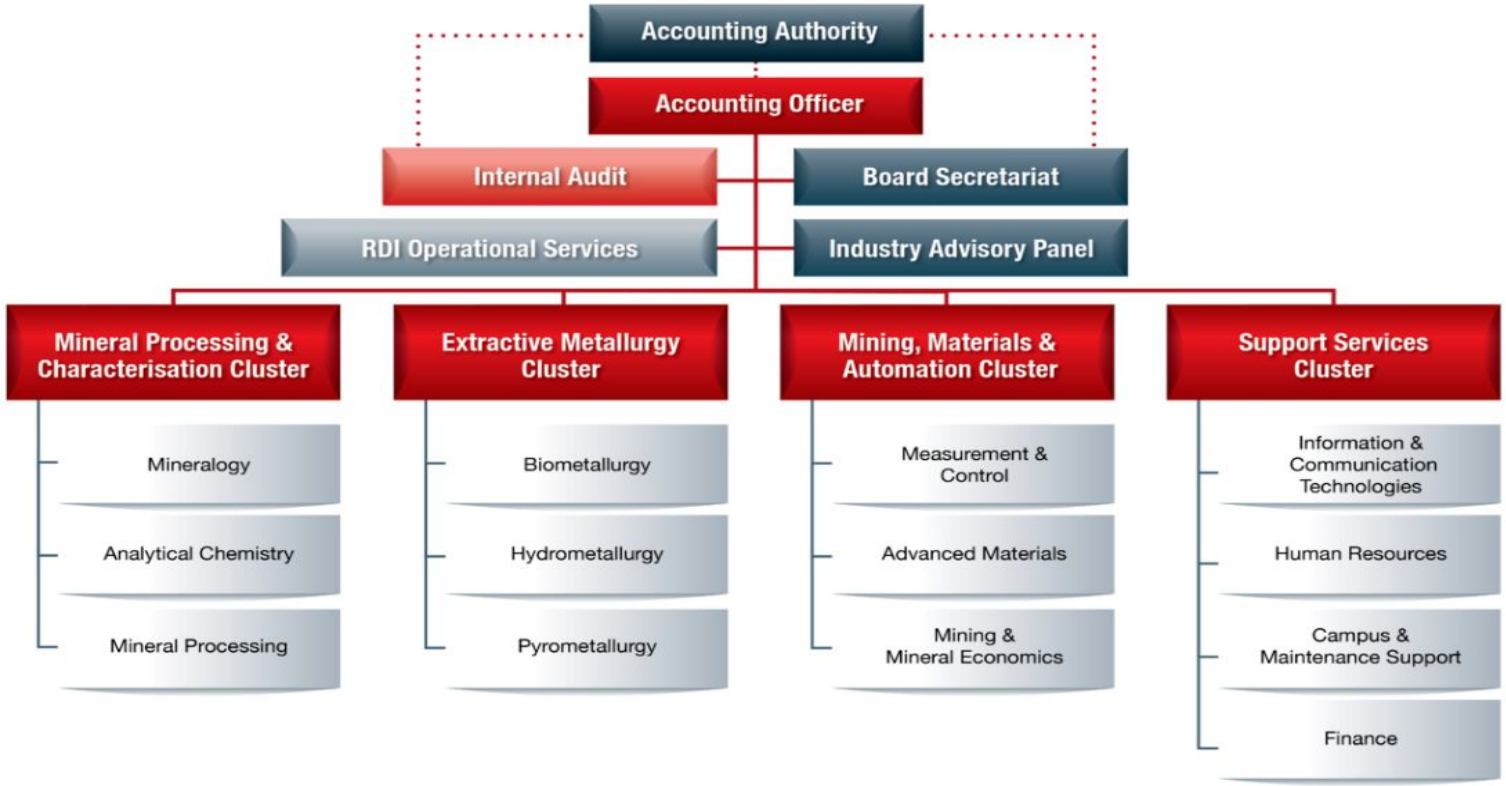
Mintek Sponsorship Presentation

Napo Ntsasa

9th International PGM conference

27-28 October 2025

Mintek Organogram



MINTEK
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Mintek Value Chain

Mineralogical & Analytical Testing

Mineral Processing (Concentration)

Pyrometallurgy

Small Scale Mining & Urban Mining

Digital Platform

Value Addition / Manufacturing

Post Mining Landscape

Core Focus Areas of the Cluster:

(i) Flowsheet: design & Optimisation
(ii) Technology know-how
(iii) Plant audits
(iv) Mineral characterization
(v) Analytical services
(vi) Modelling & simulation

Hydrometallurgy

Biometallurgy

EXPLORATION STAGE: Geochemical sample analysis and mineral ore characterization

CORE ACTIVITIES: range from **initial investigations** to **process development** and the **design, construction**, as well as **commissioning** of **industrial plants**.

