A quarterly magazine PP18691/01/2018(034114)/ISSN2289-9030

MATERIALS MIND

Issue 35

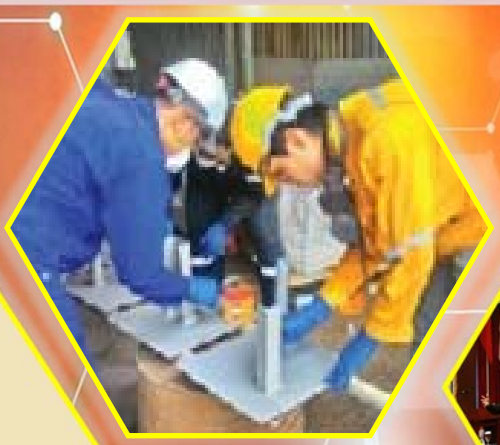
July 2022

www.iomm.org.my

Institute of Materials, Malaysia

HIGHLIGHTS

- Becoming an IMM Certified WELDING Professional is the Best Way to Reach Greater Professional Opportunities.
- The Effect of GTAW Process Welding Parameter on Weld Bead Geometry and Mechanical Properties of 2205 DSS Materials
- Rapporteurs' Report of 1-DAY Rheology Workshop on Polymers



ISSN 2289-9030

TABLE OF CONTENTS

COVER STORY

Becoming an IMM Certified WELDING professional is the best way to reach greater professional opportunities 04

IMM Council Members and Committees 16

IMM CPD Application Form 20

EVENT ARTICLES

1st IMM Council Meeting. Term: 2022-2024 22

Participation in the IMM-Miri Awareness Seminar: "Behaviours of Steel Materials during Welding" 24

The 9th Sabah Oil & Gas Conference & Exhibition 2022 (9th SOGCE 2022) 26

IMM Training and Certification Program Overview 28

IMM Authorized Training Body (ATB) / Authorized Testing Centre (ATC) / Authorized Training Partner (ATP) for IMM Courses and Certification 30

TECHNICAL ARTICLES

The Effect of GTAW Process Welding Parameter on Weld Bead Geometry and Mechanical Properties of 2205 DSS Materials 10

Rapporteurs' Report of 1-DAY Rheology Workshop on Polymers 32

STUDENT EDITORIAL

A Review on The Synthesis, Characterization and Application of Indium Sulphide Nanoparticles 40

IMM Profiles 44

INSTITUTE OF MATERIALS, MALAYSIA

Suite 1006, Level 10, Block A, Kelana Centre Point,
No. 3 Jalan SS 7/19, 47301 Petaling Jaya, Selangor.
Tel: 03-76611591
03-76611592

secretariat@iomm.org.my
www.iomm.org.my
+60 18-911 3480
Institute of Materials, Malaysia

NOTICE FOR RENEWAL OF ANNUAL MEMBERSHIP AND SUBSCRIPTION FEES 2022

APPLICATION FOR RENEWAL OF MEMBERSHIP						
PARTICULARS OF MEMBER (*update where necessary*)						
PERSONAL INFORMATION						
FULL NAME	:					
TITLE	:		IC/PASSPORT NO.	:		
DATE OF BIRTH	:		AGE	:		
CORRESPONDENCE ADDRESS	:					
MOBILE PHONE NO.	:		HOUSE PHONE NO.	:		
EMAIL ADDRESS	:					
IMM MEMBERSHIP NO.	:					
CURRENT JOB INFORMATION						
NAME OF COMPANY	:					
DESIGNATION/POSITION	:					
ADDRESS OF COMPANY	:					
OFFICE PHONE NO.	:		OFFICE FAX NO.	:		

MEMBERSHIP SUBSCRIPTION AND PAYMENT					
GRADE (Thick the appropriate box)		SUBSCRIPTION PERIOD			
	Fellow (F.I.M.M)		1-year		
	Professional (M.I.M.M)		More than 1-year, please state	:	years
	Associate (A.M.I.M.M)		Amount paid	:	
	Company				
	Ordinary				

MEMBERSHIP ANNUAL SUBSCRIPTION FEES SCHEDULE

Description	Amount (RM)				
	Fellow (F.I.M.M.)	Professional (M.I.M.M.)	Associate (A.M.I.M.M.)	Company	Ordinary
Annual Subscription	150.00	100.00	80.00	200.00	40.00

