Approximately 2400 English-French/French-English terms are presented of use to the Canadian mineral industry. A special effort was made to select terminology used in Canada, with the result that a number of "Canadianisms" are included along with French terms as used in Europe. Increasing emphasis on mechanization in both open-pit and underground mining prompted the inclusion of terminology related to mine equipment, equipment maintenance, mining operations, rock mechanics and mine geology.

Cat. No. M38-13/80-21 - 77 p

Canada \$5.00; other countries \$6.00

026

CANMET REPORT 80-23E. Patmore, D.J. and Pruden, B.B. "Thermal hydrocracking of Athabasca bitumen: Comparison of computer simulated values of feed and product vaporization with CANMET pilot plant data"

Results are provided of a study made to compare computer simulated values of feed and product vaporization with CANMET pilot plant data to calculate hydrogen partial pressures and true liquid and vapour residence times which are necessary for accurate sizing of various plant components and for formulating a kinetic model for the thermal hydrocracking reaction.

Cat. No. M38-13/80-23E - 17 p

Canada \$2.25; other countries \$2.70

026a

CANMET REPORT 80-26E. Quon, D.H.H. and Bell, K.E. "Release of lead from typical Canadian pottery glazes"

A study to determine the stability of typical Canadian pottery glazes under simulated domestic conditions and an examination of the mechanisms of Pb release and stabilization were made to develop stable, safe glazes. Lead release from glazes in contact with 4% acetic acid showed that the amount of release depends not only on composition but also on glaze thickness and firing temperature. Lead release from copper-bearing glazes can be suppressed by adding about 0.5% m/m BaCrO₄ or Cr₂O₃.

Cat. No. M38-13/80-26E - 11 p

Canada \$1.75; other countries \$2.10

SECTION 2

JOURNAL PUBLICATIONS

Papers are available only from the journal or proceedings cited or by direct request to the author.

MINERAL SCIENCES LABORATORIES

378

Cabri, L.J. "Nature and distribution of platinum-group element deposits"; Episodes 1981:2:31-35; 1981.

The bulk of platinum-group elements are currently produced in three countries - U.S.S.R. (48.1%), Republic of South Africa (45.2%), Canada (5.4%). This paper provides a tentative classification of PGE-dominant deposits, PGE co-product and by-product deposits, Ni-Cu, Ni magmatic sulphide deposits with by-product PGE, and miscellaneous deposits.

379

Cabri, L.J., Rowland, J.F., Laflamme, J.H.G., Stewart, J.M. "Keithconnite, telluropalladinite and other Pd-Pt tellurides from the Stillwater complex, Montana"; Can Mineral 17:589-594; 1979.

The new minerals keithconnite and telluropalladinite, as well as three other tellurides from the Stillwater complex, Montana, U.S.A., are described. The geology, sample locations and previous work are described or referred to. The exploration and the location of the zones of Pt-Pd-bearing mineralization are also described.

380

Chen, T.T., Dutrizac, J.E., Owens, D.R. and Laflamme, J.H.G. "Accelerated tarnishing of some chalcopyrite and tennantite specimens"; Can Mineral 18:173-180; 1980.

Chalcopyrite in contact with silver minerals, especially native silver, undergoes rapid tarnishing that appears to be caused by the surface diffusion of silver onto the chalcopyrite, followed by its reaction to form an Ag_2S film. Some tennantites undergo rapid tarnishing caused by the surface reaction of the mineral (by oxidation of As or Sb?) to form silver-bearing Cu_2S or $\text{Cu}_{1.8}\text{S}$. The copper sulfide film covers the tennantite and diffuses extensively onto adjacent phases.

381

Donaldson, Elsie M. "Determination of tin in ores, iron, steel and alloys by atomic-absorption spectrometry after separation by extraction as the iodide"; Talanta 27:499-505; 1980.

A method for determining 0.001% or more of tin in ores, concentrates and tailings, iron, steel and copper-, zinc-, aluminium-, titanium- and zirconium-base alloys is described. After

sample decomposition, tin is separated from the matrix elements, except arsenic, by toluene extraction of its iodide from a 3 M sulphuric acid-1.5 M potassium iodide medium containing tartaric and ascorbic acids. It is finally back-extracted into a nitric-sulphuric acid solution containing hydrochloric acid to prevent the formation of an insoluble tin-arsenic compound and the resultant solution is evaporated to dryness. Tin is subsequently determined by atomic-absorption spectrophotometry in a nitrous oxide-acetylene flame, at 235.4 nm in a 10% hydrochloric-0.5% tartaric acid medium containing 250 μg of potassium per mL. Co-extracted arsenic does not interfere. Results obtained by this method are compared with those obtained spectrophotometrically with gallein after the separation of tin by iodide extraction.

382

Donaldson, Elsie M. "Determination of molybdenum in ores, iron and steel by atomic-absorption spectrophotometry after separation by alpha-benzoinoxime extraction or further xanthate extraction"; Talanta 27:79-84; 1980.

A method for determining 0.001% or more of molybdenum in ores, iron and steel is described. After sample decomposition, molybdenum is separated from the matrix elements, except tungsten, by chloroform extraction of its alpha-benzoinoxime complex from a 1.75 M hydrochloric-0.13 M tartaric acid medium. Depending on the amount of tungsten present, molybdenum, if necessary, is back-extracted into concentrated ammonia solution and subsequently separated from coextracted tungsten by chloroform extraction of its xanthate complex from a 1.5 M hydrochloric-0.13 M tartaric acid medium. It is ultimately determined by atomic-absorption spectrophotometry, at 313.3 nm, in a 15% v/v hydrochloric acid medium containing 1000 $\mu\text{g}/\text{mL}$ of aluminium as the chloride, after evaporation of either extract to dryness with nitric, perchloric and sulphuric acids and dissolution of the salts in dilute ammonia solution.

383

Donaldson, Elsie M. "Determination of chromium in ores, rocks and related materials, iron, steel and non-ferrous alloys by atomic-absorption spectrophotometry after separation by tribenzylamine-chloroform extraction"; Talanta 27:779-786; 1980.

This paper describes a method for determining chromium in ores, concentrates, rocks, soils and clays after its preliminary separation, by coprecipitation with hydrous ferric oxide, from the sodium salts resulting from sample decomposition by fusion with sodium peroxide. The applicability of this extraction method to the direct determination of chromium in iron and steel and in nickel-copper, aluminium and zirconium alloys is shown.

384

Donaldson, Elsie M. "Determination of aluminium in iron, steel and ferrous and non-ferrous alloys by atomic-absorption spectrophotometry after a mercury-cathode separation and extraction of the aluminium-acetylacetonate complex"; Talanta 28:461-467; 1981.

A method for determining 0.0005% or more of total aluminium in high- and low-alloy steels, iron and ferrovanadium is described. The method is also applicable to copper- and nickel-base alloys. Results are compared with those obtained previously with the spectrophotometric Pyrocatechol Violet method.

385

Dutrizac, J.E. "The physical chemistry of iron precipitation in the zinc industry"; Lead-Zinc-Tin '80 Proc of World Symp on Metall and Environ Control, 109th Ann Meet, Las Vegas, Nevada, 532-564; Feb. 24-28, 1980.

Iron may be conveniently precipitated from zinc hydrometallurgical solutions as jarosite, goethite, hematite or magnetite, and the general advantages and disadvantages of each precipitation method are surveyed. The mechanism of iron precipitation is discussed in terms of ferric hydrolysis, followed by the dimerization and subsequent polymerization of the iron hydroxyl complexes, that lead to the eventual precipitation of some crystalline iron compound. The phase diagram relationships governing the iron compounds precipitated are presented, and the physical chemical factors such as solution concentrations, oxidation potential, ionic strength, seeding, and temperature that affect iron precipitation are reviewed and discussed. The stability of goethite with respect to Fe_2O_3 and FeO.OH is discussed with emphasis on particle size, pH and temperature effects. Special attention is paid to jarosite formation because of its more general utility in conventional zinc processing and its potential importance in the oxygen pressure leaching of zinc. In this regard the stabilities and solubilities of the various jarosite-type compounds are presented and compared with similar values for goethite and hematite.

386

Dutrizac, J.E. "Ferric sulphate percolation leaching of a pyritic Zn-Pb-Cu ore"; CIM Bull 72:810: 109-118; 1979.

A pyritic Zn-Pb-Cu ore was percolation leached with acidified ferric sulphate solutions; zinc and copper were leached, lead was oxidized, but not dissolved, and pyrite was essentially unattacked. High zinc extractions were achieved after a few months leaching, and substantial zinc solution concentrations could be produced by re-

cycle of the oxidized solution. The leaching rate was generally controlled by the transport of the ferric sulphate oxidant. Zinc extractions increased with increasing ferric ion concentration or flow rate, but were essentially independent of the concentrations of sulphuric acid, ferrous sulphate, cupric sulphate or chloride ion. The leaching rates were insensitive to the height of the ore column once a minimum height had been exceeded (0.8-1.0 m). Elemental sulphur was the principal sulphidic reaction product, but variations in the ratio of sulphur to sulphate produced anomalous temperature effects.

387

Dutrizac, J.E. "The reaction of titanium with selenium vapour"; Can Metall Q 18:383-388; 1979.

The thermogravimetric method was used to study the kinetics of reaction of annealed titanium with pure selenium vapour. The kinetics were studied between 400-550°C and for total selenium pressures from 0.1 to 32 torr. The reaction kinetics were essentially parabolic under all conditions, although brief induction periods were sometimes observed at the lower temperatures. The parabolic rate constant varied systematically as the 0.8 power of the partial pressure of Se_2 , but was independent of temperature ranges at all selenium pressures studied. The only reaction product identified was metal rich Ti (1 + x) Se_2 .

388

Dutrizac, J.E. "The $\text{Fe}_{1-x}\text{S-PbS-ZnS}$ phase system"; Can J Chem 58; 1980.

High temperature phase relationships have been determined for the binary systems: FeS-PbS , $\text{Fe}_{0.92}\text{S-PbS}$, $\text{Fe}_{0.92}\text{S-ZnS}$ and PbS-ZnS , and for the ternary system: $\text{Fe}_{0.92}\text{S-PbS-ZnS}$. All the systems were of the eutectic-type with eutectic points being noted at: 53 mol% FeS-47 mol% PbS and 850°C, 53 mol% $\text{Fe}_{0.92}\text{S-47 mol% PbS}$ and 852°C, 90 mol% $\text{Fe}_{0.92}\text{S-10 mol% ZnS}$ and 1178°C, 87 mol% PbS-13 mol% ZnS and 1050°C, and at 46 mol% $\text{Fe}_{0.92}\text{S-41 mol% PbS-13 mol% ZnS}$ and 850°C, respectively. Solid solubilities were less than 1 mol% except for an appreciable solubility of Fe_{1-x}S in ZnS .

389

Dutrizac, J.E. and Bernolak, A. "Films of metallurgical interest"; CIM Bull Jan.-Feb.; 1981.

More than 250 films in twelve major areas of metallurgical interest were identified and have been listed according to title, content, format and distributor.

390

Dutrizac, J.E., Dinardo, O. and Kaiman, S. "Selenate analogues of jarosite-type compounds"; Hydrometallurgy 6:327-337; 1981.

Selenate analogues of sodium jarosite and potassium jarosite were produced by precipitation from aqueous solution; it was concluded that selenate analogues probably exist for the nine known jarosite-type compounds. The selenium compounds possess the (R3m) structure of their jarosite analogues, although the unit cell dimensions are somewhat larger. During jarosite formation, sulphate and selenate are precipitated in approx-

imately the same ratio as they are present in solution; also, the unit cell parameters of the mixed sulphate-selenate compounds increase linearly with increasing selenium concentration. The thermal decomposition behaviour of the selenate analogues is generally similar to that of sodium or potassium jarosite. Initially, water is evolved and subsequently selenium oxides are emitted.

The selenium oxides are, however, evolved at a lower temperature (400-450°C) than for their sulphur counterparts, and the two weight-loss reactions tend to overlap slightly for the selenate analogues.

391

Hitchen, A. and Zechanowitsch, G. "Chelatometric determination of calcium and magnesium in iron ores, slag, anorthosite, limestone, copper-nickel-lead-zinc ores and divers materials"; Talanta 27:269-275; 1980.

Chelatometric methods for determining calcium and magnesium in iron ores, slags, anorthosite, copper-nickel-lead-zinc ores and various other materials are described. Results compare favourably with certified values for reference materials of diverse nature.

392

Hitchen, A. and Zechanowitsch, G. "Volumetric determination of uranium in low-grade uranium ores by the ferrous ion-phosphoric acid reduction method"; Talanta 27:383-389; 1980.

The modification and extension of the U.S.A.E.C. ferrous ion-phosphoric acid reduction method for determining uranium in high-grade or relatively pure material to a method for determining uranium with a high accuracy and precision, in ores containing 0.004-7% U is described. For sample materials having very high concentrations of interfering elements, a prior concentration step is described, but it is shown that, for most low-grade ores, this step is unnecessary.

393

Jambor, J.L., Owens, D.R. and Dutrizac, J.E. "Solid solution in the adelite group of arsenates"; Can Mineral 18:191-195; 1980.

Duftite and conichalcite specimens from Tsumeb, Namibia (South West Africa) are commonly zoned in colour and composition. Microprobe analyses and X-ray powder-diffraction studies indicate extensive Cu-Zn and Pb-Ca substitutions, which represent solid solution among conichalcite, austinite and duftite. Cell dimensions of the austinite-conichalcite-duftite series are given.

394

Kaiman, S., Harris, D.C. and Dutrizac, J.E. "Stibivanite, a new mineral from the Lake George antimony deposit, New Brunswick"; Can Mineral 18:329-332; 1980.

Stibivanite, an antimony-vanadium oxide, is a new mineral found at the Consolidated Durham Mines and Resources Ltd. antimony deposit, Lake George, N.B. This paper describes its occurrence, physical and optical properties, and composition. Synthesis investigations are also described.

395

Leclerc, A. "Room temperature Mössbauer analysis of jarosite-type compounds"; Phys Chem Miner 6: 327-334; 1980.

Powdered samples of jarosite-type compounds were analyzed at room temperature by ^{57}Fe Mossbauer spectroscopy. Although all the spectra were similar, a linear relationship between the quadrupole splitting and the iron content of the samples was observed for the monovalent jarosite-type compounds.