OFFERINGS: Working closely with clients, and in conjunction with engineering partners, Mintek supplies a flexible package of technology for process development and optimisation, products and services.

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Mintek Global Footprint

Gold	PGMs	Ferrous Metals	Equipment & Technology	Base Metals
Industrial Minerals & Diamonds	Process Control Strategies	Uranium	Rare Earth Elements	Economic & Regional Studies

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Analytical Chemistry Division[1] Competency

Applied Chemical Analysis Group

Applied Chemistry for Base metals, U, Th & REE's analysis using spectroscopic techniques

ISO-17025:T1183

Fire Assay and Reference Material Group

Precious Metals analysis from Various Ores using Fire Assay Techniques

ISO-17025:T0042

Environmental Analysis Group

Classical Chemistry

ISO-17025:T1183

Expertise in Geological and Metallurgical samples

Services Provided

Applied Chemistry

Sample preparation (Fusion, digestion); ICP-MS;ICP-OES; XRF and AAS

Determination of base metals + U&Th/ REE's/ PGM compositions in ore matrices such as Monozite, Zinkopstruit, Chambishi & Kipushi using ICP-OES, ICP-MS, AAS, and XRF from % down to ppb levels.

Precious Group Metals

Milling; Fire Assay; 3E; 4E; 6E; Total Au and PGM+Au

Analysis of precious metals from various ores such as Platreef, Merensky & UG2 Reef using fire assay preparation methods followed by ICP-OES, ICP-MS or AAS finish.

Classical Wet Chemistry

Total C&S; Anions; Calorimetry; Speciation (Cr^{6+} and Fe^{2+} / Fe^{3+})

- Analysis of Total C and S in solids, and oxygen & nitrogen in metals, by combustion;
- Gravimetric analyses such as proximate analysis of coal, silicate and sulphate determination;
- Routine water analysis (inorganic), including pH, TSS, TDS, conductivity, fluoride and toxic contaminants;
- TCLP & acid rain extractions;
- Colorimetric determination of P, SiO_2, & ammonia.
- Speciation analysis, including carbonate, S species, Cr^{6+} & Fe^{2+}/Fe^{+3}

One-stop-shop Analytical Testing Solutions

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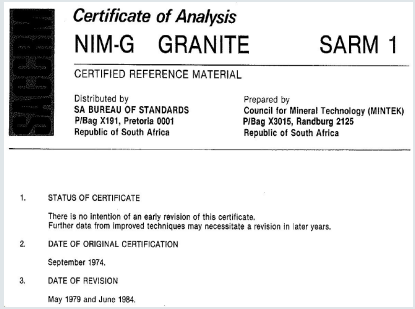
Analytical Chemistry Division[2] CRM

1934



Certificate of Analysis

NIM-G GRANITE SARM 1

CERTIFIED REFERENCE MATERIAL

Distributed by
SA BUREAU OF STANDARDS
P/Bag X191, Pretoria 0001
Republic of South Africa

Prepared by
Council for Mineral Technology (MINTEK)
P/Bag X3015, Randburg 2125
Republic of South Africa

1. STATUS OF CERTIFICATE

There is no intention of an early revision of this certificate.
Further data from improved techniques may necessitate a revision in later years.

2. DATE OF ORIGINAL CERTIFICATION

September 1974.

3. DATE OF REVISION

May 1979 and June 1984.

1974

SARM

SOUTH AFRICAN REFERENCE MATERIALS

MINTEK

CERTIFIED REFERENCE MATERIAL
Prepared by and Distributed by
MINTEK
P/Bag X3015 Randburg 2125
Republic of South Africa

Email : asdenquries@mintek.co.za
Telephone : + 27 11 7094046
Fax : + 27 11 7094006

CERTIFICATE OF ANALYSIS

SARM 199
Gold ore

1. STATUS OF CERTIFICATE
This is the first issue of the certificate.
2. DATE OF ORIGINAL CERTIFICATION
2023-12-04

2024

Purpose

- It is crucial for laboratory quality control/quality assurance procedures.
- More and more researchers, testing and calibration laboratory and measurement laboratories strive to use accurate CRM.