PAYMENT

Payment can be made by cheque, telegraphic transfer, bank draft, cash deposit machine or via online/internet banking as follows:

Account Name	:	Institute of Materials, Malaysia
Account	:	8009055156
Bank	:	CIMB
Swift Code	:	CIBBMYKL

SUBMISSION OF DOCUMENTS

Send your completed form together with the proof of payment either via email to **secretariatoffice.imm@gmail.com** or WhatsApp to **018- 9113480** or send by courier/post to:

The Secretariat
Institute of Materials, Malaysia
Suite 1006, Block A, Kelana Centre Point
No.3, Jalan SS3/17, Kelana Jaya
47301 Petaling Jaya, Selangor

The membership renewal online form can be accessed through IMM website at this link

https://www.iomm.org.my/membership-renewal/

Becoming an IMM Certified WELDING Professional is the Best Way to Reach Greater Professional Opportunities.

Welding inspection professionals play a crucial function in the fabrication industry. Their responsibilities have a direct impact on the end product's quality. They are essential in supporting industry in avoiding costly project delays and corrections by adhering to specifications and putting in place an inspection plan. It's important for welding inspection professionals to possess validated welding skills. IMM Certified Welding Certification verifies the industry's essential welding skills in accordance with ISO standards.

The institute of Materials, Malaysia (IMM) has been established over past three decades in personnel competence assurance certification. A comprehensive approach that allows individuals to demonstrate their knowledge and/or competence in a wide range of industry-required job categories to be assessed and certified.

IMM has expanded its certification portfolio to include critical disciplines such as welding for new construction and in-service inspection. The original goal was to get national recognition and industry acceptability as a technique of recognizing and validating an individual's competency.

To give its certification activities more credibility, IMM implemented a system in accordance with ISO/IEC 17024, Conformity Assessment – General in 2021.

> Certification is the best way for you to demonstrate your competency and knowledge to the employers.

Welding Engineer Course

Welding Engineers employ their extensive knowledge of physics, engineering, metallurgy, materials, welding, and standards to design, examine, and evaluate welds as well as to plan, supervise, and document welding operations in accordance with relevant codes, contracts or drawings.

The Institution of Materials Malaysia (IMM) has been in collaboration with the Japan Welding Engineering Society (JWES) since 2010 to conduct certification courses and examinations for Welding Engineer Certification in accordance to JWES – WES8013:2008 Standard of certification of Welding Coordination Personnel and ISO 14731 Welding Coordination Tasks and Responsibilities. JWES is an organization accredited by the Japan National Accreditation Board (JNAB) to Certified Personnel according to the requirement of ISO 17024.

This course is to provide participants with advanced certification for aspiring leaders/ instructors to produce skilled welding engineers in the future, candidates may apply for one of the following certification categories:

a) Associate Welding Engineer (AWE) – Level 1
b) Welding Engineer (WE) – Level 2
c) Senior Welding Engineer (SWE) – Level 3

Welding Engineer Certification in accordance to JWES – WES8013:2008 Standard of certification of Welding Coordination Personnel and ISO 14731 Welding Coordination Tasks and Responsibilities.

Welding Inspector Course

Welding inspectors are responsible for inspecting and assessing the quality and strength of welding work. Their job is to ensure welds are safe and ready to function as part of the device or structure. Welding inspectors also inspect the equipment used and ensure welders adhere to company and state safety regulations.

The Institute of Material, Malaysia's (IMM) welding Inspector (WI) Certification Scheme will equip the candidates with the technical knowledge and skills required by industries recognized by both clients and contractors. They are able to work as welding inspectors or quality control inspection personnel in the oil & gas, construction, and other industries by maintaining the quality of works and fulfil the contractual requirements.

The program is developed with reference to API 577 API 577 Welding Inspection and Metallurgy, ISO 17637 Non-Destructive Testing of Welds – Visual Testing of Fusion-Welded Joints and operated in accordance with the ISO/ IEC 17024 Standard for The Certification of Persons. There are three (3) categories of certification, candidates may apply for one of the following certification categories:

d) Associate Welding Inspector (AWI) – Level 1
e) Certified Welding Inspector (CWI) – Level 2
f) Senior Welding Inspector (SWI) – Level 3

Upon completion, inspectors will equip with comprehensive knowledge to identify the different welding methods and typical defects or other associated challenges. Increase the understanding of how welding affects the component's integrity as encountered with fabrication and repair of equipment and piping components. Common welding processes, welding procedures, welder qualifications, metallurgical effects from welding, and inspection techniques are described to aid the inspector in fulfilling their role implementing.

