

MINERAL RESEARCH CENTRE



Sustainable
Mineral
Development
Through **R&D**

Towards Sustainable Mineral Development

Mineral Research Centre (PPM) is one of the leading centres in mineral research in the world. PPM has been awarded the MS ISO 9001:2015 certification starting 2012. Originating from tin based industry, currently PPM has expanded the focus on developing and upgrading a wide range of mineral based technologies and products in Malaysia. As the main research wing of Department of Mineral and Geoscience Malaysia, PPM is working towards establishing research requirements in performing sustainable development as well as optimising the utilisation of local mineral resources. Essentially, PPM is focusing on generating inclusive and competitive technologies and innovations, evolving various ranges of value-added mineral materials, discovering inventive usage of mineral based products and empowering conducive capability and efficient operation for Research & Development (R&D) activities. In addition, PPM is also resolving on mitigating adverse environmental impact as well as enhancing the competitiveness of the local mineral resources for commercialisation hence fulfilling the current trend of Research, Development, Commercialization and Innovation (R&D&C&I). For commercialisation prospects, PPM successfully owns a total of 24 intellectual properties including 14 patents, 3 utility innovations, 6 copyrights and 1 industrial design. As an organization undertaking research in mineral based product and technology as its core business, PPM affords a pool of professionals in relevant fields and contributes significantly to the worldwide knowledge corpus. All information, scientific findings and mineral-related skills acquired from the R&D activities are channelled via publications, exhibitions, conferences and seminars at national and international levels. Proactively, PPM has participated in numerous international innovation competitions and has won 1 platinum medal, 10 gold medals, 12 silver medals and 7 bronze medals throughout its participation since 2015. Other than performing the R&D projects, PPM also provides technical services of Dimension Stone Tests and Mineral Processing Tests, the two primary scopes of MS ISO 9001:2015. In ensuring PPM is capable to keep stride in mineral technology evolution at the global stage, liaisons with national and international research institutions, universities, and group networking has been progressively enhanced.



Thank you.

“Sustainable Mineral Development through R&D”

Dr. Nazwin binti Ahmad
Senior Director of Mineral Research Centre (PPM),
Department of Mineral and Geoscience Malaysia

OUR history

Mineral Research Centre (PPM) was formerly recognised as the Mines Research Institute under the Mines Department Malaysia, Ministry of Primary Industries.

The history of the Mineral Research Centre started way back in 1951 as a minor research division of the Mines Department Malaysia located in Kuala Lumpur. The establishment of the research division was primarily to revive the production of the tin industry which had substantially experienced a regression during the World War II. In view of numerous tin mining activities centred in Perak, the research division was subsequently shifted to Ipoh, Perak in 1957. This centre was officially launched by the first Prime Minister YTM Tunku Abdul Rahman on 4th May 1957. Mr J. H. Harris was the first Director of the division. In 1973, the status of the division was elevated to Mines Research Institute.

Since its inception, a number of investigation works had been performed in the field of land evaluation for mining, geotechnical engineering and mineral processing. Attributable to the collapse of tin industry in the mid-1980's, the research works in the Institute gradually transformed its focus towards upgrading research aside from tin minerals particularly ilmenite, monazite, zircon, copper, gold, xenotime iron, wolframite, bauxite and industrial minerals including kaolin, marble, gravels, silica sand and clay.

On 1st July 1999, the Mines Department Malaysia and the Geological Survey Department Malaysia has merged to become the Minerals and Geoscience Department Malaysia Department of Mineral and Geoscience Malaysia. Under this new department, the Mines Research Institute has been rebranded as Mineral Research Centre and currently remains as the main government research centre focusing on development of minerals in Malaysia. In 2004, a restructuring practice involving the merged of several ministries and government departments has been implemented in order to improve the efficiency of the government facility and infrastructure. In this practice, the Department of Mineral and Geoscience Malaysia was placed under the new ministry namely Ministry of Natural Resources and Environments (NRE) that was responsible for the development of the mineral sector. In 2018, Department of Mineral and Geoscience Malaysia was placed under Ministry of Water, Land and Natural Resources (KATS). Starting from 2020 till now, Department of Mineral and Geoscience Malaysia has been placed under Ministry of Energy and Natural Resources (KeTSA).