396

Lundgren, D.G. and Silver, M. "Ore leaching by bacteria"; Ann Rev Microbiol 34:263-283; 1980.

A review is presented of the bacterial leaching of ores covering: theory and application of bacterial leaching; microbial involvement and leaching methods including research and commercial applications. Environmental factors influencing the leaching of ores by microbes are indicated and discussed including temperature, oxidation-reduction potential, composition of the leaching medium, and the particle size substrate concentration. Microbial metal extractions of copper, uranium, and other metals are also discussed. The bibliographies in this area are given.

397

MacKinnon, D.J., Brannen, J.M. and Lakshmanan, V.I. "The effects of chloride ion and organic extractants on electrowon zinc deposits"; J Appl Electrochem 10:321-334; 1980.

The effects of chloride ion and the organic extractants: Kelex 100, Versatic 911, di-2 ethylhexyl phosphoric acid, tri-n-butyl phosphate, LIX65N and Alamine 336 on the structure of 1h zinc deposits electrowon from synthetic and industrial acid sulphate electrolytes are presented. Under simulated tankhouse conditions the effect of chloride ion concentration on the zinc deposit morphology and orientation becomes significant only at the 500 mg/L level. The tolerance limit of the zinc deposits to organic extractants such as Kelex 100 is extremely low. In some cases the adverse effect of these organic impurities is offset by the presence of chloride ion in the electrolyte. Purification of electrolyte contaminated with organic extractants by activated charcoal results in a vastly improved zinc deposit structure. Organic extractants such as Kelex 100 and TBP which have an adverse effect on the zinc deposits, also have a pronounced effect on the zinc deposition polarization curve.

398

Malhotra, V.M. "Mechanical properties and durability of superplasticized semi-lightweight concrete"; ASTM J Concr SP68:16:283-305; 1980.

An investigation is described to determine whether superplasticizers can help in manufacturing semi-lightweight concrete having compressive strengths in excess of 30 to 40 MPa at early ages and to ascertain if the combined use of superplasticizers and fly ash can produce high strength concrete with moderate cement contents. It is concluded that superplasticizers allow the manufacture of semi-lightweight concrete having

compressive strengths of the order of 30 MPa at one day and 40 MPa at 3 days with cement contents ranging from 422 to 445 kg/m³. It is also shown that the combined use of superplasticizers and fly ash may offer a new approach in obtaining high strength concrete with cement contents less than 400 kg/m³.

399

Malhotra, V.M. "Superplasticizers: their effect on fresh and hardened concrete"; ACI Concr Int 5:81:66-81; 1981.

Superplasticizers are a new family of admixtures which can either be used as high-range water reducers or be incorporated into concrete to produce "flowing" concrete. Researchers have been developing data on their effect on fresh and hardened concrete. A review is presented on the properties of fresh concrete which includes bleeding and segregation, increases in slump and its subsequent loss with time, initial setting time, entrained air content, effect of repeated dosages, vibration requirements, and pumpability of superplasticized concrete. Properties of hardened concrete reviewed include accelerated strength, mechanical and elastic properties, freeze-thaw durability, resistance to salt scaling and sulphate attack.

400

Quon, D.H. and Malhotra, V.M. "Performance of high alumina cement concrete at elevated temperature"; J Con Ceram Soc 48:7-15; 1979.

Results are given of an investigation to obtain data on the performance of high alumina cement concrete cured at temperatures from 21 to 66°C under humid and dry conditions using compression test, pulse velocity measurement, DTA and XRD techniques.

401

Moloughney, P.E. "A fire assay-wet chemical method for the determination of palladium, platinum, gold, and silver in ores and concentrates"; Talanta 27:365-367; 1980.

This paper describes a method for the recovery of platinum and palladium remaining in the soluble fraction by reduction with stannous chloride and use of tellurium as collector. The method has been successful in determining palladium, platinum, gold, and silver in diverse certified reference materials.

402

Rolia, E. and Barbeau, F. "Estimation of individual thio-salts and sulphate in flotation mill solutions"; Talanta 27:596-598; 1980.

This paper presents suitable methods for determining thio-salts and sulphate in flotation mill solutions. Thiosulphate, tetrathionate, and trithionate were estimated spectrophotometrically after cyanolysis. A modified iodimetric procedure was used for sulphite and a titrimetric method for direct determination of sulphate. The observation that dithionate is not oxidized by hydrogen peroxide but is oxidized to sulphate by potassium chlorate-nitric acid mixture was the basis for estimation of dithionate.

403

Sastri, V.S., Hoey, G.R. and Whalley, B.J.P. "Review of the effects of corrosion inhibitors in coal-water slurry pipelines"; Can Metall Q 18:435-440; 1979.

A literature review has shown that: (i) corrosion control in coal slurry pipelines was achieved by using chromate as an inhibitor; (ii) considerable loss in caking properties of metallurgical coals subjected to hydraulic transportation was observed; and (iii) additives such as lime and alkalis adversely affected the caking properties of metallurgical coals.

404

Sastri, V.S., Hoey, G.R. and Whalley, B.J.P. "Effect of pipeline corrosion inhibitors on the caking properties of metallurgical coals"; Fuel 59:811-812; 1980.

An investigation to determine the effects of pipeline corrosion inhibitors on the caking properties of metallurgical coals is described. Results are given of proximate and ultimate analyses, FSI according to ASTM method, and leaching of inhibitor-treated coal with water.

405

Skeaff, J.M. "Electrowinning of aluminum, magnesium, lead and zinc from molten-chloride electrolytes: A survey"; Inst Min Metall Trans C:89:71-82; 1980.

The electrowinning of aluminum, magnesium, lead and zinc from fused-chloride electrolytes is reviewed on a practical basis. Electrolyte compositions, cell designs and operating conditions are discussed and, where possible, related to current efficiencies and energy consumptions.

406

Skeaff, J.M. "Survey of the occurrence of Ra-226 in the Rio Algom Quirke I uranium mill, Elliot Lake"; CIM Bull 74:830:115-121; 1981.

The main solution, ore and residue pulp streams in the Rio Algom Quirke I uranium mill at Elliot Lake have been sampled and analyzed for Ra-226. Analysis of the ore and leached residues indicates that Ra-226 dissolves and precipitates within the first pachuca tank. A maximum of approximately 0.2% of the Ra-226 in the ore remains in solution during leaching.

407

Skeaff, J.M. "Chlorination of uranium ore for extraction of uranium, thorium and radium and for pyrite removal"; CIM Bull 120-125; Aug. 1979.

This paper deals with a bench-scale investigation to develop a process for uranium extraction by high-temperature chlorination in which Ra-226 is extracted from the ore along with the uranium. Thorium and the rare earths are extracted as byproducts and the pyrite content of the ore is reduced to a low level to produce an innocuous residue.

408

Steger, H.F. "A review of the Canadian Certified Reference Materials Project"; Can J Spectrosc 25:1:5A & 6A; 1980.

A review of the Canadian Certified Reference Materials Project (CCRMP) is presented. It is a facet of the Minerals Research Program of the Canada Centre for Mineral and Energy Technology (CANMET), Energy, Mines, and Resources, Canada. In CCRMP, compositional reference ores, concentrates, and related products typical of Canadian deposits and not generally available from other sources are prepared for use in analytical laboratories associated with mining, metallurgy, and the earth sciences. The history of the CCRMP is reviewed and its procedure for certifying reference materials is outlined.

409

Steger, H.F. "Canadian Certified Reference Materials Project"; Am Lab 167-168; Feb. 1981.

This paper describes the certification program of CANMET's Canadian Certified Reference Materials Project (CCRMP). In CCRMP, compositional reference ores, concentrates and related products that are typical of Canadian deposits and not generally available from other sources are prepared for use in analytical laboratories associated with mining, metallurgy and the earth sciences. CCRMP has certified 30 ores, concentrates, and soils as RMs for various elements and has available three reference rocks, MRG-1, SY-2 and SY-3, for which recommended values are given, three commercial-grade purity copper alloys, and three phosphor-bronzes in disk form (SN - 5%, 7%, and 10% nominal).

410

Steger, H.F. and Faye, G.H. "Methodological information from the certification of CCRMP ores and concentrates"; Talanta 27:327-334; 1980.

In the course of 90 certifications for 27 elements in 26 reference ores and concentrates carried out by the Canadian Certified Reference Materials Project (CCRMP), much methodological information has been documented and is now made available to analysts for the selection of suitable methods for the analysis of specific materials. Information is presented for copper, gold, lead, silver, sodium, potassium, tin, tungsten, uranium and zinc. A relationship between the average coefficient of variation and element concentration makes it possible to make some generalizations about the precision to be expected for a given concentration of an element in ores and concentrates.

411

Szymanski, J.T. "A redetermination of the structure of Sb_2VO_5 , stibivanite, a new mineral"; Can Mineral 18:333-337; 1980.

The crystal structure of synthetic Sb_2VO_5 , has been redetermined from 1959 X-ray reflections collected on a 4-circle diffractometer. A detailed comparison of the mineral stibivanite and the synthetic material showed them to be identical (cell dimensions, space group, intensities). Their powder patterns were the same as were their physical and optical properties.

ENERGY RESEARCH LABORATORIES

027

Chmielowiec, J. and George, A.E. "Polar bonded-phase sorbents for high performance liquid chromatographic separation of polycyclic aromatic hydrocarbons" J Anal Chem 52:7:1154-1157; June 1980.

The selectivity of seven HPLC silica-based polar bonded phase sorbents was evaluated for the separation of polycyclic aromatic hydrocarbons (PAHs) in normal mobile phases. Separation data for 46 PAHs on silica - $\text{R}(\text{NH}_2)_2/\text{n}$ -heptane and 6% methylene chloride in n-heptane show that this HPLC bonded phase is superior to other phases for this purpose.

028

Friedrich, F.D. "Developments in fluidized bed technology"; Mod Power Eng 36-37; Sept. 1979.

The technology and current developments in fluidized bed combustion are described as well as its advantages and disadvantages.

029

Nandi, B.N. and MacPhee, J.A. " ^{13}C n.m.r. as a probe for the characterization of the low-temperature oxidation of coal"; Fuel 60:169-170; Feb. 1981.

Results are given of an investigation using the "cross-polarization magic angle spinning" (CP-MAS) n.m.r. technique on fresh and oxi-

dized samples of carboniferous, high-volatile bituminous coal from the Cape Breton Development Corporation to determine the nature of low-temperature coal oxidation.

030

Nandi, B.N., MacPhee, J.A. and Ciavaglia, L. "The formation of rosette carbon in the fly-ash from the combustion of delayed bitumen coke"; presented 3rd Int Carbon Conf, Baden-Baden; June 30-July 4, 1980 and in Carbon '80 457-460.

The various proportions of aromatic: aliphatic carbon in bitumen and its products were determined by ^{13}C n.m.r. spectroscopy. Results show that the aromaticity of this heavy residual oil is much higher than that of either the bitumen or the distillation residue from the heavy oil. It also appears that rosette-type carbon may be formed from high-aromaticity heavy residual oil whereas small mesophase formation arises from low aromaticity bitumen.

031

Nandi, B.N., Ternan, M. and Belinko, K. "Conversion of non-coking coals to coking coals by thermal hydrogenation"; Fuel 60:347; 1981.

Coking properties were observed in four non-coking coals which had been treated by partial thermal hydrogenation. Microscopic examination

showed that they all contained anisotropic structures somewhat spherical in shape which are associated with mesophase development. The dilatation, plastic character and free swelling index of the solid products were considerably better than those of the original coals.

032

Poirier, M.-A and George, A.E. "A method for the determination of olefin content in petroleum distillate fractions by hydroboration"; Fuel 60:194; 1981.

An accurate analytical method for determining olefin content in naphtha and higher boiling distillate fractions is described. Results are compared with the standard Fluorescent Indicator Absorption (FIA) method, and a method utilizing both the FIA and proton magnetic resonance spectrometry.

033

Ternan, M., Packwood, R.H., Buchanan, R.M. and Parsons, B.I. "Preparation of high porosity catalysts"; presented 7th Can Symp Catal, Edmonton; Oct. 19-22, 1980.

Porous alumina catalyst supports were prepared with pore volumes exceeding 1.0 mL/g, with most pores having diameters of the order of 3 μ m and with surface areas exceeding 150 m²/g. The catalysts were characterized by gravimetric BET surface area, mercury porosimetry, X-ray

diffraction and scanning electron microscopy. Catalyst supports having these geometric properties should eliminate mass transfer restrictions during hydrocracking of petroleum residua, heavy oils and bitumen derived from oil sand deposits.

034

Ternan, M. and Kriz, J.F. "Some effects of catalyst composition on deactivation and coke formation when hydrocracking Athabasca bitumen"; presented Int Symp Catal Deact, Brussels; Oct. 13-15, 1980 and in Catal Deact p 283; 1980.

A study was made to determine whether catalysts of decreased coke content after short term experiments would deactivate less rapidly in longer term experiments. Results show that catalyst chemical composition does not influence the long term deactivation rate, although it has a strong influence on most rates of reaction.

035

Whaley, H. "The Canadian coal-oil mixture program"; Eng Digest 26:6:15-20; June 1980.

A description is given of the status of four projects of the Canadian coal-oil mixture (COM) program jointly funded between EMR and New Brunswick Electric Power Commission, Saskatchewan Research Council, Ontario Research Foundation, and Steel Company of Canada Ltd. An outline is also given of other related COM work being undertaken or planned in Canada.

PHYSICAL METALLURGY RESEARCH LABORATORIES

036

Blefer, G.J. "Atmospheric corrosion of steel in the Canadian Arctic"; Mat Perform 20:1:16-19; 1981.

A corrosivity survey was made in the Canadian Arctic and sub-Arctic using mild steel wire-on-nylon bolt specimens, exposed for one year. For comparison, specimens were also exposed at points in southern Canada. Average rates of penetration by corrosion were 2 to 5 μ m/y on the mainland of the western Arctic and the north-west Arctic islands. Within 1 km of the sea, corrosion rates were 21 to 34 μ m/y compared to 22 to 30 μ m/y in southern Quebec and Ontario.

037

Briggs, D.C. and Thomson, R. "The properties of high speed tool steel produced by horizontal continuous casting"; presented Int Conf on Cutting Tool Materials; Fort Mitchell, Kentucky; Sept. 15-17, 1980. (Will be published in Conf Proc.)