TECHNICAL TRAINING

IMM WELDING & JOINING TECHNOLOGY FOR NON WELDING PERSONNEL

This is a one day welding technology course for engineering Management Personnel. This course is specially designed for both practicing engineers and technical managers as well as those specifically interested in keep abreast with the current welding technology and wishing to gain some knowledge on how a welding procedure specification (WPS) and a welder through welder qualification test (WQT) being qualified and certified accordingly in the Oil and Gas Industry. Furthermore, using the current effective non-destructive / inspection techniques as quality control tools can be applied to ascertain that quality welds are consistently produced/ maintained.

INSTRUCTOR

Ir. Associate Prof. Dr. Edwin Jong
CPEng, CEng, FIEM, FIMM, FIMMM, AAE

- 22 years working experience for Sarawak Shell Berhad/ Sabah Shell Petroleum Company in upstream and Downstream Sectors.
  - 17 years as the Principal Materials and Corrosion Engineer cum Technical Authority in the maintenance and operations
  - 5 years in Shell Malaysia Deepwater Engineering Design Project Office as a Team Lead/Senior Materials and Welding Engineer and a Technical Authority
- 7 years experiences as a Research Scientist with ICI Advanced Materials Research, United Kingdom.
- A Doctorate Degree in Materials Engineering from Imperial College of Science, Technology and Medicine, Royal School of Mines, University of London.
- Fellow member of Institute of Engineers, Malaysia (IEM), Institute of Materials, Mineral and Mining (IOM3) UK (FIMMM) & Institute of Materials, Malaysia (IMM)

COURSE CONTENT

- Introduction
- Welding Quality
- Welding Procedure Qualification
- Welding Processes
- Materials and Weldability
- Welder Qualification
- Welding Inspection

COURSE DURATION

1 Day

WHO SHOULD ATTEND

This course is most beneficial to administrative staff, technical management personnel of all levels including junior and senior engineers, inspectors, designers, manufacturers, fabricators, technical managers and practicing engineers who are involve in the management and planning of welding and inspection related activities as well as maintenance activities in upstream oil and gas.

Eligible for

MBOT LEMBAGA TEKNOLOGIS MALAYSIA
MALAYSIA BOARD OF TECHNOLOGISTS
CPD Points

HRDCORP CLAIMABLE

Materials Technology Education Sdn Bhd

13-2, Pusat Dagangan Shah Alam. Lot 13,Persiaran Damai, Seksyen 11,
40100 Shah Alam, Selangor
Tel : 03-78867066/7166 | Website : www.mte.com.my
Email: info@mte.com.my | ikmal@mte.com.my | azlizul@mte.com.my | amirah@mte.com.my

Follow us on social media: Mte Imm | MTE IMM | mte_imm | MTE Training

INSTITUTE OF MATERIALS, MALAYSIA

IMM CERTIFIED WELDING INSPECTOR

The IMM Certified Welding Inspector course is a 5-day certification program comprised a 4-day theory, practical class sessions and 1-day final written examination. Participants will be exposed to different aspects of industrial welding technology and fabrication, welding personnel.

COURSE CONTENTS

- Introduction on CWI Roles & Responsibilities Welding Quality.
- World-wide Standards Supporting Quality of Welds.
- Welding Safety & Health
- Materials & Behaviors During Welding.
- Basic Metallurgy & Steels
- Types of Joints & Welds.
- Welding Symbols: BS 499 Part2, ISO 2552, ISO vs. AWS.
- Welding Processes (Overall View, Shielded Metal Arc Welding, Gast Tungsten Arc Welding, Gas Metal Arc Welding)
- Welding Procedure Qualification.
- Welding Procedure Specification.
- WPS, WQT, WPQT & WPQR
- Review WPS & PQR.
- Non-destructive Examination (NDE)

WHO SHOULD ATTEND?

This course is suitable for professionals with working experience in welding and fabrication, who are willing to upgrade their skills according to International standards. Participants can choose any two of the standards from API1104, ASME IX, AWS D1.1 and ISO 5817 for their assessment.

