



INTELLECT

Exploring Technologies, Advancing Innovation



**MICROELECTRONIC AND NANOTECHNOLOGY SHAMSUDDIN RESEARCH CENTRE (UTHM)
GAS MASK LABORATORY (NIOSSH)**

INTRODUCTION

Welcome to the March 2024 edition of INTELLECT, the quarterly magazine of NIOSH that explores technologies and advances innovation in the field of Occupational Safety and Health (OSH). Intellect is a platform for exchanging information, sharing knowledge and experiences and highlighting the latest developments and achievements of NIOSH and its partners. Intellect aims to benefit all the stakeholders in the OSH community, including research institutes, laboratory service providers, universities, academicians, government and private sectors, employers and students.

We hope that Intellect will inspire and inform you about the exciting and important works that NIOSH and its partners are doing to enhance OSH standards and practices in Malaysia and beyond. We also welcome other organisations who are interested in promoting or sharing their laboratory facilities and services in the field of OSH. We welcome your feedback and suggestions on how to improve our magazine and services. We would love to hear from you and feature your contributions in our future issues.

If you have any stories, projects, or achievements that you would like to showcase in our magazine, please feel free to contact us at penerbitan@niosh.com.my. Thank you for your support and interest in NIOSH. We look forward to hearing from you and serving you better.



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MICROELECTRONIC AND NANOTECHNOLOGY SHAMSUDDIN RESEARCH CENTRE (UTHM)

Assoc. Prof. Dr. Marlia Binti Morsin

Head of MiNT-SRC,

Faezahana binti Mohkhter,

Assistant Engineer,

Microelectronics and Nanotechnology - Shamsuddin Research Centre

Institute for Integrated Engineering, Universiti Tun Hussein Onn Malaysia (UTHM)



The Microelectronic and Nanotechnology Shamsuddin Research Centre (MiNT-SRC) is one of five centers of excellence (CoE) under the Institute for Integrated Engineering (IIE), Universiti Tun Hussein Onn Malaysia (UTHM). This research center was established on 27th November 2006 and was known as Microelectronics and Nanotechnology Center (MiNTEC) before being upgraded as a Research Excellence Center on 25th November 2007. MiNT-SRC was named after the Chairman of UTHM Board of Director, Y.Bhg. Tan Sri Dato' Seri Ir Shamsuddin bin Abdul Kadir to commemorate his contribution to UTHM (2007-2009). MiNT-SRC aims to become a leading research hub in the field of microelectronics and nanotechnology especially in southern Malaysia.

The research center is led by Assoc. Prof Dr. Marlia Morsin who conducts research in the field of sensors, fungal treatment and vector control based on nanomaterials. Moreover, there are 6 principal researchers with various fields of expertise, which are Prof. Dr. Nafarizal Nayan (Nano plasma processing and diagnostics), Prof. Ts. Dr. Mohd Khairul Ahmad (Nanostructure Materials), Assoc. Prof Ir. Dr. Soon Chin Fhong (Bionanotechnology, Bio Engineering and IoT), Assoc. Prof Dr. Fariza Mohamad (Homo & Hetero Junction Thin Films using Electrodeposition), Ir. Dr. Farhanahani Mahmud (Medical Electronics, Embedded Systems and Artificial Intelligence) and Assoc. Prof. Ts. Dr. Nur Hanis Hayati Hairom (Nanotechnology, Membrane Technology and Wastewater Treatment). These seven core researchers form the backbone of research advancement in MiNT-SRC.



In terms of modern facilities, the research center comprises of 4 Characterization Laboratories, 4 Fabrication Laboratories, 2 Computer Laboratories and 6 postgraduate student workspaces. The 4 Characterization Laboratories are equipped with the storage of high-end equipment for Nano Processing, Material Analysis and Electrical Analysis. The characterization laboratory is supervised by three experienced and highly skilled MiNT-SRC Assistant Engineers (AE). Mdm. Faezahana Mohkhter is the person in charge of the Atomic Force Microscopy (AFM Park System), Atomic Force Microscopy (AFM

Nanocute Hitachi), Raman spectroscopy, X-Ray Diffractometer (XRD), Incident Photon to Current Efficiency (IPCE), Ball miller, Semiconductor Parametric Analyzer (SPA) with Probe Station, Hall Effect, and 2-Point Probe with Solar Simulator. Mr. Mohd Azwadi Omar is responsible for the Contact Angle, UV-Vis, Surface Profiler, 4-Point Probe, Thermal Evaporator, and 3D Printer equipment. and Mr. Ahmad Nasrull Mohamed operates the Field Emission Scanning Microscope (FESEM ISO 17025), Energy Dispersive X-Ray (EDX), and Sputter Coater. The entire equipment and tools in MiNT-SRC are regularly maintained to ensure they meet the international standards required by users. The high-tech equipment provided in this research center is mainly used for nanotechnology characterizations. In general, demand of equipment usage in MiNT-SRC is mainly coming from among UTHM staff and students, and outsiders from local or international universities as well as industries that are conducting test and measurements related to nanotechnology field.