This paper briefly describes a more efficient method of producing high-speed tool steel, developed at CANMET, examines the physical metallurgy and performance of concast high-speed steels and sketches a conceptual design and the economics of a small plant dedicated to continuous casting of tool steel.

037a

McGrath, J.T., Laufer, E.E. and Gordine, J. "Ferritic-martensitic structures and their effect on HAZ notch toughness" Can Metall Quart 19:1980.

The presence of a ferrite/martensite mixed microstructure in the HAZ of a grade 65 line-pipe steel has been identified. The embrittling effect of this structure on the notch toughness of the HAZ is discussed.

038

Paley, Z., Ng-Yelim, J. and Martin, P. "A weldability testing procedure for premium rail steels with particular reference to V-N experimental steels"; Am Weld J 60:1:7s-11s; Jan. 1981.

A procedure for determining electroflash welding parameters is described. This procedure has been applied to the welding of Cr-Mo premium rails.

039

Sahoo, M., Campbell, W.P. "Weldability of both Nb-modified and Cr-modified high-strength 20/30 Cu-Ni casting alloys"; Trans Am Fdy Soc 88:727-736; 1980.

Weldability of both Nb-modified (C96400) and Cr-modified (IN-768) 70/30 Cu-Ni casting alloys was evaluated using the automatic gas-metal-arc welding process. Also, the Varcstraint

test was used to examine the hot cracking sensitivity of Cr-modified alloys. The weldability of both alloys was considered satisfactory, although short intergranular cracks were often found near weld toes.

040

Szabo, E.I. and Gauthier, R. "Novel, inorganically bonded closed-sand systems"; Trans Am Fdy Soc 80:104; 1980.

Two moulding techniques based on alkaline earth compounds have been developed. Both offer full sand reclamation and the complete recovery of the non-volatile component of the binder.

041

Tyson, W.R. "The effect of lattice defects on hydrogen solubility"; J Less Common Metals 70:209; 1980.

A simplified solubility model is proposed in which interaction energy is taken as constant over an extended core region and concentration enhancement is treated by Fermi-Dirac statistics. Results show that this model gives good agreement with experiment for H in Pd.

042

Tyson, W.R. "Discussion of hydrogen embrittlement and 'hydrogen-dislocation interactions'" Corr (NACE) 36:411; 1980.

The solubility of hydrogen in iron and steel is enhanced by the presence of defects; in commercial steels at hydrogen levels commonly encountered in practice, most of the hydrogen is trapped at defects, with the strength of the trapping dependent on the type of defect. This discussion clarifies the interpretation of computed enhancement levels, introduces a simple model for the treatment of the hydrogen-dislocation interaction and comments on the effects of hydrogen and plasticity in iron.

043

Tyson, W.R. and Trudeau, L.P. "Fracture mechanics concepts"; presented CIM/CFRC Sem Fract Mech and Control of Fract, Sudbury, Ont.; Aug. 19, 1979 and in Can Metall Quart 19:3; 1980.

A brief survey is provided of the more important characteristics of fracture mechanics and the methods that have emerged to describe the state of affairs at the tips of cracks in stressed bodies.

044

Tyson, W.R. "Note on hydrogen effect on 410 stainless steel"; Mater Sci Eng 44:294; 1980.

This note cites the implications of the rapid diffusion of hydrogen in the interpretation of tests for hydrogen embrittlement. A lack of

embrittlement in thin specimens tested sometime after charging may be due to hydrogen loss by diffusion rather than inherent resistance to hydrogen.

045

Vosikovsky, O. "Effects of stress ratio on fatigue crack growth rates in X70 line-pipe steel in air and salt water"; J Test Eval 8:2:68-73; March 1980.

The effects of stress ratio on fatigue crack growth rates in X70 line-pipe steel in air and salt water, and of cyclic frequency in NaCl solution were studied. Results are compared with fatigue crack growth rates measured previously in lower strength X65 steel.

046

Vosikovsky, O. "Effects of mechanical and environmental variables on fatigue crack growth rates in steels - A summary of work done at CANMET"; Can Metall Quart 19:1:87-97; 1980.

The effects of stress ratio and frequency are examined in air and liquid environments, represented by 3.5% NaCl water solution, distilled water and sour crude oil, on X65 and X70 line-pipe steels, and on HY130 marine steel.

046a

Vosikovsky, O. "Fatigue crack closure in an X70 steel"; Inst J Fract 17:1; Feb. 1981.

Results of fatigue crack closure measurements by a DC potential drop technique on X70 line-pipe steel are reported and compared with other available closure measurements.

047

Vosikovsky, O., Trudeau, L.P. and Rivard, A. "Effect of residual stresses on fatigue crack growth threshold"; Int J Fract 16:R187-R190; 1980.

Residual stresses occasionally present in "as rolled" steel plates can significantly alter the threshold stress intensities and near-threshold crack growth rates, and thus contribute to scatter. This report documents an example of this phenomenon.

048

Whiting, L.V. and Brown, D.A. "Air/oxygen injection refining of secondary copper alloys"; Trans Am Fdy Soc 88:80-124; 1980.

Experimental 45-kg induction melts of leaded red-brass alloy C83600 (85-5-5-5), to which the three most common impurities - aluminum, silicon and iron - were added, were refined by subsurface gas injection under various conditions. Results show that air/oxygen mixtures in the ratio of about 1:6 gave the best results.

MINING RESEARCH LABORATORIES

049

Blair, R., Cherry, J.A., Lim, T.P. and Vivyurka, A.J. "Groundwater monitoring and containment occurrence at an abandoned tailings area, Elliot Lake, Ontario"; Proc 1st Int Conf Uranium Mine Waste Disposal; 29:411; May 19-21, 1980.

Results are reported from the first phase of an investigation of the chemical composition of subsurface water and the hydrochemical processes in and near the abandoned Nordic tailings at Elliot Lake, Ontario conducted in 1979.

050

Cheng, K.C. "The measurement of radon emanation rates in a Canadian cut and fill uranium mine"; CIM Bull 74:828:110-118; Jan. 1981.

Concentrations of radon and daughters were monitored at cut-and-fill stopes in a Canadian uranium mine during all phases of the mining cycle. Results show that backfilling

operations and daily shift-end blasts were the major sources for the contamination of radon gas in the ventilation air in addition to the stope background levels of radon.

051

Kirk, B. and Westaway, K. "A quantitative assessment of PNA levels in underground mines"; Western Miner p 42; Oct. 1980.

Results from a study to determine the concentrations of polynuclear aromatic hydrocarbons (PNA's or PAH's) from diesel engines operating in underground mines indicate that the PNA's are present at levels significantly above those found in the general surface atmosphere. Tentative correlations are made between the PNA concentrations and other parameters such as ventilation conditions, diesel activity and carbon dioxide concentration.

ENERGY RESEARCH PROGRAM

052

Ternan, M., Mysak, L.P., Faurschou, D.K. and Reeve, D.A. "Coal as an energy source in recovery and upgrading of Canadian heavy oils and tars"; presented 5th Int Conf Coal Research; Dusseldorf, W. Germany; Sept. 1-5, 1980 and in Proc D-2:269.

The amount of coal required for manufacturing synthetic crude oil from the Canadian oil sand deposits varies substantially depending on the combination of recovery and upgrading methods. Recovery methods - surface mining, steam injection and combustion and upgrading processes - hydrocracking and flexicoking are described. Results show that the coal required for steam injection/hydrocracking combination could approach 20 per cent of current Canadian thermal coal production.

053

Whaley, H., Capes, C.E., Ogle, I.C.G. and Reeve, D.A. "Coal-oil-mixture research and development in Canada"; presented 5th Int Conf Coal Research; Dusseldorf, W. Germany; Sept. 1-5, 1980 and in Proc C2:165.

The Canadian coal-oil-mixture (COM) program embraces both demonstration-scale projects and associated research and development. The demonstration projects include COM firing of an electrical utility company boiler rated at 10 MW_e with plans for the firing of a larger unit. R & D studies include COM rheology, preparation and combustion. The spherical agglomeration process, important to the beneficiation of coals is also described.

TECHNOLOGY INFORMATION DIVISION

054

Dixon, C.F. "New metals from swarf"; GEOS 16-17; Fall, 1980.

A technique is described which could reduce the loss of tons of aluminum, iron and copper each year in the form of machine turnings. Usually, these wastes are recycled by remelting but this process is energy intensive and is characterized by high oxidation losses. Using the new method, wastes are reclaimed and converted to a superior product by cold compacting followed by hot forming.

055

Job, A.L. "The early development of health and safety legislation in Ontario"; Can Inst Min Directory 14:91-96; 1980.

This report describes the development of health and safety legislation in Ontario mines from the earliest Act of 1890 to the 1960's. Major legislation is listed chronologically and bibliographic references are provided.

056

Weidmark, P.E. "Sixteenth supplement to bibliography of Canadian contributions in the field of rock mechanics"; Can Min Metall Bull 73:820:124-126; 1980.

SECTION 3

ORAL PRESENTATIONS

The following papers were presented at various meetings, conferences, and symposia. As indicated some have been published in the appropriate conference proceedings or as journal articles. They are available only from the journal or proceedings cited, or by direct request to the author.

MINERAL SCIENCES LABORATORIES

057

Campbell, M.C. "An overview of uranium extraction research at CANMET"; ERP/MSL 81-20(OP); presented NEA/IAEA Working Group on Uranium Extraction Meet; Paris, France; Feb. 25-27, 1981.

The Canada Centre for Mineral and Energy Technology (CANMET) is the principal federal government metallurgical laboratory in Canada. Its basic mission is to provide scientific and technological advice and support in the husbanding of Canadian mineral and energy resources. This report covers research carried out at CANMET or under contract by CANMET.

058

Campbell, M.C. and Ritcey, G.M. "Applications of chloride metallurgy to base metal sulphide and uranium ores at CANMET"; MRP/ERP/MSL 81-19(OPJ); presented Extraction Metall Conf '81. (Will be published in Conf Proc).

This paper presents an overview of the philosophy behind the selection of chloride metallurgy for the treatment of both base metal and uranium ores. Preliminary results and flow-sheets are shown for several of the options studied. Advantages, disadvantages, and economic aspects are discussed.

059

Carette, G.G., Painter, K.E. and Malhotra, V.M. "Performance of concrete made with normal portland cement, normal portland cement and slag or normal portland cement and fly ash at sustained high temperatures"; MRP/MSL 80-39(OPJ); presented Transport Research Board Ann Meet, Washington, D.C.; Jan. 1981.

Three concretes of different compositions were investigated to determine the changes in their mechanical properties after long-term exposure to sustained temperatures from 75 to 600°C and to ascertain if concrete containing less-energy-intensive material can perform satisfactorily at the prescribed temperatures. Results show that incorporating blast-furnace slag or fly ash did not adversely affect the mechanical properties.

060

Chen, T.T. "Mineralogy and characteristics that affect recovery of metals and trace elements from the ore at Heath Steele Mines; New Brunswick";

MRP/MSL 79-172(OP); presented 19th CIM Conf Metall, Halifax; Aug. 25-27, 1980.

Observations are offered on the deportment and mineralogical forms of valuable trace elements such as silver cadmium, indium and cobalt which have been ascertained for the milling circuit at Heath Steele Mines Limited, New Brunswick.

060a

Collings, R.K. "Mineral wastes as potential mineral fillers"; MRP/MSL 80-74(OPJ); presented 7th Mineral Waste Utilization Symp, Chicago, Illinois; Oct. 20-21, 1980. (Will be published in Symp Proc).

A study was made of mineral filler usage by selected industries in two major areas in Eastern Canada. Consumption in these two areas is probably about 75% of the estimated Canadian total with possibly 50% being imported. Filler requirements, waste availability and characteristics are reviewed and the possibility of utilizing specific wastes as fillers is discussed.

061

Craigen, W.J.S. "Overview on copper extraction technology for British Columbia"; MRP/MSL 80-147(OP); presented British Columbia Copper Smelting and Refining Technologies Seminar; Vancouver; Nov. 5-6, 1980.

This overview documents on a comparable basis the relative merits of various copper smelting/refining processes, with special emphasis on factors relevant to a British Columbia location. Suggestions are offered on how government and industry can interact to promote the development of the most desirable technology.

062

Haque, K.E. "Chlorine-assisted leaching of typical Canadian uranium ores"; ERP/MSL 80-86(OP); presented CIM Conf Metall, Halifax; Aug. 25-27, 1980.

This paper describes the results of laboratory-scale chlorine-assisted leaching of the three major types of Canadian uranium ores - conglomerate, vein and pegmatite. A comparison of results with other processes shows that only the chlorine-assisted and acid-chloride leachings in stages produce environmentally acceptable tailings from the three ores.

063

Joe, E.G. "Research on uranium mine/mill tailings management at the Canada Centre for Mineral and Energy Technology"; MRP/MSL 80-106(OPJ); presented AECB, Ottawa, Dec. 1979; Int Symp on Uran Tailings, May 1980 and Ministers' Briefing, July 1980 and in Proc.

A brief outline is given of CANMET's program of research relating specifically to the problem of existing uranium tailings and to examining alternatives in the management of current and future tailings.

064

Laguitton, D. and Sirois, L. "SPOC Project: Status and prospects after one year of joint effort"; MRP/MSL 80-179(OPJ); presented Can Min Process Ann Meet; Ottawa; Jan. 1981.

The SPOC project (Simulated Processing of Ore and Coal) was initiated in 1980 in CANMET to provide the mineral and coal industries with an easily usable computer methodology for process evaluation and optimization. This report gives the project's history, current structure and reviews progress achieved so far as well as results anticipated.

065

Lucas, B.H., Lakshmanan, V.I. and Slater, M.J. "Single stage deep fluidized bed continuous ion exchange demonstration pilot plant for the treatment of Beaverlodge uranium mine water"; ERP/MSL 80-97(OPJ); presented 19th Conf of Metall, CIM, Halifax; Aug. 24-28, 1980.

Eldorado Nuclear Ltd. and CANMET have developed a process for extracting uranium from Beaverlodge mine water while obtaining design data from a 0.76 m-diam extraction column. This paper describes the bench-scale process development and the design, construction and operation of a large pilot plant.

066

Malhotra, V.M. "Continuing education in concrete"; MRP/MSL 79-115(OPJ); presented 2nd Pan Am Symp on Concr Educ, Washington, D.C.; Oct. 30, 1979.

Recent developments in concrete technology are outlined and the slow acceptance of continuing education in concrete design and technology is explained.