CERTIFICATE

IMM Certified Welding Inspector Level 1 / Level 2

OBJECTIVES

- To improve safe welding practices
- To understand the welding practices carried out in their industry
- To implement good welding practices in their industry
- To select right welding equipment in the industry
- To identify common welding defects and ways to overcome them
- To make right selection of electrodes & materials
- To understand WPS,PQR,WQT for repair of pressure & unfired pressure vessels

PRE-REQUISITES

- SPM or equivalent Engineering (5 years of working experience)
- Diploma in Engineering /Technology (3 years of working experience)
- Vocational Diploma in Engineering /Technology (3 years of working experience)
- Degree in Engineering (1 year of working experience)

DURATION

5 Days

Eligible for MBOT CPD Points

HRD CORP CLAIMABLE

MTE Materials Technology Education Sdn Bhd

13-2, Pusat Dagangan Shah Alam, Lot 13,Persiaran Damai, Seksyen 11,40100 Shah Alam, Selangor
Tel : 03-5524 3704 / 03-5524 6707 | Website : www.mte.com.my
Email: info@mte.com.my | ikmal@mte.com.my | amirah@mte.com.my | iqram@mte.com.my

Follow us on social media: Mte Imm | MTE IMM | mte_Imm | MTE Training

TECHNICAL TRAINING
AND CERTIFICATION PROGRAM

IMM-JWES WELDING ENGINEER

- ***Associate Welding Engineer (AWE)***
- ***Welding Engineer (WE)***
- ***Senior Welding Engineer (SWE)***

IMM in collaboration with the Japan Welding Engineering Society (JWES) will conduct certification courses and examinations leading to the status of certified ASSOCIATE WELDING ENGINEER (AWE),WELDING ENGINEER (WE) & SENIOR WELDING ENGINEER (SWE). JWES is an organization accredited by Japan National Accreditation Board (JNAB) to certify personnel according to the requirement of ISO 17024.

Course Objectives

- To provide training, knowledge and examination leading to the Welding Engineer Certification in accordance to JWES-WES 8013:2008 Standard of Certification of Welding Coordination Personnel and ISO 14731 Welding Coordination Tasks and Responsibilities.
- To provide participants with advanced level of certificate "ASSOCIATE WELDING ENGINEER (AWE), WELDING ENGINEER (WE) & SENIOR WELDING ENGINEER (SWE)" to be leaders Instructors to produce skilled welding engineers in the future.
- To enhance the participants' flexibility through exercises in this training course.

Pre-requisites

Associate Welding Engineer (AWE)
Welding engineers who are in-charge of welding engineering / teaching in welding engineering / inspected welded products.

Welding Engineer (WE)
Passed AWE Examination and have experience in attending a past AWE training course

Senior Welding Engineer (SWE)
Passed WE Examination and have experience in attending a past WE training course

Course Content

Associate Welding Engineer (AWE)

1. Welding Process and Equipment
2. Materials and their behaviour during welding
3. Design and construction
4. Fabrication and application engineering

Welding Engineer (WE)

1. Advanced welding process and equipment
2. Advanced materials and their behaviour during welding
3. Advanced design and construction
4. Advanced fabrication and application engineering

Course Duration

- 5 days class + 1 day written exam (AWE & WE)

Certificate

IMM - JWES Associate Welding Engineer
IMM - JWES Welding Engineer

Date

Online Training Date: 19 - 23 September 2022
F2F Examination Date: 26 September 2022

Venue

Online Training via Microsoft Teams
F2F Examination at Shah Alam, Selangor and Miri, Sarawak

Eligible for

CPD Points

HRD CORP CLAIMABLE

Materials Technology Education Sdn Bhd

15-2, Pusat Dagangan Shah Alam, Lot 15,
Persiaran Damai, Seksyen 11, 40100 Shah Alam, Selangor, MALAYSIA

Tel : 03-55243704 | Website : www.mte.com.my
Email: info@mte.com.my | ikmal@mte.com.my | amirah@mte.com.my | iqram@mte.com.my

Follow us on social media: Mte Imm | MTE IMM | mte_imm | MTE Training

MIGRATION OF IMM STANDARD (FP01) TO MALAYSIAN STANDARD

Institute of Materials, Malaysia (IMM) is delighted to announce the successful migration of **IMM Standard FP01:2020** on ***Coating Fingerprinting Overall Procedures for Paints using FTIR and Other Related Methods*** to **Malaysian Standard (MS2736:2022).**

This Standard emphasizes the evaluation of the manufacturer's paint fingerprint, with the aim of reaffirming the consistency of the paint supplied with reference to the qualified paint. This Standard covers the fingerprint requirement of both single-pack and multi-pack paints for qualification, quality control and verification.