The 4 Fabrication Laboratories and 2 Computer Laboratories are used by UTHM students from all education levels including Bachelor, Master and Doctor of Philosophy to carry out their research projects. The fabrication laboratory is equipped with various equipment such as RF & DC Sputtering, microscope, centrifuge, vacuum oven, ultrasonic cleaner, fume chamber, and others. The operation of these fabrication laboratories is regularly audited by the UTHM Occupational Safety and Health (OSHE) department to ensure that it meets the strict safety standards. A total of 6 student workspaces have been prepared to provide a convenient and work-friendly environment to enhance productivity and determination of research activities. Undergraduate and postgraduate students pursuing studies here are composed of local and international students such as Indonesia, India, Saudi Arabia, Yemen and Iraq. Currently, MiNT-SRC has been actively involved in various research fields locally or internationally through research grants, consultancy, community service, student mobility, publications and many other activities with strong collaboration among universities, industries and community partners.



Fig 1: Equipment for (a) Material Analysis, (b) Electrical Analysis and (c) Nano Processing

GAS MASK LABORATORY (NIOSH)

Consultation, Research & Development Department (CRDD), NIOSH

1.1 INTRODUCTION

The establishment of the Respiratory Protective Equipment Testing Laboratories (RPETL) is a NIOSH endeavour to strengthen its position as a comprehensive national occupational safety and health (OSH) institution. NIOSH has gone through significant phases since they proposed establishing a Personal Protective Equipment (PPE) testing laboratory for R&D and commercialization purposes.

The Gas Mask Laboratory (GML), one of the RPETL subsidiaries and part of the OSH Hazard Evaluation and Control Technology Centre (OSHECT) laboratory in NIOSH Malaysia was funded under the 11th Malaysian Plan (11MP). GML came into operation in the year 2022. The function of this laboratory is to analyze various aspects of OSH including verifying and ensuring that the respiratory protection equipment in the market complies with the established criteria before consumers' usage. The laboratory has collaborated with several international organizations such as the Korean Safety and Health Agency (KOSHA) of South Korea, INSPEC International Ltd of United Kingdom (UK), ProQares of Netherlands and Draeger of German.

1.2 PROJECT DIRECTION

Establishment of GML

NIOSH's direction is to become a centre of excellence in the region for OSH-related PPE testing with the establishment of this laboratory. NIOSH is also committed to conducting intensive research to fulfill its responsibilities to the nation and society. Consequently, the laboratory will become one of NIOSH's strengths in providing services that meet international standards and become an icon of NIOSH Malaysia.

1.3 THE RATIONALE FOR THE ESTABLISHMENT OF GML

The objective and functions of GML

1. Empowering Research and Development (R&D)

The field of R&D is undeniably important to conduct proper studies on the use of Respiratory Protective Equipment (RPE) in Malaysia. The existence of an extensive supply of RPE in the market, based on international standards, does not fully guarantee its suitability for use in Malaysia. The initial phase of establishing this laboratory is to provide a technological facility for testing and certifications. The laboratory is also used as an R&D platform that is responsible for the study of RPE in the country.

Generally, the objective of establishing R&D-oriented OSH facilities is to obtain new knowledge, that can be applied in practise. Accordingly, the establishment of the RPE testing laboratory for R&D aims to gather new knowledge that fulfills the company's business needs and ultimately translates into facilitating new products or improving processes and systems. This will create better services to increase business volume and profits.

Thus, emphasizing R&D is essential to create new or improved technologies that can be transformed through technology management into competitive advantages at the business, corporate and national levels. Although the process of technological innovation through R&D is complex and risky, the rewards can be very high, as evidenced by many companies in Malaysia and overseas.

2. Providing 'Third Party Testing Laboratory' services

Third-Party Testing Laboratory is an independent facility that provides testing without being influenced by any person or organisation. The laboratory is independent because it is not affiliated with the manufacturers as well as the tested items to avoid biased results for commercial purposes. The contracted test facility is referred to as a third-party testing or local-assessment facility.