067

Mathieu, G.I., Pritzker, M.D. and Capes, C.E. "Benefication of waste coals in Canada"; ERP/MSL 80-22(OP); presented Coal Technology '80 Conf, Houston, Texas; Nov. 18-20, 1980.

Investigations were undertaken to determine if coal being lost at various stages and particularly in the final tailings of concentration processes at cleaning plants could be recovered at commercial grade. Extensive grinding was necessary to obtain high grade coal concentrates, i.e., 9-12% ash by flotation. In spherical agglomeration test, even finer grinding was used and resulted in better coal concentrates with only 6% ash and high combustibles recoveries of 93 to 95%.

068

Mirkovich, V.V. "Significance of thermophysical properties of rocks on thermomechanical stability of underground installations"; MRP/MSL 80-90(OPJ); presented 7th European Thermophysic Prop Conf, June 30-July 4, 1980. (Will be published in Conf Proc).

To evaluate the thermomechanical stability of a proposed underground nuclear power site, rock specimens from a 300 m deep drill core were obtained and their thermal conductivity, diffusivity and expansion were determined from 20 to 500°C. Results are discussed from the viewpoint of the stability of a rock enclosure at higher heat fluxes.

069

Mirkovich, V.V. and Bell, K.E. "A novel method for predicting thermal shock resistance of brittle materials"; MRP/MSL 80-173(OPJ); presented Ann Meet, Can Ceram Soc, Toronto; Feb. 1981. (Will be published in J Can Ceram Soc).

Previous work had shown a relationship between the thermal spalling behaviour of rocks and the product of values for thermal expansion and diffusivity. This report describes an extension of this concept to thermal failure of a series of clay bodies. Good correlation is obtained between the predicted order of failure in thermal shock and actual failure determined by an empirical method.

070

Ralcevic, D. "Removal of radionuclides from uranium ores and tailings to yield environmentally acceptable waste"; MRP/MSL 80-32(OP); presented 1st Int Conf Uran Mine Waste Disposal, Vancouver; May 19-20, 1980. (Will be published in Conf Proc).

Two possible solutions to the problem of residual uranium and other radionuclides in uranium mill tailings are described. Economic and environmental advantages of both approaches and the leaching of concentrates are also discussed.

071

Silver, M. and Andersen, J.E. "Removal of radium from Elliot Lake uranium tailings by salt washing"; MRP/MSL 79-142(OPJ); presented 15th Can Symp Water Poll Res Can, Univ of Sherbrooke; Dec. 7, 1979. (Will be published in Conf Proc).

The commercial and environmental implications of a salt washing procedure for removing radium from Elliot Lake uranium tailings are discussed.

072

Silver, M. and Ritcey, G.M. "A simulated study on the effects of bacteria, organics and salt solutions on uranium mine mill tailings from Elliot Lake, Ontario"; MRP/MSL(OPJ); presented 2nd Int Symp of Waste Treatment and Utilization; June 19, 1980, Univ of Waterloo, Waterloo, Ont. (Will be published in Proc).

The effects of iron-oxidizing bacteria and organic solvent extraction reagents on uranium mine mill tailings from Elliot Lake, Ontario were examined to establish a model to predict acid

formation and radium-226 leaching. Results show that there is no difference in the rates that radium-226, sulphate, iron and uranium are leached from the tailings in the absence or presence of organic solvent extraction reagents.

073

Skeaff, J.M. and Laliberté, J.J. "Continuous high temperature chlorination of uranium ore"; ERP/MSL 80-48(OP); presented Am Inst Chem Eng Meet, Portland, Oregon; Aug. 17-20, 1980.

This paper describes current research in the operation of a vertical 25-mm diam continuous shaft furnace for the chlorination of uranium ore with a maximum capacity of approximately 1 kg/h. Extractions of 94 and 93% for uranium and Ra-226 respectively have been obtained for an Elliot Lake ore.

074

Sutarno, R. "ISO/TC 102/SC 2/WG 12 Report on activities for the period of 1978-1980"; MRP/MSL 80-119(OP); presented 10th Meet, ISO/TC 102/SC 2, Pretoria, S.A.; Oct. 20-30, 1980.

This report describes the activities of ISO/TC 102/SC 2/WG 12 during 1978-1980. It outlines the application of centralized data processing within the subcommittee and summarizes the results of a questionnaire on the validity of precision estimated by international tests conducted by the subcommittee.

075

Tuovinen, O.H., Silver, M., Martin, P.A.W. and Dugan, P.R. "The Agnew Lake uranium mine leach liquors: Chemical examinations, bacterial enumeration and composition of plasmid DNA of iron-oxidizing thiobacilli"; ERP/MSL 80-143(OPJ); presented Int Conf on Use of Micro-organisms in Hydrometall, Pecs, Hungary; Dec. 1980. (Will be published in Conf Proc).

Results show that there is no seasonal variation in the numbers of glucose and iron oxidizing bacteria, nor in pH and Eh, nor in the concentrations of uranium, ferrous and total iron, sulphate sulphur, radium-226 and thorium in the leach liquors of the Agnew Lake uranium mine.

076

Wheat, T.A. "An overview of the CANMET program in fast-ion conductors"; ERP/MSL 80-70(OP); presented seminar on fast-ion conductors, Queen's Univ; May 14, 1980.

The formation of CANMET's fast-ion conductors program is presented relative to developments elsewhere. A brief review of its R & D and a survey of extramural activities being conducted under contract are given. The role of both these intra- and extramural activities in developing a vertically integrated program between laboratory-scale research and industrial development is outlined.

077

Wilson, H.S. "Investigation into sintering coal-mine shales for lightweight aggregate - Part 2"; MRP/MSL 80-44(OPJ); presented Lightweight Concr Congr, London, England; April 14-15, 1980. (Will be published in Conf Proc).

Sintering tests were made on two samples of low-carbon coal-mine shale from Sydney, N.S. Physical properties of the lightweight aggregate made from each sinter were determined. Results indicate that lightweight aggregate suitable for concrete masonry units could be produced from these shales.

078

Winer, A.A. and Pilgrim, R.F. "Density and surface tension as parameters in the processing of mineral insulation"; MRP/MSL 79-57(OPJ); presented Can Ceram Soc Conf, Ottawa; Feb. 27-29, 1980. (Will be published in J Can Ceram Soc).

A multivariable statistical analysis was made from the results of surface tension and density, both important parameters in mineral insulation processing. Mathematical models were developed for the $\text{SiO}_2\text{-Al}_2\text{O}_3\text{-CaO}$ system relating these parameters to melt composition. This provided a means for determining the relative effects of the components in a glass melt.

ENERGY RESEARCH LABORATORIES

079

Adams, C.J. "The reduction of composite pellets of iron ore and coal to liquid iron - A summary of laboratory work"; MRP/ERL 80-15(OP); presented CIM Conf of Metall, Halifax; Aug. 24-28, 1980.

A summary is presented of an investigation of a proposed direct-reduction process at a theoretical and bench-scale level. A computer study using energy and mass balance equations supported by experimental results showed that the proposed smelting process is thermodynamically sound. However, the ultimate success of the process will depend on whether sufficient heat can be retained within the reaction vessel where it is needed.

080

Braaten, R.W., Hayden, A.C.S., Reilly-Roe, P. and Kunz, W.G. "Canadian road test of automotive exhaust lead traps"; ERP/ERL 80-49(OP); presented Ann Meet Air Poll Control Assoc, Montreal; June 22-27, 1980.

Results are given of a two-year test program on automotive exhaust lead traps. These traps, designed and built by DuPont Company, can reduce lead emissions by an average of 80%.

081

Brown, T.D. "The application of coal petrography in different processes: Coal conversion"; ERP/ERL 80-81(OP); presented Can Coal Pet Group Spec Meet; Ottawa; Nov. 7, 1980.

Coal gasification and liquefaction processes are described which involve the chemical and structural characteristics of the coal on a micro-scale in a manner that could reflect differences in the chemical structure (petrographically identifiable) of the coal.

082

Brown, T.D., Leeder, W.R., Price, J.T. and Gransden, J.F. "The role of CANMET in the research activities of the Canadian Carbonization Research Association"; ERP/ERL 80-59(OP); presented 19th Conf of Metall, CIM, Halifax; Aug. 24-28, 1980.

CANMET provides the experimental facilities for the Canadian Carbonization Research Association's activities in cokemaking and resource evaluation. Experimental programs using technical-scale coke ovens to investigate the effects of selective pulverization, partial briquetting and pitch additions are illustrated.

083

Chmielowiec, Jan, Beshai, Joan E. and George, Albert E. "Separation characterization and instrumental analysis of polynuclear aromatic hydrocarbon ring classes in petroleum"; ERP/ERL 80-65 (OP); presented meeting Am Chem Soc, Las Vegas, Aug. 24-29, 1980.

A high performance liquid chromatographic (HPLC) separation procedure having selectivity for up to four aromatic rings was used to separate polynuclear aromatic hydrocarbon (PAH) ring classes in heavy Lloydminster and light Medicine River

oils. The procedure proved useful for characterizing the complex PAH mixtures in hydrocarbon materials.

084

George, A.E. "Rapid chromatographic procedure for the characterization of hydrocarbons in synthetic fuel naphthas"; ERP/ERL 80-53(OP); presented 35th Northwest 5th Biennial Rocky Mountain Joint Regional Meet, Am Chem Soc; June 12-14, 1980.

A rapid chromatographic procedure is described for determining the hydrocarbon component composition of full range naphtha in synthetic fuels. Five naphtha samples produced by the hydrocracking of Athabasca bitumen were analyzed by this method. A complete characterization takes 90 min and requires only 30 µm of sample.

085

George, A.E. "Separation and characterization techniques for chemical analysis of bitumens, heavy oils and their processing products"; ERP/ERL 80-56(OP); presented Petro-Canada, Calgary; May 13, 1980.

Various separation and characterization techniques used by CANMET's Energy Research Laboratories for chemical analysis of bitumens, heavy oils and their processing products are described.

086

Grandbois, M.A., Fonseca, R., Chornet, E., Teodosiu, G. and Kelly, J.F. "Low rank coal liquefaction with synthesis gas"; ERP/ERL 80-86(OP); presented 30th Can Chem Eng Conf; Edmonton; Oct. 19-22, 1980.

This report describes a continuing study to liquefy a Saskatchewan lignite using simulated syngas (carbon monoxide/hydrogen mixtures). Results show that a stepwise process is needed for catalytic upgrading of lignite-derived oil. Nitrogen should be reduced first, followed by oxygen removal and final hydrogen addition. A significant reduction in the severity of operating conditions can be achieved with catalysis since oil yields were as high as 51%.

087

Hayden, A.C.S. and Braaten, R.W. "Effect of wood stove design on performance"; ERP/ERL 80-46(OP); presented 1980 Ann Meet Can Wood Energy Inst, Toronto; March 31-April 2, 1980.

Experiments were conducted on a number of wood stoves representing five basic designs. Typical results from the five types are presented and the effects of combustion design on performance, related to both efficiency and emissions, are discussed.

088

Kelly, James, F. "Coal liquefaction in Canada - The CANMET program"; ERP/ERL 80-61(OPJ); presented 63rd Can Chem Conf, Ottawa; June 8-11, 1980 and in CIM Bull 74:826:72-80; Feb. 1981.

A review of basic principals and some of

the processes in the production of liquid fuels from coal are presented. An overview of the CANMET coal liquefaction contract program is given and results from batch autoclave studies are discussed. Development of a laboratory-scale continuous-flow coal liquefaction unit at CANMET is also discussed.

089

Poirier, M.A. and George, A.E. "Olefin distribution in the naphtha products of processed Lloydminster oil"; ERP/ERL 80-05(OP); presented Pittsburgh Conf on Anal Chem and App Spectrosc, Atlantic City; March 1981.

Two Lloydminster naphthas were analyzed by an hydroboration-oxidation procedure which permits the separation of olefins in the form of alcohols. This report describes the separation and analysis of the alcohol component by gas chromatography-mass spectrometry, which leads to identification of the corresponding olefins.

090

Poirier, Marc-André and George, Albert E. "A method for determining the olefinic content of the saturated and aromatic fraction of petroleum distillates by hydroboration"; ERP/ERL 80-63(OP); presented Energy Research Laboratories, Bells Corners complex; Dec. 11, 1980.

A method for determining olefin content in naphtha and higher boiling distillate fractions is described. Results are compared with the standard FIA method, and a method utilizing both the FIA and proton magnetic resonance spectrometry.

091

Ranganathan, R., Patmore, D., Belinko, K., Khulbe, C.P., Tscheng, J., Logie, R.B. and Denis, J.M. "Upgrading processes for heavy oils and bitumen"; ERP/ERL 80-54(OP); presented 63rd Can Chem Conf, Ottawa; June 8-11, 1980.

A general review and description of the coking and hydrocracking processes for heavy oils and bitumen are given along with a comparison of these processes from the viewpoint of Canadian and Venezuelan feedstocks. Processing and energy balance problems as well as products specifications and byproduct waste are discussed.

092

Staff, Coal Resource and Processing Laboratory "Canadian Carbonization Research Association research activities at CANMET"; ERP/ERL 80-50(OP); presented by Dr. J.T. Price 3rd joint NKK-CCRA Technol Meet, Stelco Research Centre, Burlington, Ont.; May 26-27, 1980.

An outline is presented of the research activities of the CCRA, i.e., comparison of technical and commercial coke ovens, cokemaking with Canadian coals, selective pulverization, partial briquetting. Future programs are also delineated in coal beneficiation, coal additives, and coke quenching.

093

Whaley, Horace. "Overview of the Canadian COM program"; ERP/ERL 81-07(OP); presented 3rd Int Symp Coal-Oil Mixture Combustion, Orlando, Florida; April 1-3, 1981.

The effect of the increasing differential between the cost of fuel oil and coal in Canada has led to the initiation of a program encompassing the technologies relating to the combustion of mixtures of coal and oil (COM). This report provides an overview of the Canadian COM program under two headings - demonstration projects and research and development.

094

Whaley, H. and Lee, G.K. "Studies of plume rise during neutral and stable conditions in Canada"; ERP/ERL 80-13(OPJ); presented 73rd Ann Meet Air Poll Cont Assoc; Montreal; June 22-27, 1980.