Timeline

- **1934 - Establishment of MINTEK.**
- **1974 - First SARM 1 produced**
- **2024 - Accredited facility for the first time (RMP0018)**
  - **Technical Signatory**

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SARM
SOUTH AFRICAN REFERENCE MATERIALS

sanas
Reference Material Producer
Accreditation Number: RMP0018

CERTIFIED REFERENCE MATERIAL
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Telephone : + 27 11 709 4046
Fax : + 27 11 709 4006

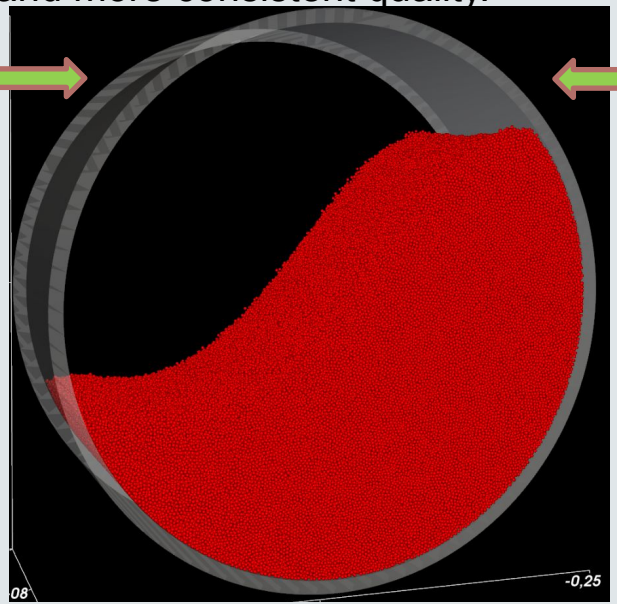
CERTIFICATE OF ANALYSIS

SARM 146X
Chrome Ores

1. STATUS OF CERTIFICATE
Date: 2024-03-25

Mineral Processing Division[1] Comminution

Comminution, the process of breaking down raw minerals into smaller particles, is the foundation of mineral processing. While laboratory tests yield promising outcomes, scaling up these processes can encounter hurdles like increased energy consumption and altered particle behavior. Addressing these challenges through comprehensive scale-up studies enables us to optimize the comminution process, resulting in higher yield and more consistent quality.



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Mineral Processing Division^2 Flotation

Flotation, a key separation technique, involves selectively attaching air bubbles to valuable minerals in a slurry. Scaling up from laboratory setups to industrial operations demands a deep understanding of fluid dynamics, ore/water composition and equipment performance. Unresolved scale-related issues can lead to decreased recovery rates and lower concentrate quality. Rigorous scale-up studies bridge this gap, ensuring optimal flotation efficiency and resource recovery.

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Mineral Processing Division[3] Physical Separation

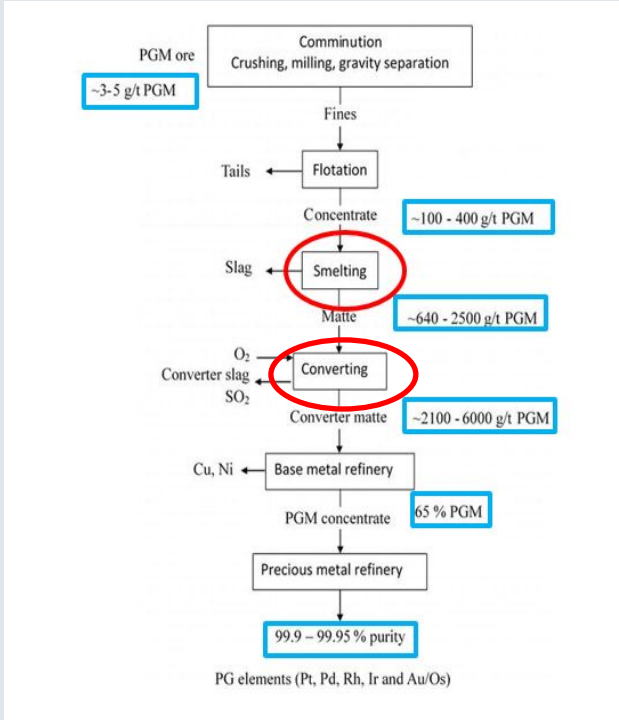
Physical separation methods like magnetic and gravity separation play a crucial role in extracting pure minerals from complex ores. These processes rely on manipulating differences in physical properties to achieve separation. When transitioning to larger scales, challenges arise in maintaining accurate control over variables like flow rates and particle behavior. Implementing well-designed scale-up studies enables us to refine these processes and enhance separation efficiency.