3. Promising ROI in New Services

As a well-known national institution, offering new services is crucial for sustaining service continuity and generating returns to support ongoing operations. With the laboratory's establishment, NIOSH Malaysia will pioneer a unique service in the country. Commercializing the return on investment should encompass facilities and human resource development.

4. Introduction to NIOSH Mark

The NIOSH Mark on a product declares to customers that it complies with essential safety, health, and environmental protection standards. It's a vital indicator of compliance with the law and ensures free product movement in the Malaysian market. Affixing the NIOSH Mark indicates the manufacturer's commitment to meeting all legal requirements for obtaining the mark, guaranteeing product authenticity nationwide.

This mark signals to governmental authorities that the product meets regulatory specifications for the local market. The NIOSH Mark operates as a self-certification scheme, necessitating specific product categories to undergo testing by an independent organization against technical standards.

5. Supporting Government Bodies as OSH Center of Excellence

NIOSH was established under the Ministry of Human Resources as an OSH centre of excellence to develop knowledge that combines experts and skills from various fields. NIOSH conducts original and pioneering research to provide knowledge leadership through policy and technology development for the community, both locally and internationally. Centres of excellence come in various forms such as training institutions, research centres and research laboratories.

6. Consulting and Training Services

As a center of excellence, NIOSH certainly has the technological facilities, qualified experts as well as professionals who are recognised by the industry. Emphasis will be placed on these centers of excellence to fulfill their respective objectives effectively. Accordingly, this center of excellence will provide the following reliable services:

- GML was developed to meet Malaysia's need for comprehensive testing of chemical gas masks for workers, the public, and national security forces.
- GML assists stakeholders, including government and private sectors, in accessing advanced testing equipment and experts for reference.
- The establishment of GML aims to conduct laboratory testing according to local and international standards.
- GML performs various tests for chemical gas masks to comply with Malaysian Standards (MS), European Standards (EN) and American Standards (NIOSH).

1.4 GML TESTING SERVICES

ACCORDING TO MS 2554:2014 and EN14387:2004

Mechanical Strength (M.S.)

- The filters must demonstrate no mechanical defects and meet the standards' requirements.

Temperature Conditioning (T.C.)

- The filters will be subjected to the temperature conditioning test, and no damage should be evident afterward.

Breathing Resistance

- Several filters will be tested, and the resistance imposed on the air flow needs to be as low as possible.

Gas Capacity

- Determining the minimum breakthrough time at the test condition with a specific test gas concentration in the air.

GML Testing Facilities



Figure 3.0 Gas Mask Laboratory Entrance

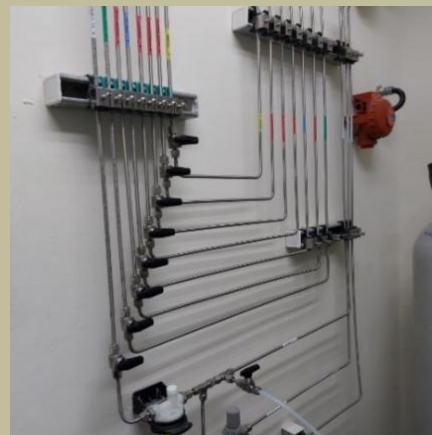


Figure 3.2 Main Gaseous Supply



Figure 3.1 Gas Testing Chamber

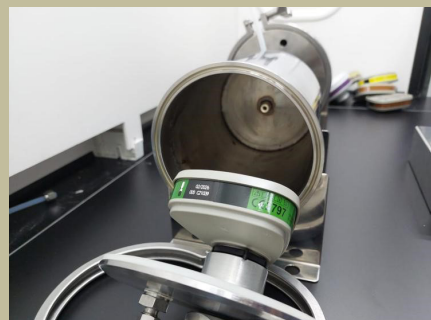


Figure 3.3 Tested Filter in the Chamber



Figure 3.4 The Testing Chamber

International Collaborations



Figure 3.5 Study Visit to KOSHA, South Korea



Figure 3.6 Visit to Military Gas Mask Manufacturers in South Korea



Figure 3.7 KOSHA Gas Mask Experts with the NIOSH Study Visit Team



Figure 3.8 KOSHA Directors with NIOSH Study Visit Members



Figure 3.9 KOSHA Gas Mask Testing Facility



Figure 3.10 KOSHA PPE Certification Centre

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Did you know?

The Chemical Hazardous to Health Laboratory (CHL) at NIOSH has consistently demonstrated excellence in laboratory services, receiving the Malaysian Institute of Chemistry (IKM) Laboratory Excellence Award for thirteen consecutive years since 2011.





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