Plume rise data obtained during six years of research by the Canadian Combustion Research Laboratory (CCRL) was evaluated and compared to the two forms of the Briggs relationship for neutral and stable conditions. It has been shown that the data can be represented by the Briggs form of equation, particularly for stable conditions. In neutral conditions the data suggest a proportionality constant of 0.87 and a levelling-off at 15 stack heights rather than a 1.6 constant and a levelling-off at 10 stack heights as suggested by Briggs.

095

Whaley, H., Lee, G.K. and Doiron, C.C. "An assessment of the environmental emissions from a utility boiler firing beneficiated coal-oil mixtures"; ERP/ERL 80-24(OP); presented 73rd Ann Meet Air Poll Cont Assoc; Montreal; June 22-27, 1980.

A cooperative demonstration project to evaluate the feasibility of burning coal-oil mixtures (COM) in a small utility boiler is described. The aim was to assess the environmental impact of COM technology and whether this can be reduced through coal cleaning by spherical agglomeration. It was shown that fly ash emissions can be reduced by 50% and sulphur emissions by 10% using the coal cleaning process.

PHYSICAL METALLURGY RESEARCH LABORATORIES

096

Davis, K.G. and Magny, J.G. "Magnesium wire treatment of molten cast iron"; MRP/PMRL 80-36 (OPJ); presented Conf Solidification Tech in the Foundry and Casthouse, Univ Warwick, England; Sept. 1980. (Will be published in Conf Proc).

Tests on techniques for producing ductile iron by injecting magnesium wire into molten cast iron are described. None proved suitable for direct industrial use. However, problem areas in wire injection were delineated, and the means to obtain good magnesium recovery identified.

097

Davis, G.K. and Magny, J.G. "Optimum ladle preheating practice with gas torches"; MRP/PMRL 81-1(OPJ); presented CANMET/AFS Sem on Energy Conservation in the Foundry, Cambridge, Ont.; Oct. 27-30, 1980.

The efficiency of preheating a 450-kg ladle by a natural-gas torch was examined. Results show that the best torch-head position is approximately central and level with the ladle rim; ladle configuration is not critical; high-alumina lining always required more gas for a given temperature than the fireclay-mullite lining; for holding times up to 15 minutes, only about the first 50 mm of the lining takes part in heat transfer with the metal.

098

Godden, M.J. and Boyd, J.D. "Characterization of microstructures in weld heat-affected zones by electron microscopy"; ERP/PMRL 80-52(OPJ); presented 13th Ann Meet Int Metall Soc, Brighton, England; Aug. 1980.

A technique for preparing thin foil specimens from known locations in a weld heat affected zone is described, and the results of a transmission electron microscopy study of the seam weld HAZ for three types of commercial line pipe are presented.

099

Knight, R.F., Tyson, W.R., Lavigne, M.J., McGrath, J.T. and Boyd, J.D. "Materials for hydrogenation vessels"; MRP/PMRL 79-85(OPJ); presented Conf Mat to Supply Energy Demand; Harrison Hot Springs, B.C.; May 12-16, 1980.

Hydrogenation is used in the petroleum industry in processes such as hydrocracking, hydrosulphurization and a catalytic reforming. A review is presented of materials and fabrication methods for hydrogenation vessels.

100

Packwood, R.H. and Brown, J.D. "Concerning X-ray production and quantitative analysis"; MRP/PMRL 80-43(OPJ); presented Microbeam Analysis Soc, Reno, Nevada; Aug. 1980.

This paper describes a new fundamental theory for microprobe analysis, which permits greater analytical accuracy over a larger range of conditions than was previously possible.

101

Pussegoda, L.N. and Tyson, W.R. "Relationship between microstructure and hydrogen susceptibility of some low carbon steels"; MRP/PMRL 80-42(OPJ); presented 3rd Int Conf on the effect of hydrogen on behaviour of materials, Jackson Lake, Wyoming; Aug. 1980. (Will be published in Conf Proc).

Results are given from a study on the effect of internal hydrogen in reducing the ductility of some low-carbon steels, as indicated by slow tensile testing.

102

Revie, R.W. "Line-pipe research in the Canadian federal government"; ERP/PMRL 80-28(OPJ); presented Int Conf, Pipeline and Energy Plant Piping - "Fabrication in the 80's"; Calgary; Nov. 10, 1980.

Highlights from EMR's line-pipe program are presented to illustrate the work the department has been performing to ensure the integrity of pipelines operating in the Canadian north.

103

Sahoo, M., Edwards, J.O. and Thomson, R. "Influence of corrosion inhibiting heat treatment on the microstructure and impact properties of nickel-aluminum bronze alloy C95800"; MRP/PMRL 80-35(OPJ); presented Am Fdy Soc Conf, St. Louis, Mo.; April 21, 1980 and in *Trans* 88:769-776; 1980.

Results are given from the following studies conducted by EMR Canada on materials utilization: control of cooling rates of test bar castings to optimize benefit from precipitation effects of kappa phase; analysis of phases precipitated during anti-corrosion heat treatment; effect of corrosion-inhibiting heat treatment on the Charpy V-notch impact toughness of NAB alloys; thermomechanical processing of concast alloys.

104

Tyson, W.R. "Elastic-plastic fracture"; MRP/PMRL 80-40(OPJ); presented Int Summer School "Fracture of Metals - Control - Reliability"; Ecole Polytechnique, Montreal; July 14-23, 1980.

This paper summarizes the concepts underlying the proposed test methods of elastic-plastic fracture mechanics and indicates the extent to which the microstructural parameters which control ductile fracture during crack propagation have been identified.

105

Tyson, W.R. "Hydrogen in steel"; MRP/PMRL 80-77(OPJ); presented 22nd Mech Working and Steel Processing Conf, Iron and Steel Soc, AIME; Toronto; Oct. 1980.

A brief overview is presented of the fundamental characteristics of the iron hydrogen system, a discussion of embrittlement phenomena, and a summary of practical implications. Current understanding of the factors involved in embrittlement is emphasized.

MINING RESEARCH LABORATORIES

106

Bigu, J. "Progress during 1980 in the underground environment project of the CANMET minerals program"; MRP/MRL 80-78(OP); presented Joint Panel on Occupational and Environ Res for Uran Prod in Canada, Saskatoon; June 24-26, 1980.

A summary is given of the progress of CANMET's underground environment project dealing with radiation source identification, measurement and control; dust source identification, measurement and control; diesel emissions, measurement and control; ventilation network R/D; and noise/vibration evaluation and control.

107

Bigu, J. "Monitoring of radiation variables in the underground environment"; MRP/MRL 80-81(OPJ); presented Joint Panel Occupational Environ Res for Uran Pro in Canada, Saskatoon; June 24-26, 1980.

A review is presented of instrumentation for monitoring radiation variables in the underground environment. Continuous monitoring systems, grab sampling systems, personal dosimeters and time-integrating environmental monitors are discussed.

108

Bigu, J. and Kirk, B. "Determination of the unattached radon daughter fractions in some Canadian uranium mines"; MRP/MRL 80-112(OP); presented Workshop on Attachment of Radon Daughters, Measurement Techniques and Related Topics, Univ of Toronto; Oct. 30, 1980.

The unattached radon daughter fraction was experimentally determined in several Canadian uranium mines by wire screen, and diffusion sampler based on Mercer's theory of diffusional deposition on parallel circular plates. Unattached fractions ranged from 1.95 to 8% for non-diesel areas and about 0.55% for diesel areas.

109

Bossert, J.A. "The role of research and development in certification of mining equipment"; MRP/MRL 80-27(OP); presented 82nd Ann Gen Meet, Toronto; April 1980.

A brief outline is given of the historical development of the certification services provided by CANMET's Canadian Explosive Atmospheres Laboratory (CEAL) as well as the effect of R & D on certification.

110

Cherry, J.A., Blackport, R.J., Dubrovsky, N., Gillham, R.W., Lim, T.P., Murray, D., Reardon, E.J. and Smyth, D.J.A. "Subsurface hydrology and geochemical evolution of inactive pyritic tailings in the Elliot Lake uranium district, Canada"; presented Symp on Uranium Tailings Management, Fort Collins, Colorado; Nov. 24-25, 1980.

Results are given from an investigation to delineate the hydrogeochemical conditions and directions of groundwater flow within tailings of different age, texture, surface drainage, and surface reclamation status.

111

Dainty, E.D., Lawson, A. and Mogan, J.P. "The impact on underground ventilation of the reduction of diesel emissions toxicity by water-in-oil fuel emulsification"; MRP/MRL 80-11(OP); presented CIM Ann Gen Meet, Toronto; April 20-24, 1980.

This paper describes an investigation of the water/oil emulsion strategy on two diesel engines - the Deutz indirect injection engine and the Detroit direct injection engine. The application of emulsified fuel treatment to the Detroit engine did not prove practicable; however, substantial benefits occurred in the Deutz engine.

112

deKorompay, V. "Proposed procedure for using a 'hydraulic pot' for measuring the effect of the revegetation on the hydraulic and radiation conditions of uranium tailings ponds"; MRP/MRL 79-65(OPJ); presented Can Soc for Civil Eng Conf, Montreal; June 7-8, 1979.

This paper describes a procedure for measuring the effect of revegetation on hydraulic and radiation properties of uranium mill tailings stored in surface ponds.

113

Fisekci, M.Y., Chiang, C. and Bannerman, W. "Update in the hydraulic mine strata mechanic studies in thick and steep seams of Rocky Mountains"; ERP/MRL 80-56(OP); presented 21st U.S. Rock Mech Symp, Rolla, Missouri; 1980 and in Proc.

An update is presented on a joint strata mechanics (ground control) research project undertaken with Kaiser Resources Ltd. at its hydraulic mine in Sparwood, B.C. It covers the R & D at the nine-year old mine before its closure. Variations in support loading, pillar and roadway deformations are discussed in relation to underground extraction and depth of cover. A new computer application to data analysis is discussed and programmed work for a new hydraulic mine at a deeper cover is outlined.

114

Gyenge, M. "Nuclear waste vault sealing"; MRP/MRL 80-16(OPJ); presented 13th Can Rock Mech Symp; Toronto; May 28-29, 1980.

Of particular concern in vault sealing are the physical and chemical properties of the sealing materials, its long-term durability and stability, and the techniques used for its emplacement. Present sealing technology and material are reviewed and areas requiring research and development are indicated.

115

Hambley, D.F., Hedley, D.G.F. and Morgan, G.M. "Use of analog and computer models in the Elliot Lake uranium mines"; MRP/MRL 80-5(OP); presented 13th Can Rock Mech Symp; Toronto; May 28-29, 1980 and in CIM Spec Vol 22, p 151; 1981.

The electrical resistance analog and the displacement discontinuity method developed for orebodies on the Witwatersand in South Africa have recently been used for similar type orebodies in

the Elliot Lake mines. A short description of the development of these techniques is given together with their advantages and limitations in modelling complex mining geometries. Typical results and possible applications are presented.

116

Herget, G. "Regional stresses in the Canadian Shield"; MRP/MRL 80-8(OP); presented Geotech Info Meet, Ottawa; May 5-6, 1980 and in Proc 13th Can Rock Mech Symp, Toronto; May 1980.

A summary is provided on ground stress determinations from several mine sites in Ontario and Manitoba. All sites are located in the Superior and Southern Tectonic Province of the Canadian Shield which consists of Precambrian crystalline rocks comprising volcanics, metamorphosed sediments and granites.

117

Kirk, B. "An iris diaphragm based interface for use in eriometry"; MRP/MRL 80-64(OP); presented as Master of Science Thesis, Laurentian Univ, Sudbury, Ont.; Feb. 1980.

A new inexpensive method is described for interfacing the eriometer to a mini-processor. The interface consists of an iris diaphragm placed in the diffraction plane with subsequent focussing onto a single photodetector. The system integrates over any angular variations in the diffraction pattern without requiring a complex photodetector system.

118

Kirk, B. "A review of optical methods of measuring fineparticles"; MRP/MRL 80-73(OP); presented seminar, Laurentian Univ, Sudbury, Ont.; June 1980.

A review is made of basic principles of the most commonly used optical methods - extinction (turbidity), diffraction (spatial filtering), and depolarization with single particle or group analysis. Uses in the automobile and medical industry are cited.

119

Kirk, B. "A newly designed automatic sieving system"; MRP/MRL 80-74(OP); presented Powder Bulk Solids Conf, Chicago; May 1980.

A new method known as SORSI, for automatically sieving powders is described. This system overcomes many of the difficulties encountered in conventional sieving methods.

120

Knight, G. "The use of an on-line computer to control quantitative XRD analysis"; MRP/MRL 80-101(OPJ); presented 4th Symp on Electron Microsc and X-ray Appl to Environ and Occup Health Anal, State College, Pennsylvania; Oct. 15-17, 1980.

A PDP8 on-line computer technique was interfaced to a Phillips X-ray diffractometer to minimize analysis time. Up to four quartz and four other diffraction lines can be analyzed on 34 samples at a time. Statistical accuracy shows good agreement with previous off-line technique.

121

Murray, D.R. "Water movement and contamination in and from sulphide uranium tailings related to surface treatment and abandonment"; MRP/MRL 80-91(OP); presented Can Land Reclam Assoc 5th Ann Meet, Timmins, Ont.; Aug. 18-20, 1980.

Results are presented from investigations into water treatment technology, water quality monitoring and oxidation processes to create a model to understand better the problems of tailings in the context of management and abandonment.

122

Savich, M.U. "Noise measurement in mines"; MRP/MRL 80-47(OP); presented Int Symp Pers Hearing Protect, Toronto; May 14-16, 1980.

Systems developed for evaluating and monitoring noise in mines are described including the graphical method, noise monitor hat, noise monitor gun, measurement of the attenuation of ear muffs and the noise exposure index, and new noise dosimeter instruments.

123

Savich, M. "Practical problems of hearing protector use in Canadian mines"; MRP/MRL 80-59(OP); presented Int Symp Pers Hearing Protect Ind, Toronto; May 14-16, 1980.

The main characteristics of 11 commercially available ear muffs were investigated and analyzed by psychophysical and physical methods. Conclusions and recommendations are provided.

124

Singh, K.H. and Hedley, D.G.F. "Review of fill mining technology in Canada"; MRP/MRL 80-38(OPJ); presented Conf Appl Rock Mech Cut and Fill Mining, Lulea, Sweden; June 1-3, 1980.

An historical review is described of the evolution of technology in underground hardrock mines in the Canadian mining industry in the areas of hydraulic and cemented fills, undercut-and-fill, mechanized cut-and-fill, post pillar, vertical retreat and blasthole mining methods.