Pyrometallurgy Division[1]

- **PMD capabilities to support the PMGs industry**

  - Conceptualisation and project development capabilities:
    - Thermochemical and process simulations are undertaken using FactSage, HSC Chemistry, and Pyrosim
    - Mathematical modelling and computer simulations of different flow regimes in PGMs processing
    - Arc modelling work to support the electric arc furnace testing work

  - Laboratory scale testing: conventional and unconventional processes
    - Material property measurement: liquidus temperatures, heat capacities and other thermochemical properties
    DSC-TGA, Hot stage microscopy – soon to have furnace rheometer system for determining viscosity and electrical conductivity of materials (NRF-Mintek co-funded facility)
    - Smelting and converting testing: Chamber and induction furnaces



Typical process flowsheet used in SA

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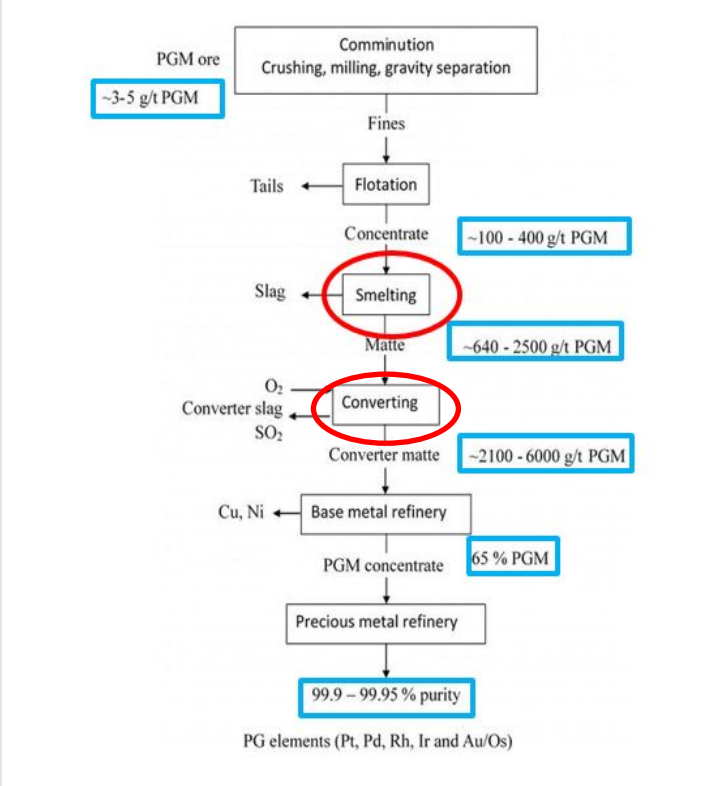
- **PMD capabilities to support the PMGs industry**

 Demonstration scale using pilot furnaces: conventional and unconventional processes
Smelting testwork at different scales and using different furnace technologies:
from 30 kW to 2 MW DC arc furnaces,
300 kVA to 2 MW AC arc furnaces

Converting work: using different scales of top-blown rotary converters – 20 L working volume or 50 kg batch, and 100 L working volume or 650 kg batch



Typical process flowsheet used in SA

Pyrometallurgy Division[3]

- **PMD capabilities to support the PMGs industry**

  Level of testing capabilities: from mg scale, to 100s of grams, and to 100s of tonnes (TRL 1-7/8)

Research & Development	Technology Development	Technology Demonstration
Basic research, conceptualising applications, basic feasibility, proof of concept **Basic Technology Research** **TRL 1 to 3**	Viability and validation of process in relevant environment (demonstrated concept) **Applied Research** **TRL 4 to 5**	Integrated demonstration of prototype, demonstrated piloting in operational environment; design **TRL 6-8 (9)**

RDI– Enabling the Implementation of the 2030 Strategy

- Core research, development and innovation programmes
- Core industry development programmes
- Strategic and national programmes
- Priority commodities
- **Enabling programmes**

5 CORE PROGRAMMES

4 TRANSFORMATION IMPERATIVES

6 STRATEGIC GOALS

- **Conduct any relevant, applied research and technological innovation**
- Foster industry establishment and expansion
- Commercialisation & technology Transfer
- **Develop a capable workforce**
- Ensure financial sustainability
- **Develop and maintain world-class RDI infrastructure**

4 BUSINESS & OPERATING DESIGN PRINCIPLES

Agile, innovative and impact-oriented operations, and focused attention on critical capabilities

Mining and minerals value chain, clustering, quality infrastructure, industry facing programmes

Collaborative, cross-functional teaming and partnerships across technical disciplines, the organisation at large and the broader market

Commercialisation, business development, technology transfer, innovation, manufacturing capabilities, business incubation, partnerships & alliances, and joint development with industry

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