Our Values

Vision

To
become a centre of
excellence in mineral R&D in the region

Mission

To contribute towards enhancing competitiveness and
sustainable development of the mineral sector through
R&D

Objectives

To encourage and diversify use of local mineral resources
so as to contribute towards the development of the
country's industrial sector through R&D

To encourage the development
of mineral resources in a
sustainable manner
through
R&D

Our functions

To carry out R&D on local minerals in order to produce feed and value added materials for industrial use

To develop suitable mineral processing and recycling technologies

To carry out collaborative research with Institutes of Higher Learning, other R&D agencies and industries in the field of minerals

To commercialise significant R&D result through technology transfer to any interested parties

To assume the role as an advisor and reference centre in areas related to research in local minerals

To undertake R&D in mineral extraction and its environmental impact as well as support to the Department and providing services to the industries

ORGANISATION CHART



RESEARCH OFFICERS OF MINERAL RESEARCH CENTRE 2021



- Behind from left :** Dr. Zulkhairi b Zakaria, Mohd Hakim b Ibrahim, Muhammad Hazim bin Yaacob, Anuar b Othman, Muhammad Afiq Afandi b Abdul Aziz.
- Standing from left :** Costantine b Joannes, Ts. Zawawi b Mahim, Dr. Emea Marina bt Salleh, Syarifah Aminah bt Ismail, Fatimah bt Azmi Rashid, Dr. Tinesha A/P Selvaraj, Aspaniza bt Ahmad, Hamizah bt. Abdul Samad, Roshaida bt Arbain, Ahmad Firdaus b Shamsul Baharin, Mohd Zaid b Md Sharif.
- Sitting from left :** Mohd Syahrir b Mohd Rozi, Hj. Malek b Selamat, Hj. Abdullah b Hussin (retired), Norinsafrina bt Mustaffa Kamal, Hjh. Salmah bt Baharuddin, **Dr. Nazwin bt Ahmad (Senior Director)**, Dr Rohaya bt Othman, Marlinda bt Daud, Dr. Izhar Abadi b Ibrahim Rais, Mohd Idham b Mustaffar, Hamdan b Yahya.
- Not in Picture :** Dr. Hj. Ismail b Ibrahim, Dr. Rashita bt Abdul Rashid, Siti Mazatul Azwa bt Saiyed Mohd Nurddin, Siti NoorZidah bt Mohd Sabri

RESEARCH OFFICERS OF MINERAL RESEARCH CENTRE 2022



Behind from left :

Costantine Joannes, Mohd Zaid b Md Sharif, Mohd Hakim b Ibrahim, Anuar b Othman, Muhammad Hazim bin Yaacob, Ts. Zawawi b Mahim, Ahmad Firdaus b Shamsul Baharin, Dr. Zulkhairi b Zakaria, Muhammad Afiq Afandi b Abdul Aziz, Hamdan b Yahya.

Middle from left :

Siti Mazatul Azwa bt Saiyed Mohd Nurddin, Dr. Emea Marina bt Salleh, Siti Noorzidah bt Mohd Sabri, Dr. Tinesha A/P Selvaraj, Norinsafarina bt Mustaffa Kamal, Fatimah bt Azmi Rashid, Marlinda bt Daud, Nabinah bt Othman, Roshaida bt Arbain.

Front from left :

Hj. Malek b Selamat, Dr. Hj. Ismail b Ibrahim, Dr. Rashita bt Abdul Rashid (retired), **Dr. Nazwin bt Ahmad (Senior Director)**, Dr. Rohaya bt Othman, Mohd Syahrir b Mohd Rozi, Dr. Izhar Abadi b Ibrahim Rais, Mohd Idham b Mustaffar.

Not in Picture :

Hjh. Salmah bt Baharuddin, Aspaniza bt Ahmad, Hamizah bt. Abdul Samad, Syarifah Aminah bt Ismail.

MINING & QUARRYING TECHNOLOGY SECTION



**DR. IZHAR
ABADI
IBRAHIM RAIS**
Section Head



FATIAHAH AZMI
Researcher



**MUHAMMAD
HAZIM YAACOB**
Researcher



**AHMAD FIRDAUS
SHAMSUL
BAHRIN**
Researcher

OBJECTIVE



- To carry out R&D on mining and quarrying technology towards efficient, safe and sustainable manner in order to minimize impacts to the environment.

FIELD OF EXPERTISE



- Mining and quarrying technology.
- Environmental management related to mining and quarrying.
- Occupational safety related to mining and quarrying.
- Recycling of waste materials from mines and quarries.