125

Srajer, V. "Air injection test in oil sands"; ERP/MRL 80-24(OP); presented Applied Oilsands Geosci Conf, Edmonton; June 11-13, 1980.

An air injection technique to investigate permeability in coal pillars resulting from fracturing at the Saline Creek Tunnel in Fort McMurray is described.

126

Zahary, G. "Organization of coal mining research in Canada"; ERP/MRL 80-86(OP); presented IMEC 80 Conf, Calgary; Aug. 26-28, 1980.

The four most active centres for coal mining research in Canada are CANMET, CMRC, universities of Alberta and Calgary and consulting engineering firms as a group. CANMET maintains the oldest and most comprehensive program of coal research. Its organizational structure, laboratories and services are described. A list of contacts representing the coal mining research system in Canada is given.

SECTION 4

DIVISIONAL REPORTS

The reports listed below are available for purchase in microfiche or paper copy from Micromedia Limited, Box 502, Station S, Toronto, Canada, M5M 4L8.

MINERAL SCIENCES LABORATORIES

INVESTIGATION REPORTS (IR)

128

MRP/MSL 79-88(IR). Pritzker, M.D. "The use of sodium sulphate to float secondary heavy-media cyclone middlings from Fording Coal Limited"

129

MRP/MSL 79-127(IR). Parsons, H.W. and Kearns, J.B. "The dry chlorination of Zn/Pb/Cu sulphide ores 7. Further investigation of the oxidation of the chlorinated calcine"

130

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- 263
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301
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304
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ENERGY RESEARCH PROGRAM

TECHNICAL REPORTS (TR)

307
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308
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309
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310
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TECHNOLOGY INFORMATION DIVISION

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314

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SECTION 5

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The reports listed below are available for purchase in microfiche or paper copy from Micromedia Limited, Box 502, Station S, Toronto, Canada, M5M 4L8

- 326
"Study of the use of tailings as backfill in uranium mines"; Watts, Griffis and McOuat Limited
Contract OSQ77-00096 - 132 p
- 327
"Feasibility study for an occupational health and safety research centre at Elliot Lake, Ontario for uranium production"; Greig, G.A., Harris, R.A., Kidd, W.M. and Zahary, G.
Contract OSQ77-00032 - 125 p
- 328
"Evaluation of the CEA personal alpha dosimeter"; Phillips, C.R. and Lin Pai, H. University of Toronto
Contract OSU76-00222 - 106 p
- 329
"Optimization of coal recovery from open pits"; Kim, Y.C. and Wolff, S.F., University of Arizona
Contract OSQ77-00036 - 234 p
- 330
"Liquefaction of low rank coals. Phase 1 - An overview batch hydrogenolysis of lignite equilibrium thermodynamics"; Beak Consultants Limited
Contract OSQ77-00131 - 267 p
- 331
"Engineering feasibility study of the British Columbia Research Hog Fuel Gasification System"; Simons, H.A. (International) Ltd.
Contract OSQ77-00269 - 83 p
- 332
"Fluidized bed gasification of fine coal waste"; B.C. Research
Contract OSQ77-00269 - 113 p
- 333
"Report on geotechnical review of applicability of shortwall mining in the Lethbridge coalfield"; Dames and Moore
Contract OSQ77-00175 - 69 p
- 334
"Modelling of grinding and classification for fine-grained sulfide ores of New Brunswick"; Everell, M.D., Bérubé, M.A. and Hodouin, D., Université Laval
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- 335
"Study of the relative fuel efficiencies under Canadian climatic conditions of automobiles with advanced engine designs. Phase III"; Grinberg, L., Shell Canada Limited
Contract OSQ77-00197 - 44 p
- 336
"Nuclear magnetic resonance spectroscopy in the Energy Research Laboratories of the Canada Centre for Mineral and Energy Technology"; Ozubko, Richard
Contract 93945 - 80 p
- 337
"Emission control of a Deutz F6L 714 diesel engine, derated for underground use, by application of water/oil fuel emulsions"; Lawson, A., Simmons, E.W. and Pielt, M., Ontario Research Foundation
Contract ISQ78-00022 - 87 p
- 338
"Annual report 1978-79, Canadian Uranium Health and Safety Program"; Elliot Lake Centre d'Elliot Lake
Contract OSQ77-00032 - 42 p
- 339
"Design, development and prototype production of a heat reclaimer, Phase II report"; The Cambrian Engineering Group Limited
Contract OSQ77-00110 - 20 p
- 340
"Report on the design and development of micro-computer real time data acquisition monitoring and control system"; McCullough, L.R., Testa, V., Mohamad, M.H. and Shankaranarayana, L.G. Powers Conspec.
Contract OSQ77-00133 - 111 p
- 341
"Final report - CO utilization project, 1977-78"; Pandompatan, B., Union Carbide Canada Ltd.
Contract OSQ77-00257 - 83 p
- 342
"Gasification and petrographic studies of Saskatchewan lignites"; Saskatchewan Power Corporation
Contract OSQ78-00023 - 222 p
- 343
"Analysis of the products of Canadian coal washeries"; Warnock Hersey Professional Services Ltd.
Contract OSQ78-00026 - 8 p

344

"Technical and economic assessment of horizontal continuous casting of steel"; Ferrco Engineering Ltd.

Contract OSQ78-00197 - 118 p

345

"Laboratory report on the preparation of large concrete specimens for long-term durability studies in sea water environment off the coast of the Maritime Provinces"; Bremner, T.W., Department of Civil Engineering, University of New Brunswick

Contract OST78-00035 - 20 p

346

"Arsenic pollution associated with gold extraction - Literature review"; Western Research and Development Ltd.

Contract OSQ4-0152 - 59 p

347

"Impact of the partial substitution of methanol in industrial and automotive fuels, Final report - Part I"; Ontario Research Foundation

Contract OSQ76-00162 - 130 p

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"Impact of the partial substitution of methanol in industrial and automotive fuels, Final report - Part II"; Ontario Research Foundation

Contract OSQ76-00162 - 255 p

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"Study of the removal of radionuclides from process streams, Final report"; Itzkovitch, I.J., Ontario Research Foundation

Contract OSQ78-00001 - 189 p

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"A study of coal agglomeration and coal-in-oil mixture combustion in a utility boiler period: June 1978 to July 1979"; Whalen, P.J., Davies, F.W., Lee, L.K. and Mitchell, K.A., New Brunswick Electric Power Commission

Contract OSQ78-00025

351

"Design of a boiler utilizing a fluid-bed concept for the combustion of coal and waste product"; Intercontinental Engineering Ltd., Coal Processing Consultants Ltd.

Contract OSQ77-00240 - 185 p

352

"Conceptual design of a fluidized bed steam generator"; Foster Wheeler Limited

Contract OSQ77-00241 - 130 p

353

"Study of the effect of light on cadmium release from glazes"; Baranyi, Ontario Research Foundation

Contract OSQ78-00189 - 47 p

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"A conceptual design for a computer program to assist in the design of mine layouts (MINLAY); Noranda Mines Limited, Norcomp Division

Contract OSQ79-00084 - 118 p

355

"Bore hole locator model BH-20"; Richard Brancker

Research Ltd.

Contract OSQ79-00059 - 25 p

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"Characterization of TiN particles in HSLA steels for the control of grain growth; Weatherly, G.C., Department of Metallurgy and Materials Science, University of Toronto

Contract OSU79-00265 - 19 p

357

"Emission control of a Detroit Diesel 8V 71N engine derated for underground use - Final report of Phases I and II; Lawson, A., Pielt, M.J. and Last, A.J., Ontario Research Foundation

Contract OSQ77-00183 - 195 p

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"Heating plant fluidized bed boiler study, Phase II: Conceptual design of plant"; Foster Wheeler Limited, Montreal Engineering Company Limited

Contract OSQ78-00168 - 156 p

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"Investigation of the utilization and disposal of boiler ash from C.F.B. Summerside, P.E.I. Interim report; Intercontinental Engineering Ltd., Coal Processing Consultants Ltd.

Contract OSQ79-00065 - 236 p

360

"Ion exchange pilot plant: Final report"; Wright Engineers Ltd.

Contract OSQ78-00151 - 7 p

361

"Preparation of a conceptual heating plant design and boiler demonstration program for C.F.B. Summerside, P.E.I."; Intercontinental Engineering Ltd., Coal Processing Consultants Ltd.

Contract OSQ78-00237 - 341 p

362

"Pylon working level meter WL-1000, CANALPH 3A"; Pylon Electronic Development Company Ltd.

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363

"Specimens for study of performance of portland cement/slag/fly ash concrete in marine environment - Phase II; Bremner, T.W., Department of Civil Engineering, University of New Brunswick

Contract OSU79-00068 - 26 p

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"Soil amendments"; Techman Ltd.

Contract OSQ79-00083 - 212 p

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"The quantitative assessment of polynuclear aromatic hydrocarbon levels in uranium mines (UP-L-98); Westaway, K., Chemistry Department, Laurentian University

Contract ISU79-00042 - 102 p

366

"Pyrite removal from steam coals using the counter-current fluidized cascade, Final report, Phase I"; Beeckmans, J.M., Faculty of Engineering Science, University of Western Ontario

Contract IST78-00075 - 32 p

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"Longwall mining feasibility study with particular reference to the Atlas Mine, Vols. I & II"; Stephenson, H.G. (Mining Consultants) Ltd.

Contract OSQ77-00171 - 415 p

368

"An experiment in high speed mine development at Kaiser Resources Ltd.'s hydraulic coal mine in Sparwood, South Eastern British Columbia"; Kaiser Resources Ltd.

Contract OSQ77-00203 - 36 p

369

"Feasibility study for a peat-fired steamelectric power station with specific reference to North-East New Brunswick"; Montreal Engineering Company Limited

Contract OSQ78-00163 - 260 p

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"Study of corrosion and erosion of fluid bed coal combustor boiler tubes. Phase I"; B.H. Levelton and Associates Ltd.

Contract OSQ79-00005 - 84 p

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"Selection of criteria to evaluate plant species for use in mine waste reclamation"; Dames and Moore

Contract OSQ79-00066 - 42 p

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"Specialized reclamation equipment"; Techman Ltd.

Contract OSQ79-00079 - 214 p

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"Supercritical gas extraction of Canadian coals"; Raylo Chemicals Limited

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376

Man, P.K., Yang, E., Dalla Lana, I.G. and Otto, F.D. "Study of high-pressure hydroprocessing reactions using a flow mini-reactor system" Edmon-

ton, University of Alberta, Department of Chemical Engineering, November 1979. Agreement 143-2-79 - 34 p

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INDEX

(AUTHOR & SUBJECT)

Refer to bracketed number at end of each entry to find publication details which are listed numerically in Sections 1 through 6 of Catalogue.

- ABBEY, Sydney (003)
 Acid leach residues (141)
 ADAMS, C.J. (191)
 Additives/Organic (164)
 Adelite group/Arsenates (393)
 Administration/MRL (269)
 Agglomeration/Coal (350)
 Aggregate/Lightweight (010)
 Aggregates (009)
 Aggregates/Degradation (174)
 Agreements/Technology exchange (309)
 Alloys/Copper-base (224)
 Alloys/Corrosion (171)
 Alloys/Cu-Ni (039)
 Alloys/Copper (048)
 Alloys/Nickel-aluminum bronze (224)
 Alumina (157) (158) (166)
 Alumina extraction (180)
 Alumina/Recovery/Purification (157)
 Aluminum/Electrowinning (405)
 Aluminum/Iron, steel, alloys (384)
 Analysis/Quantitative (100)
 ANDERSEN, J.E. (071)
 ANDERSON, G.C. (194)
 Anion exchanger (168)
 ANNOR, A. (268)
 Annual Report/PMRL (222)
 Antimony (206)
 Antimony deposits (394)
 Arctic/Atmospheric corrosivity (215) (228)
 Arc welding (217)
 Arsenates/Adelite group (393)
 Arsenic analysis (206)
 Asbestos (276)
 Ash analysis (209)
 Ash/Boiler (359)
 Athabasca tar sand (374)
 Atmospheres/Uranium mine (247)
 Automobiles/Fuel (335)
 AUGSTEN, R. (271) (283)
- Beneficiation (067)
 BERNOLAK, A. (389)
 BERRY, T.F. (136)
 BESHAI, Joan E. (083) (207)
 Bibliography/CCRA (325)
 Bibliography/Crushing and grinding (314) (315)
 (316) (317) (318) (320) (322) (323) (324)
 Bibliography/Rock mechanics (056)
 BIEFER, G.J. (036) (215) (227) (228)
 BIELENSTEIN, H.U. (253)
 BIGU, J. (106) (107) (108) (234) (247) (278) (279)
 (281) (284)
 Bitumen (026) (034) (091) (212) (374)
 Bitumen coke (030)
 Bitumens/Chemical analysis (085)
 BLACKPORT, R.J. (110)
 BLAIR, R. (049) (260)
 Blast furnace/Slag:quartz (154)
 BLOUIN, A. (013)
 Boiler/AFBC (204)
 Boiler/Fluid-bed (351) (358)
 Boiler tubes/Corrosion (370)
 BOIRE, A. (141)
 Borehole locator (355)
 BOSSERT, J.A. (109) (267) (290) (298)
 BOWMAN, W.S. (014) (015) (138) (140) (148) (153)
 BOYD, J.D. (098) (099)
 BRAATEN, R.W. (080) (087) (197)
 BRANNEN, J.M. (164) (182) (397)
 Break-flash apparatus (233) (254)
 BREDIN, R.H. (136)
 BREMNER, T.W. (023)
 BRIGGS, D.C. (037)
 BRIGHAM, R.J. (225)
 BROWN, D.A. (048)
 BROWN, J.D. (100)
 BROWN, T.D. (081) (082)
 BUCHANAN, R.M. (033)
 Bulk concentrate (133)
- BALE, C.W. (001)
 BANNERMAN, W. (113)
 BARBEAU, F. (402)
 Barometers/Aneroid (274)
 BARRY, J. (224)
 BARTELS, K. (169)
 BAXTER, W.A. (250) (253)
 Beach ore (203)
 BEDNAR, J.S. (171) (229)
 BELINKO, K. (031) (091)
 BELL, K.E. (012) (026a) (069)
- CABRI, L.J. (378) (379)
 Cadmium/Glazes (352)
 Calcium (391)
 CAMERON, D. (190)
 CAMERON, W.H. (187)
 CAMPBELL, M.C. (057) (058)
 CAMPBELL, W.P. (039)
 Canadian Shield/Stresses (116)
 CANALPH 3A (362)
 CANMET Catalogue 1978/79 (007)
 CANMET Catalogue 1979/80 (020)
 CANMET research contracts (002)