✓ This Standard includes:
i. Coating fingerprinting qualification
ii. Test method to fingerprint the paint supplied in the manufacturer's container
iii. Criteria and execution of Coating Fingerprint Certificate

User's requirement on Coating Fingerprint Certificate is listed here:

✓ Shell Global Solutions International B.V. (Shell GSI), Design and Engineering Practice (DEPs) (Technical Specification) (2017) (**DEP30.48.0031-Gen**) on Protective Coatings for onshore and offshore facilities

✓ PETRONAS Technical Standards (2019) (**PTS15.20.03**) (Protective coatings and linings)

Scan here to view the standard

https://mysol.jsm.gov.my/search-catalogue?keyword=fingerprinting

Prepared by:
Hairunnisa Ramli, Nurul Fatahah Asyqin Zainal, Suhaila Idayu Abdul Halim & Melissa Chan Chin Han
Universiti Teknologi MARA,
Coating Fingerprinting Committee

Technical Article 1

The Effect of GTAW Process Welding Parameter on Weld Bead Geometry and Mechanical Properties of 2205 DSS Materials

Bernard Sim[a] and Edwin Jong[b]
Institute of Materials Malaysia, Miri Chapter, 98000 Miri, Sarawak, Malaysia
abernard_sim@yahoo.com and bedwin_jong@yahoo.co.uk

Abstract

Research on Duplex Stainless Steel (DSS) welded with Tungsten Inert Gas (TIG) was conducted to determine the impact of weld bead geometries, and mechanical properties on the weldment by varying the current values setting (80, 105, 140 and 164 A) and controlling the heat inputs (1.1KJ/mm ± 25%). The string and weave welding methods are used with a tungsten nozzle diameter of 9.5 mm for root and hot passes and a nozzle diameter of 12.7 mm for fill and cap passes. One of the four (4) test specimens capping has been welded with two different nozzle diameters for the weld capping; one half of the length has been welded with nozzle diameter 9.5 mm and the other lengths have been welded with nozzle diameter 12.7 mm. According to the findings, the nozzle diameter of 9.5 mm produces a rough weld surface geometry and has a greater influence on the weld metal dilution and mechanical properties of the heat affected zone. It was revealed that the weld geometry is very much dependent on the current intensity and travel speed as it influences the deposition rate, weld contour appearance, weld bead size and depth penetration.

Keywords: Duplex stainless steel, weld geometry, nozzle diameter, dilution, ferrites

Introduction

SAF2205 is a specially designed corrosion resistance alloy (CRA) material for application in offshore processes containing corrosive chloride medium. The welding metallurgy has significant impact to the characteristics of weld metal (WM) and heat affected zone (HAZ) in the reduction of corrosion resistance and toughness properties. The welding process parameters in joining these materials are crucial particularly the thermal cycle imposed on the base metal [1], as it affects the amount of austenite and ferrite contents in weld metal. The fast heating and the cooling cycles of the WM and HAZ regions contribute significantly to the development of higher ferrite contents in the welded joint [2]. Welding is still the preferred welding process for small bore piping and root passes [3] because of its weld quality in weld bead geometry and mechanical-metallurgical features of the weld metal [4]. There have been numerous studies on the effect of CRA-DSS mechanical properties and pitting corrosion resistance influenced by welding parameters [5]. However, no reported research work or explanation on the impact of changing the TIG welding nozzle diameter influences on the plasma arc and heat concentration on WM and heat affected zone due to higher shielding gas velocity by maintaining the flow rate with a smaller nozzle diameter is available (i.e., 9.5 mm). This research aims to study the effect of weld geometry and mechanical properties by varying the welding currents and the selected nozzle diameter size using manual TIG process.

Methodology

The material used in this study is UNS S31803 S2205 duplex stainless-steel pipe with outside diameter 60.32 mm with thickness of 5.54 mm. ER2209 of 2.4 mm diameter filler wire was chosen to match the material chemistry and mechanical properties. Table 1 present the compositions of the base and filler materials in TIG process.