CURRENT PROJECTS



- Application of precipitated calcium carbonate (PCC) in acid mine drainage (AMD) treatment.
- Application of enzymatic calcification for dust control and rainfall erosion resistance.
- Active treatment for AMD pilot plant scale.

PREVIOUS PROJECTS



- Experimental field – scale constructed anaerobic wetland system for AMD treatment.
- Development of Quarry Particulate Pollution Index (QPPI).
- Classification of mine effluent in Malaysia.
- Ambient dust monitoring and assessment surrounding *Stesen Janakuasa Sultan Azlan Shah, Manjung, Perak*.
- Characterization of by products from AMD treatment process for potential use in cement production.

MINERAL PROCESSING TECHNOLOGY SECTION



**DR. ISMAIL
IBRAHIM**
Section Head



**ANUAR
OTHMAN**
Researcher



**ROSHAIDA
ARBAIN**
Researcher



**COSTANTINE
JOANNES**
Researcher



**DR. TINESHA
SELVARAJ**
Researcher

OBJECTIVE



- To undertake research activities as well as initiate technology transfer in various aspects of mineral processing so that the available mineral resources in the country can be utilised optimally with minimal negative impact.

FIELD OF EXPERTISE



- Mineral processing technology expertise with multidisciplinary team in various areas (mineral and chemical processing, material and chemistry).
- Experienced in areas of mineral processing for metallic and non-metallic minerals.
- Experienced in extraction of rare earth elements.
- Experienced in developing and promoting effective environmentally friendly minerals processing techniques.
- Mineral processing tests (iron, tin, gold ores and silica sand) under MS ISO 9001:2015 scope.

CURRENT PROJECTS



- Processing of complex ores:
 - High and low grade of metallic and non-metallic minerals.
 - Removing impurities in minerals.
 - Applying an environmentally friendly processing techniques and technology.
- Processing and extracting of rare earth elements from ion adsorption clay and bauxite.

PREVIOUS PROJECTS



- Processed local sericite product for water treatment.
- Simulation technique in mineral processing circuit.
- Removing impurities in minerals (silica sand, feldspar, mica etc.).
- Producing alumina from local bauxite.
- Improving the grade of recovery in fine cassiterite
- Synthesis of silica aerogel.

ADVANCED MATERIAL TECHNOLOGY SECTION



**SITI MAZATUL
AZWA SAIYED
MOHD NURDDIN**
Section Head



**HAMIZAH ABDUL
SAMAD**
Researcher



**DR. ZULKHAIRI
ZAKARIA**
Researcher

OBJECTIVE



- To undertake R&D activities that are related to the processing (purification and synthesis) of local minerals which can be used as the starting materials for advanced material technologies.

FIELD OF EXPERTISE



- Materials science and technology.
- Glass and glass ceramic biomaterials processing.
- Nanostructured materials.

CURRENT PROJECTS



- Production of nano-sized minerals.
- Preparation and characterization of magnesium oxide (MgO) powder from local dolomite.
- Development of composite beads as an adsorbent for water treatment.

PREVIOUS PROJECTS



- Production of artificial marble using local minerals and industrial quarry waste.
- Development of dental ingot from leucite glass ceramic.
- Synthesis of wollastonite using local limestone and silica sand.

CLAY BASED TECHNOLOGY SECTION



MALEK SELAMAT
Section Head



HAMDAN YAHYA
Researcher



ASPANIZA AHMAD
Researcher



MUHAMMAD AFIQ AFANDI ABDULAZIZ
Researcher

OBJECTIVE



- To conduct research activities related to clay based technologies involving processing, beneficiation, value adding and product development.
- To provide laboratory facilities, R&D consultation and technology transfer to local clay industries.

FIELD OF EXPERTISE



- Clay and ceramic raw materials characterization and selection.
- Ceramic based materials processing.
- Ceramic based product formulation and fabrication.

CURRENT PROJECTS



- Development of refractory ceramic product using local clay and limestone.
- Development of halal anti bacterial porcelain product.
- Extraction of rare earth element from local ion adsorption clay sources.
- Development of ceramic adsorbent for separation of heavy metals and rare earth.

PREVIOUS PROJECTS



- Development of ceramic balls for commercial application in the oil and gas industries.
- Development of thermal shock resistance whitewares.