- CANMET Review 1979-80 (022)
 CAPES, C.E. (053) (067)
 Carbonization Research (082) (092) (313)
 Carbonization Research/Bibliography (325)
 Carbon/Rosette (030)
 CARETTE, G.G. (023) (059) (139)
 CARSON, D.W. (175)
 Casting/Horizontal continuous (037)
 Catalogue/CANMET 1978/79 (007)
 Catalogue/CANMET 1979/80 (020)
 Catalysts (033) (034)
 CCRA (082) (092) (313)
 Cellulose-degradation (156)
 Ceramics (008) (162)
 Certification/Mining equipment (109)
 Certified Reference Materials/Canadian (408) (409) (410)
 Chalcopyrite/Tarnishing (380)
 CHEN, T.T. (060) (185) (186) (380)
 CHENG, K.C. (050) (265)
 CHERRY, J.A. (049) (110) (260)
 CHIANG, C. (113)
 Chlorination/Sulphide ores (129)
 Chlorination/Uranium ore (074) (407)
 CHMIELOWIEC, J. (027) (083)
 CHORNET, E. (086)
 Chromium (383)
 CIAVAGLIA, L. (030)
 CIM/Coal Division (200)
 Coal (052)
 Coal/Assessment (258)
 Coal/Characterization (198)
 Coal/Combustion (271)
 Coal conversion (081)
 Coal database (127)
 Coal Division/CIM (200)
 Coal/High-sulphur (204)
 Coal-in-oil/Combustion (350)
 Coal liquefaction (086) (088)
 Coal/methane (283)
 Coal mining/Equipment (288)
 Coal-oil (035) (053) (093)
 Coal mine shales (077)
 Coal/Nova Scotia (312)
 Coal/Oxidation (029)
 Coal petrography (081)
 Coal R & D (321)
 Coal recovery (329)
 Coal resources/Nova Scotia (201) (202)
 Coals (004)
 Coal/Slagging/Fouling (198)
 Coals/Metallurgical (163) (404)
 Coals/Oxidized (193)
 Coal/Ultimate analysis (194)
 Coal washeries (343)
 COCHRANE, T.S. (273)
 Coke/Deactivation/Formation (034)
 Cokemaking (004)
 Coke ovens (006)
 Coke quality (188)
 Coking coals (004) (031)
 COLLINGS, R.K. (017) (018) (024) (060a)
 COLLINS-DECOTRET, J. (007) (020)
 Combustion (030)
 Combustion/Coal (271) (351)
 Combustion/Coal-in-oil (350)
 Composting/Garbage (133)
 Compounds/Jarosite-type (390) (395)
 Compression tests (268)
 COM Program (093)
 Computer/Uranium mines (115)
 Concentrates (401)
 Concentrates/Certified Reference Materials (410)
 Concentrates/Zinc-lead sulphide (388)
 Concrete
 corrosion (225)
 durability of (023)
 education in (066)
 high-alumina cement (400)
 lightweight aggregate in (010)
 mechanical properties (139)
 performance of (059)
 petrography in evaluation of (009)
 phase changes in (175)
 sea water (345)
 specimens for study of (363)
 superplasticized semi-lightweight (398)
 superplasticizers (399)
 Concretes/Highway (147)
 Conductors/Fast-ion (076)
 Contamination (210)
 CONTESTABILE, E. (257)
 Conversion/Non-coking coals (031)
 Conversion/Petrography (081)
 Copper extraction (061)
 Copper-nickel/Smelting (319)
 Corrosion inhibitors (163) (403) (404)
 Corrosion/Steel (229)
 Corrosivity/Atmospheric (215) (228)
 CO utilization (341)
 COUTURE, A. (210)
 CRAIGEN, W.J.S. (061)
 CRAWLEY, A.F. (221)
 Crushing and grinding/Bibliography (314) (315) (316) (317) (318) (320) (322) (323) (324)
 Crushing strength test (133)
 CUNNINGHAM, G.A. (286)
 Curve-fit program (141)
 DAINTY, E.D. (111) (241) (249) (252) (285)
 DAS, B. (242)
 Database/Coal (127)
 DAVIS, K.G. (096) (097)
 deKOROMPAY, V. (112) (244) (246) (251) (261)
 DELOR, P. (194)
 DENIS, J.M. (091)
 Deposits/Platinum-group (378)
 Design/Heating plant (361)
 Designs/Pressure vessel (212)
 Diesel emissions (111) (249) (337) (357)
 Diesel fuel/Heated (252)
 Diesel fuel/Mining (263)
 DINARDO, O. (390)
 Displacement discontinuity (262) (282)
 DIXON, C.F. (054) (211)
 DNA/Plasmid (073)
 DOIRON, C.C. (095)
 DONALDSON, Elsie, M. (381) (382) (383) (384)
 Dosimeters (175) (284) (328)
 Drill core rocks (152)
 DUBROVSKY, N. (110)
 DUGAN, P.R. (073)
 DUREAU, R. (206)
 DUTRIZAC, J.E. (380) (385) (386) (387) (388) (389) (390) (393) (394)
 Dust (278) (281)
 Dust survey (255)

- EDWARDS, J.O. (103)
 Electrolytes (130)
 Electrowinning/Lead (001) (405)
 Electrowinning/Magnesium (405)
 Electrowinning/Zinc (164) (182)
 Emission/Engine (357)
 Emission/Water-oil fuel (337)
 Energy research/Glossary (211)
 Energy Research Program/Outputs 79/80 (311)
 Energy Research Program/Plan 80-85 (307)
 Energy Research Program/Plans (308)
 Energy supply/NACCMR (310)
 Engine/Deutz (252)
 Engine/Emission (357)
 Environment/Radiation (107)
 Equipment/Coal mining (288)
 Equipment/Reclamation (372)
 ERICKSON, W.H. (222)
 Eriometry (117)
 Eriometry/Size analysis (286)
 Excavations/Mining (301)
 Exhaust lead traps (080)
 Exhaust systems (285)
 Explosions/Test pit (298)
 Extraction/Gas (373)
 Extraction/Gold (346)
- Fatigue crack growth (047)
 FAURSCHOU, D.K. (052)
 FENG, K.K. (271) (283)
 Ferrite/Martensite (037a)
 Fill mining (124)
 Films/Metallurgical (389)
 Fine particles (118)
 FISEKCI, M.Y. (113)
 Flotation mill (402)
 Flowsheets/Mineral processing (132)
 Fluidized-bed combustion (005) (028) (157)
 FONSECA, R. (086)
 Fractionation/Size (237)
 Fractions/Radon daughter (108)
 Fracture/Elastic plastic (104)
 Fracture mechanics (043)
 Fractures/Mine roof (262)
 FRIEDRICH, F.D. (005) (028) (204)
 Fuel efficiencies (335)
 Fuel emulsification (111)
 Fuel/Hog/Gasification (331)
 Fuel naphthas/Synthetic (084)
 Fuels/Ignition (299)
 Fuels/Jet (208)
 Fuels/Methanol (347) (348)
 Fuel/Water-oil (337)
 FURIMSKY, E. (208)
 Furnace/Induction (165)
- GALBRAITH, L (196) (203)
 GANGAL, M.K. (274) (278) (281)
 Garbage/Composting (133)
 Gas extraction (373)
 Gasification/Fine coal waste (332)
 Gasification/Hog fuel (331)
 GAUTHIER, R. (040)
 GELLER, L. (270)
 Generation/Particulate (252)
 Generator/Fluidized bed (352)
 Geology/Mining (253)
 GEORGE, A.E. (027) (032) (083) (084) (089) (090) (207)
- Geostatistics (238)
 GILLHAM, R.W. (110)
 GILMORE, A.J. (168) (183)
 GILMORE, J. (019)
 Glaze (012)
 Glazes/Cadmium (353)
 Glazes/Pottery (026a)
 Glossary/Energy research (211)
 Glossary/Mineral research (211)
 Glossary/Mining (025)
 GODDEN, M.J. (098)
 Gold/Determination of (401)
 Gold extraction (346)
 GORDINE, J. (037a) (213)
 GORSKI, B. (296) (297) (305)
 GRANDBOIS, M.A. (086)
 GRANSDEN, J.F. (004) (082) (188) (189)
 GREEN, D.J. (008)
 Grouting/Staff (303)
 GYENGE, M. (114) (303)
- HAMBLEY, D.F. (115)
 HAMER, C.A. (157)
 HAQUE, K.E. (062) (173) (177) (179)
 HARBECK, J. (223)
 HARDY, R. (325)
 Harwell Mossbauer (142)
 HAYDEN, A.C.S. (080) (087) (192) (197)
 HAZ notch toughness (037a) (214) (226)
 HAZ/Weld (098)
 Health/Safety (055) (287) (327) (338)
 Hearing protection (275)
 Hearing protector (123)
 Heating plant/Design (361)
 Heat reclaimer (339)
 Heat treatment/Alloy (103)
 HEDLEY, D.G.F. (115) (124) (256) (273) (293) (300)
 HERGET, G. (116) (294)
 HICKMAN, G. (198)
 HITCHEN, A. (391) (392)
 HOARE, R. (224)
 HOEY, G.R. (164) (171) (229) (403) (404)
 Hongshute (186)
 Hydraulic mine (368)
 Hydraulic mine/Seams (113)
 Hydraulic pot (112)
 Hydroboration (032) (090)
 Hydrocarbons (084) (207)
 Hydrocarbons/Polycyclic aromatic (027)
 Hydrocracking (026) (034) (212)
 Hydrogen (041) (042) (044)
 Hydrogenation (031)
 Hydrogenation vessels (099)
 Hydrogen/Steel (105)
 Hydroprocessing (376)
- IEA coal database (127)
 Image analysis (143)
 Impactor (237)
 Inhibitors/Corrosion (403) (404)
 Insulation/Mineral (016) (078)
 Interface/Eriometry (117)
 International Energy Agency (309)
 International Peat Society/Minutes (205)
 International tests (159)
 Ion conductors/Potassium (021)
 Ion exchange (360)
 IPEKOGLU, B. (173)
 Iron/White cast (096)

Iron-non-mercury (148)
 Iron ore, coal/Reduction (079) (191)
 Iron ore materials (199)
 Iron ore pellets (138)
 Iron ores (140) (148) (153)
 Iron precipitation (385)
 ISO/Methods (199)
 Isomorphous system (185)
 Isoplatinocopper (186)
 ISO/TC 102/SC 2 (159)
 ISO/TC 69/SC 6 (170)
 ISO/TC 102/SC 2/WG 12 (075) (181)

JAMBOUR, J.L. (393)
 JANKE, L. (194) (198)
 Jarosite/Selenate analogues (390)
 Jarosite-type compounds (395)
 JEFFORD, R.D. (272)
 JOB, A.L. (055)
 JOE, E.G. (063)
 JONGEJAN, A. (133) (156)
 JUBB, T. (222)

KAIMAN, S. (390) (394)
 KANASY, James, E. (127)
 KAPPELLER, F. (302)
 KEARNS, J.B. (129)
 Keithconnite (379)
 KELLY, F.J. (172) (176)
 KELLY, J.F. (086) (088) (161) (167)
 Kerosene/Drainage waters (150)
 KHULBE, C.P. (091)
 KIRK, B. (051) (108) (117) (118) (119) (255) (259)
 (276) (277) (279)
 KLEINSCHMIDT, K. (224)
 KNIGHT, G. (120) (278) (281) (287) (289)
 KNIGHT, R.F. (099) (216)
 KRIZ, J.F. (034)
 KUNZ, W.G. (080)

Ladle preheating (097)
 LAGUITTON, D. (064) (132) (134) (141)
 LAKSHMANAN, V.I. (065) (397)
 LALIBERTÉ, J.J. (074)
 Lanthanum strontium carbonate (178)
 LAFLAMME, J.H.G. (379) (380)
 LAROCQUE, G.E. (273)
 LAUFER, E.E. (037a)
 LAVIGNE, M.J. (099) (212) (213)
 LAWSON, A. (111)
 Leaching (062) (177) (179) (396)
 Leaching/Percolation (386)
 Leach liquors (073)
 Lead (001)
 Lead concentrates/Iron and zinc-rich (388)
 Lead/Electrowinning (405)
 Lead/Release (026a)
 Lead/Silver (141)
 Lead traps/Exhaust (080)
 LECLERC, A. (142) (395)
 LEE, G.K. (094) (095) (192)
 LEEDER, W.R. (004) (006) (082) (188) (189)
 LEIGH, G.W. (136)
 LENIO, W. (237)
 LETT, G. (194)
 LETTS, M.W. (217)
 Lignites/Saskatchewan (341)

LIM, T.P. (049) (110) (236) (260) (292)
 Lime-sinter process (180)
 Line-pipe (102)
 Line-pipe steel (217) (220)
 Liquefaction/Coal (086) (088) (330)
 Liquid iron (079) (191)
 LOGIE, R.B. (091)
 Logs/Fireplace (192)
 Longwall mining (367)
 LUCAS, B.H. (065)
 LUNDGREN, D.G. (396)

MacDONALD, R.J.C. (316) (317) (318) (320) (322)
 (323) (324) (314) (315)
 MacKINNON, D.J. (164) (178) (182) (397)
 MacPHEE, J.A. (029) (030)
 Magnesia/Alumina extraction (158)
 Magnesium (391)
 Magnesium/Electrowinning (405)
 MAGNY, J.G. (096) (097)
 MALHOTRA, V.M. (023) (059) (066) (398) (399) (400)
 MARTIN, P. (038)
 MARTIN, P.A.W. (073)
 MARWAHA, V. (189) (190) (195)
 MATHIEU, G.I. (067)
 McGRATH J.T. (037a) (099) (213) (214) (217) (218)
 (220) (226) (231)
 McMILLAN, R.S. (178)
 MEARS, A. (297) (305)
 Mercury/Porosimeter (296) (297) (304) (305)
 Metal/Base (213)
 Metallurgical coals (404)
 Metallurgical films (389)
 Metals (054)
 Metals/Corrosion (171)
 Metals terminology (013)
 Metals/Trace elements (060)
 Meter/Working level (362)
 Methane (243)
 Methane/Coal (283)
 Methanol/Fuels (347) (348)
 METZ, J.L. (007) (020)
 Microbial cellulose-degradation (156)
 Micro-computer (340)
 Microstructures/Weld HAZ (098)
 Middlings/Cyclone (128)
 MILEWSKI, P. (292)
 Mill products/Silver (135)
 Mill/Uranium (406)
 Mine/Atmospheres (247)
 Mine layouts/Design (354)
 Mineral insulation (016) (078)
 Mineral processing/Flowsheets (132)
 Mineral research/Glossary (211)
 Mineral/Stibivanite (394) (411)
 Mineral system (185)
 Mineral waste (017) (018) (024) (060a)
 Mineral wool (146)
 Mineral wool fibres (143)
 Mines (051)
 Mines/Hearing protector (123)
 Mines/Noise (122)
 Mines/PNA levels (259)
 Mines/Uranium (108)
 Mining/Coal (126)
 Mining equipment/Certification (109)
 Mining excavations (301)
 Mining/Fill (124)
 Mining/Geology (253)

- Mining/Glossary (025)
 Mining/Longwall (293) (367)
 Mining machinery (285)
 Mining methods (242)
 Mining/Shortwall (333)
 Mining simulator (301)
 Mining wastes (017)
 MINPAT documentation (295)
 MINTAB program (266)
 MINTAB/Stress/Displacement (306)
 MIRKOVICH, V.V. (068) (069) (152)
 MISENER, D.C. (002)
 MOGAN, J.P. (111) (252) (263) (285)
 MOLOUGHNEY, P.E. (401)
 Molybdenum/Ores, iron, steel (382)
 MONTGOMERY, W.J. (194) (209)
 MORGAN, G.M. (115)
 MORRISON, R. (178)
 MUIR, W.B. (293)
 MURRAY, D. (110) (121) (291)
 MYSAK, L.P. (052)
- NACCMR/Energy supply (310)
 NANDI, B.N. (029) (030) (031)
 NESBITT, W. (130)
 Nickel-aluminum bronze (103) (224)
 Nickel-copper-cobalt (014)
 NG-YELIM, J. (038)
 Noise/Mines (122)
 Noise suppression (270)
 Notch toughness (037a) (214)
 Nuclear/Spectroscopy (336)
 Nuclear waste (114)
 Nuclear waste repository (151)
- OGLE, I.C.G. (053)
 Oil/Lloydminster (089)
 Oil sand analysis (248)
 Oil sands (239)
 Oils/Heavy (085) (091) (212)
 Oils/Tars (052)
 Oil sands/Air injection (125)
 Olefin (032) (089)
 Open pits (329)
 Optical methods (118)
 Orebodies (262)
 Ore/Coal processing (064)
 Ore leaching (396)
 Ores (401)
 Ores/Certified Reference Materials (410)
 Ores/Sulphide/Uranium (058)
 Ores/Zinc-lead-copper (161)
 Ores/Zinc-lead sulphide (388)
 Ore/Variability/Control (187)
 Organic additives (164)
 Outputs 79/80/Energy Research Program (311)
 Oven/Coke quality (188)
 Oven/Pilot (189)
 Ovens/Coke (006)
 Ovens/Test (190) (195)
 Overlay/Stainless steel (213)
 Owens, D. (135) (380) (393)
- PALMER, J. (166)
 PARSONS, B.I. (033)
 PARSONS, H.W. (129)
 Particulate generation (252)
 PATEL, T.J. (320) (322) (323) (324)
 PATMORE, D.J. (026) (091)
 PELTON, A.D. (001)
 Percolation leaching (386)
 Permeability system (302)
 Petrography/Conversion (081)
 Petroleum distillates (083) (090)
 Petroleum distillate fractions (032)
 PETRUK, W. (143)
 PICHÉ, R. (248)
 Pillar model (266)
 Pilot plant/Fluidized-bed (065)
 Pipelines (403) (404)
 Pipeline steels (227)
 Pipe/Mill weld (218)
 Plan 80-85/Energy Research Program (307)
 Plans/Energy Research Program (308)
 Platinum (401)
 Plume rise (094)
 PMRL Annual Report (222)
 PNA levels (051) (259)
 POIRIER, M.-A. (032) (089) (090)
 Polymers (196)
 Polynuclear aromatic hydrocarbon (083)
 Porosimeter/Mercury (296) (297) (304) (305)
 Potassium ion conductors (021)
 Pottery glaze (012) (026a)
 Power station/Peat-fired (369)
 Powder preparation (008)
 PRICE, J.T. (004) (006) (082) (188) (189) (199)
 PRITZKER, M.D. (067) (128)
 Procedure/Optimization (377)
 Program 0100/User's guide (232)
 Programs/DRUKGEN, DRUKSTA (264)
 PRUDEN, B.B. (026)
 PUSSEGODA, L.N. (101)
 Pyrite removal (407)
 Pyrite/Steam coals (366)
- QUON, D.H.H. (012) (021) (026a) (130) (146) (154)
 (160) (165) (174) (175) (400)
- Ra-226/Water samples (236)
 Radiation (107) (278) (281)
 Radionuclides (070) (251)
 Radium (071) (407)
 Radium/Radioactive (183)
 Radionuclides (349)
 Radon (050) (272)
 Radon measurements (265)
 Radon monitor (265)
 Radon progeny (235)
 RAICEVIC, D. (070) (131) (137) (141) (145)
 RAICEVIC, M. (131) (137) (145)
 RALPH, M.S. (267) (280) (288) (290)
 RANGANATHAN, R. (091)
 REARDON, E.J. (110)
 Reclamation/Equipment (372)
 Reclamation/Mine waste (371)
 Redoximetry (140)
 Reduction/Iron ore, coal (079)
 REEVE, D.A. (052) (053) (309) (313)
 Reference materials (003) (011)
- PACKWOOD, R.H. (033) (100)
 PAINTER, K.E. (059)
 PALEY, Z. (038)
 Palladium (401)

- Reference Materials/Canadian Certified (408) (409) (410)
 Reference ore/DL-1a (015)
 Reference ore/SU-1a (014)
 Refining/Copper alloys (048)
 REGAN, R. (234) (278) (281) (284)
 REILLY-ROE, P. (080)
 Repository/Nuclear waste (151)
 Research and development/Coal (321)
 Research/Coal mining (126)
 Research/Coal-oil (053)
 Research contracts (002)
 Research/Health and Safety (287)
 Resistance/Thermal shock (069)
 Resource Appraisal (240)
 Resources/Mineral waste (017) (018) (024)
 Revegetation (112)
 REVIE, R.W. (102)
 Ring classes/PAH (083)
 RIPLEY, L.G. (158) (180)
 RITCEY, G.M. (058) (072)
 Riverside mine (250)
 ROBERTS, N. (213)
 Rock mechanics (293)
 Rock Mechanics/Meeting
 Rock mechanics/Bibliography (056)
 Rock samples (003) (268)
 Rocks/Drill core (152)
 Rocks/Stability (068)
 ROLIA, E. (402)
 ROLKO, V.H.E. (144) (150)
 ROMANIUK, A.S. (025) (258)
 ROWLAND, J.F. (379)
- SABOURIN, R. (232) (238)
 Safety/Explosion/Fire (241)
 SAGE, Roy (310) (312)
 SAHOO, M. (039) (103) (224)
 Salt washing (071)
 SAMSON, Wendy (311)
 Sand systems (040)
 SASTRI, V.S. (163) (403) (404)
 SAVICH, M.U. (122) (123) (243) (275)
 SCOTT, Joan P. (269)
 SCOTT, Tony (282)
 Seams/Hydraulic mine (113)
 Selenate analogues/Jarosite (390)
 Selenium (206)
 Sellers, T.G. (192)
 Shales/Coal mine (077)
 SHEHATA, M.T. (219)
 Shock/Thermal (069)
 Sieving system (119)
 Silica/Free (289)
 Silver (401)
 Silver/Lead (141)
 Silver, M. (071) (072) (073) (155) (396)
 Silver/Mill products (135)
 SILVER, S. (233) (254) (299)
 SINGH, K.H. (124)
 Sintering (077)
 SIROIS, L. (064)
 Size analysis/Eriometry (286)
 Size distributions (277)
 SKEAFF, J.M. (001) (073) (405) (406) (407)
 Slag:quartz/Blast furnace (154)
 SLATER, M.J. (065)
 SLEYPEN, Y. (292)
 SLOWIKOWSKI, I. (319)
- Slurry explosives (257)
 Smelting/Copper-nickel (319)
 SMYTH, D.J.A. (110)
 Soil (364)
 SOLES, James, A. (009) (147) (150)
 Solubility/PbCl₂ (169)
 Spectroscopy/Nuclear (336)
 SPOC Project (064)
 SRAJER, V. (125) (239)
 STAFF, CRPL (092)
 Staff, Energy Research Program (307) (308)
 Staff, Technology Information (321)
 Statistical methods (170)
 Steel (046a)
 Steel/Carbon (229)
 Steel casting (344)
 Steel/Corrosion (036)
 Steel/Hydrogen (105)
 Steel/Line-pipe (045) (217)
 Steels (046)
 Steel/Stainless (044) (229)
 Steels/C-Mn dual phase (219)
 Steels/Cr-Mo plate (216)
 Steels/Dual phase (221)
 Steels/HSLA (356)
 Steels/Line-pipe (220)
 Steels/Low carbon (101)
 Steels/Pipeline (227)
 Steels/Rail (038)
 Steels/Ti/N (226)
 Steel ship plate (223)
 STEFANICH, W. (278) (281)
 STEGER, H.F. (011) (014) (015) (408) (409) (410)
 STEMEROWICZ, A. (136)
 STEWART, J.M. (379)
 Stibivanite (394) (411)
 Stove/Wood (087)
 Strata mechanic studies (113)
 Stresses/Canadian Shield (116)
 Stresses/Residual (047)
 Sulphate (402)
 Sulphation-roast-leach (161) (172)
 Sulphide ores (334)
 Sulphide ores/Zn/Pb/Cu (129)
 Sulphide/Uranium ores (058)
 Sulphuric acid leach (176)
 Summerside project (204)
 Superplasticizers/Concrete (399)
 SUTARNO, R. (074) (138) (140) (148) (149) (159) (170) (181)
 SWARF (054)
 Synthetic fuel naphthas (084)
 SZABO, E.I. (040)
 SZYMANSKI, J.T. (411)
- Tailings (049) (131) (137) (145) (251) (260) (326)
 Tailings/Pyritic (110)
 Tailings/Uranium (063) (070) (071) (072) (112) (375)
 Tailings/Mine stability (300)
 Tar sand/Athabasca (374)
 Tars/Oils (052)
 TAYLOR, G. (325)
 Technology Information/Coal research (321)
 Tellurides (379)
 Telluropalladinite (379)
 Tennantite/Tarnishing (380)
 Terminology/Metals (013)
 Test/Crushing strength (138)

- TEODOSIU, G. (086)
 TERNAN, M. (031) (033) (034) (052)
 Tetrathionate (168)
 Thermal shock (069)
 Thiobacilli (073)
 Thio-salts (402)
 THOMPSON, W.T. (001)
 THOMSON, R. (037) (103)
 Thorium extraction (407)
 Thorium resources (240)
 Thoron (272)
 TIBBETTS, T.E. (200) (201) (202) (205)
 Tin bronzes (210)
 Tin/Ores, iron, steel, alloys (381)
 Tin particles (356)
 Titanium (144) (387)
 TMG services (Niobec) (377)
 TOEWS, N.A. (262) (264) (295) (301) (306)
 TOWNSEND, M.G. (175a)
 Trace elements/Metals (060)
 Treatment/Uranium mine water (065)
 TREMBLAY, R.J. (175a)
 TRUDEAU, L.P. (043) (223)
 TSCHENG, J. (091)
 Tumbler tests (149)
 TUOVINEN, O.H. (073)
 TUPPER, E.C. (269)
 TURCOTTE, M. (291) (292)
 TYSON, W.R. (041) (042) (043) (044) (099) (101) (104) (105)

 Uranium/Chlorination (407)
 Uranium deposits (238)
 Uranium extraction (057) (407)
 Uranium/Health and Safety (338)
 Uranium/Leaching (062) (155)
 Uranium mill (406)
 Uranium mine (050) (108) (247) (272) (326)
 Uranium mines/Computer (115)
 Uranium mines/PAH levels (365)
 Uranium mine water/Treatment (065)
 Uranium ore/Leaching (173) (177) (179)
 Uranium ore/Chlorination (074)
 Uranium ore/Permeability (244) (246)
 Uranium ores/Preconcentration (131) (137) (145)
 Uranium processing (168)
 Uranium research (057)
 Uranium resources (240)
 Uranium/Sulphide ores (058)

 Uranium tailings (071) (072) (121) (291)
 Uranium-thorium (015)
 Uranium/Volumetric determination (392)

 Vapour generation (206)
 Ventilation (111) (278) (281)
 Vessel/Designs (212)
 Vessel/Pressure (231)
 VIVYURKA, A.J. (049) (260)
 VOSIKOVSKY, O. (045) (046) (046a) (047)

 WANG, S.B. (016) (024) (146) (154) (160) (165)
 Washeries (343)
 Waste (070)
 Waste/Nuclear (114)
 Waste coals (067)
 Wastes/Mining (017)
 Water samples/Ra-226 (236)
 WEIDMARK, P.E. (056)
 Welds/Corrosion (019)
 WESTAWAY, K. (051) (259)
 Western Research Labs (193)
 Whaley, H. (035) (053) (093) (094) (095)
 WHEAT, T.A. (008) (021) (076) (130) (162)
 WHITE, D.W.G. (222)
 WHITING, L.V. (048)
 WILSON, H.S. (010) (077)
 WINER, A.A. (016) (078)
 WONG, A.S. (295) (306)
 WONG, W.S. (161) (172)
 Wood stove (087) (197)

 X-ray production (100)
 XRD analysis (120)

 YU, Y.S. (262) (264) (301) (306)

 ZAHARY, G. (126)
 ZAWADSKI, W. (294)
 ZECHANOWITSCH, G. (391) (392)
 Zinc (001)
 Zinc deposits/Electrowon (397)
 Zinc electrowinning (164) (182) (405)
 Zinc industry (385)
 Zinc-lead-copper (161) (386)

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