SILICA BASED TECHNOLOGY SECTION



**MOHD IDHAM
MUSTAFFAR**
Section Head



**SYARIFAH
AMINAH ISMAIL**
Researcher



**MOHD HAKIM
IBRAHIM**
Researcher



**NABIHAH
OTHMAN**
Researcher

OBJECTIVE



- To carry out research activities with respect to silica sand and silica rock processing for silica based products
- To develop an indigenous technology for making products from silica sand, silica rocks and silicate waste
- To become a centre of excellence for silica-based technical services and technologies

FIELD OF EXPERTISE



- Manufacturing of crystal glass pellet and products
- Sintered glass-ceramic tiles from industrial waste
- Melting, annealing and sintering process for glass and glass-ceramic
- Final product quality testing (physical, mechanical, optical, chemical)

CURRENT PROJECTS



- Development of porous and dense glass-ceramic from industrial waste
- Development of crystal glass using silica rocks
- Removal of Fe from silica rock by using mechanical and chemical method
- Development method of silica rock processing for high grade application

PREVIOUS PROJECTS



- Production of dental ingot from leucite glass ceramic
- Synthesis of wollastonite using local limestone and silica sand

ROCK BASED TECHNOLOGY SECTION



**DR. ROHAYA
OTHMAN**
Section Head



**SITI NOORZIDAH
MOHD SABRI**
Researcher



**DR. EMEE
MARINA SALLEH**
Researcher



**TS. ZAWAWI
MAHIM**
Researcher

OBJECTIVE

- To value add rock materials through research in producing low-cost-high-quality and globally competitive materials thereby contributing towards their optimal uses
- To become a centre of excellence for rock-based technical services and technologies

FIELD OF EXPERTISE

- Synthesizing technology of precipitated calcium carbonate (PCC).
- Paper filler with PCC.
- Recycle of rock-based waste material for making new products.
- Dimension Stone tests under MS ISO 9001:2015 scope.

CURRENT PROJECTS

- Production of nano PCC for various applications
- Production of paper coating materials using nano PCC
- Exclusive licensing of in-situ technique for papermaking (Client: MRSB)

PREVIOUS PROJECTS

- Development of spraying technique for producing hollow PCC.
- Development of high-temperature technique for producing perforated PCC.
- Production of controlled structured PCC from low-grade starting material including carbide lime waste

MINE & QUARRY REHABILITATION TECHNOLOGY SECTION



**MOHD SYAHRIR
MOHD ROZI**
Section Head



**NORINSAFRINA
MUSTAFFA KAMAL**
Researcher



**MOHD ZAID
MD SHARIF**
Researcher

OBJECTIVE



- To conduct research on reclamation and rehabilitation of mining areas and quarries to minimize negative impact on the environment.

FIELD OF EXPERTISE



- Wastewater treatment (mining and ex-mining effluents).
- Reclamation of ex-mining/quarry areas.

CURRENT PROJECTS



- Development of composite beads as adsorbent for water treatment.
- Recovery of rare earth elements from acid mine drainage (AMD).

PREVIOUS PROJECTS



- Development of AMD passive treatment technology.
- Floating phytoremediation of AMD system.

COMMERCIALIZATION SECTION



**SALMAH
BAHARUDDIN**
Section Head



MARLINDA DAUD
Researcher

OBJECTIVE



- To provide support to the research and development (R&D) activities through:
 - i. Commercializing and patenting of R&D products
 - ii. Transferring of technology to government agencies, industries, universities and public
 - iii. Enhancement and maintenance of Information technology & communication facilities
 - iv. Providing appropriate training of all employees
 - v. Printing and safe keeping of all reports of researches, studies and other relevant documents

Management Quality System of MS ISO 9001:2015



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DIMENSION STONE TESTS MS ISO 9001:2015

Mineral Research Centre (PPM) is certified to MS ISO 9001: 2015 - Quality Management Systems (QMS). The scope is inclusive of dimension stone tests at Rock-based Technology Section Laboratory.

List of physical and mechanical characterisation tests provided by Dimension Stone Unit:

1. Water Absorption
2. Specific Gravity
3. Compressive Strength
4. Modulus of Rupture
5. Flexural Strength
6. Coefficient of Thermal Expansion
7. Abrasion Resistance
8. Abrasion Resistance by Taber Abraser



Water absorption



Specific gravity



Compressive strength



Modulus of Rupture



Flexural strength



Coefficient of thermal expansion



Abrasion resistance



Abrasion resistance by Taber Abraser

Dimension stone in application



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Management Quality System of MS ISO 9001:2015

MINERAL PROCESSING TESTS MS ISO 9001:2015

Mineral Research Centre (PPM) is certified to MS ISO 9001: 2015 - Quality Management Systems (QMS). The scope is inclusive of mineral processing tests at Mineral Processing Technology Section Laboratory.



**MINERAL
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01



SAMPLE PREPARATION

- Crushing
- Sampling

TIN ORE



IRON ORE



GOLD ORE



SILICA SAND



MINERALOGICAL & CHARACTERISATION TESTS

- Analysis of Mineral Contents
- Determination of Chemical Composition by XRF
- Identification of Mineral Phases by XRD
- Quantitative Determination of Individual Constituents in Samples : Sn, Au, Fe, S, Ca, Mg, Si, Al, Ti and Organic Content
- Carbon and Sulphur Analysis

02



03



MINERAL EXTRACTION TESTS

- Particle Size Analysis
- Grindability
- Gravity Separation
 - Jig
 - Shaking Table
- Magnetic Separation
 - Dry Magnetic Separator (DDMS)
 - Wet Magnetic Separator (WHIMS)
- Flotation
- Conductivity Separation
- Attrition Scrubber

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INTELLECTUAL PROPERTY

1. Lead- And Barium-Free Crystal Glass (MY-160046-A)
2. Apparatus for Producing Precipitated Calcium Carbonate (MY-169907-A)
3. Quarry Particulate Pollution Index Software Volume 1.3.2 (QPPIs V1.3.2) (CRLY00000991)
4. A Method Of Loading Filler in Pulp Fibre (MY-187763-A)
5. Quarry Particulate Pollution Index and Noise Software Volume 1.0.0 (QPINsV1.0.0) (CRLY00002953)
6. Method for Recovery of Sulphide Minerals from Sulphide-containing Material (PI 2015704029)
7. Floating Tray For Hydroponic (MY 16-E0153-0101)
8. Quarry Dust Deposition Rate Modelling Software (QDDRM V3.1) (CRLY00005558)
9. Quarry Environmental Modelling Software (QEMs V1.0) (CRLY00005545)
10. A Method of Producing Precipitated Calcium Carbonate (MY-181351-A)
11. Eco-Friendly Glass Ceramic Tile from Silicate Waste (MY-181351-A)
12. Leucite Glass Ceramic and Method of Preparing Thereof (MY-184614-A)
13. An Apparatus for Preparing Filler (PI 017704057)
14. A Waste Treatment Composition (MY-186600-A)

INTELLECTUAL PROPERTY

15.	Porcelain Ball for Catalyst Bed Support	(MY-186355-A)
16.	A Synthetic Marble Composition	(PI 2018701720)
17.	Quarry Environmental Modelling Software Version 2.0 (QEMs Ver2.0)	(CRLY00014804)
18.	Process for the Recovery of Mica	(PI 2018704279)
19.	Porcelain Composition and Article Made Therefrom	(PI 2019001569)
20.	Acid Mine Drainage (AMD) Treatment System	(PI 2020005368)
21.	A Method for Iron Ore Beneficitation To Produce Iron Concentrates	(PI 2020005369)
22.	Apparatus For Treating Acidic Wastewater	(PI 2020005967)
23.	A Method For Producing Perforated Precipitated Calcium Carbonate	(PI 2020006223)
24.	QPIN Web System	(LY2021P05658)

XRF

X-ray Fluorescence Spectrometer



Qualitative and quantitative analysis for the determination of the chemical composition of many types of materials in solid state

ICP-OES

Inductively Coupled Plasma Optical Emission Spectrometry



Rapid and sensitive way of measuring the elemental concentrations of solutions, up to 71 elements can be determined within detection limits of 1 part per billion

XRD

X-ray Diffraction Spectrometer



Rapid analytical technique primarily used for phase identification of a crystalline material and can provide information on unit cell dimensions

Analytical facilities

AAS

Atomic Absorption Spectroscopy



Spectro analytical procedure for the quantitative determination of Chemical elements to determine the concentration of a particular element

C & S ANALYZER

Carbon and Sulfur Analyzer



A Carbon and Sulfur Analyzer is used to analyse the percentage of carbon and sulfur present in materials

ZETA POTENTIAL Zeta Potential Analyzer



Colloidal stability measurement which reflects the inter-particle repulsion strength of small particles dispersed in a liquid

Analytical facilities

List of Professional Officers

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