Table 1 *Chemical composition (wt.%) for base and filler materials*

Type	C	N	Si	Cr	Mn	Ni	Mo
S2205	0.03	0.12	0.4	22.7	1.7	6.02	3.4
ER2209	0.02	0.16	0.5	23.0	1.6	9.00	3.2

Table 2 *The welding parameter conditions*

Test	Weld Passes	Amps (A)	Volts (V)	Travel Speed (mm/min)	Heat Input (kJ/mm)
S1	1	80	11	66	0.80
	2	80	11	52	1.02
	3	80	11	48	1.11
S2	1	105	11	80	0.87
	2	105	11	63	1.10
	3	105	11	55	1.06
S3	1	140	12	105	0.96
	2	140	12	90	1.12
S4	1	164	12	145	0.81
	2	164	12	124	0.95

The welding groove configuration is designed with Root Gap, 3.2 mm, and Root face, 0 mm, with bevel angle of 32.5°. A horizontal groove (2G) welding position is chosen for this experiment. This is because this position is more difficult to weld due to molten metal tends to sag or flow when the weld parameter has not been appropriately adjusted. In this particular experiment, argon (Ar) with a purity of 99.994 percent is chosen because it produces a more concentrated and penetrated welding arc. The flow rate for shielding gas is maintained in the range of 23-25 L/min and purging gas is ranging from 16-18 L/min.

All four (4) test specimens were welded with different heat inputs by adjusting the welding amperes at 80A, 105A, 140A & 164A. The inter-pass temperatures were maintained at 120-140°C. The heat inputs were controlled within the range of 1.1 kJ/mm ± 25% as recommended [1] by varying the currents and travel speeds in a controlled manner. Both stringing and weaving welding methods with nozzle diameter 9.5 mm for root and hot passes and nozzle diameter 12.7 mm are used for the fill and the cap passes. The number of passes depend on the influence of welding currents and travel speeds as shown in the welding parameter conditions (Table 2).

Results and Discussions

Weld Geometry: The quality of weld geometry is very important to ensure high reliability joints are produced. Visual inspection on the weld bead geometry was carried out for these specimens. It was observed that all the welded specimens were completely fused together with no detectable defects except for the surface profiles which show slightly sagging/concave configurations (Fig. 1) with the increasing of welding currents. This is possibly influenced by the electromagnetic force and conductive heat induced to the surface tension of materials [6]. The experiment has clearly indicated that the welding currents and the travel speed variations have great influences on weld bead width, penetration, deposition rate, contour and discoloration.

The welding parameters as shown in Table 2 indicate that by increasing welding current values and travel speeds, the weld bead width and deposition rates also increased proportionally. It is observed that high current intensity has induced more depression and caused turbulence to the molten pool. Macrographs in Fig.1 have shown that sample 1 is an acceptable weld profile and selected as benchmark for the comparison with other welded samples (except the flushed tack weld on the left). Sample 2 has indicated the increase of dimension with the increment of welding current as also reported by Kumar [9], even though an average of heat input is the same with sample 1 as indicated at Table 2.

Sample 3 showed a significantly increase of deposition rate in respective to the changes of welding current with smaller nozzle diameter. It is observed that nozzle diameter 9.5 mm has produced more surface roughness as shown in Fig. 3 with greatest influence of weld metal dilution on the heat affected zone. This is due to a smaller area of weld nozzle diameter 9.5 mm with jet stream flow rate as compared to nozzle diameter 12.7 mm. Smaller welding nozzle is difficult to control the molten pool especially to cover wider groove area, excessive weaving in welding and higher travel speed are required to complete the desired bead size as a result of high heat concentration as evidence shown in Fig. 2 & 3 for the welded sample 3. The finishing of welded sample 4 has similar dimension as compared to welded sample 2 except for the volume of deposition rate is greater.

The colour of the surface finishing for welded samples is also examined in order to better understand the cooling effect brought on by convective heat produced to the surface of materials. Fig. 3 illustrates how the specimen's colour changed from bright to darker as the welding currents increased. Sample 3 has experienced higher heat input with slow cooling rates to allow sufficient time at high temperature for austenite formation [1], ferrite testing on weld metal has validated this and shown that the root and cap had the lowest ferrite values as indicated in Graph 1 and this observation has also been reported by Muthupandi [10]. Sample 4 has indicated increment of ferrite contents due to the lowest heat inputs as tabulated in Table 2. This is affected by high travel speed causing higher cooling rate that inhibits the formation of austenite nucleation growth process along the ferrite boundaries as also reported by Chakrabarti [11].

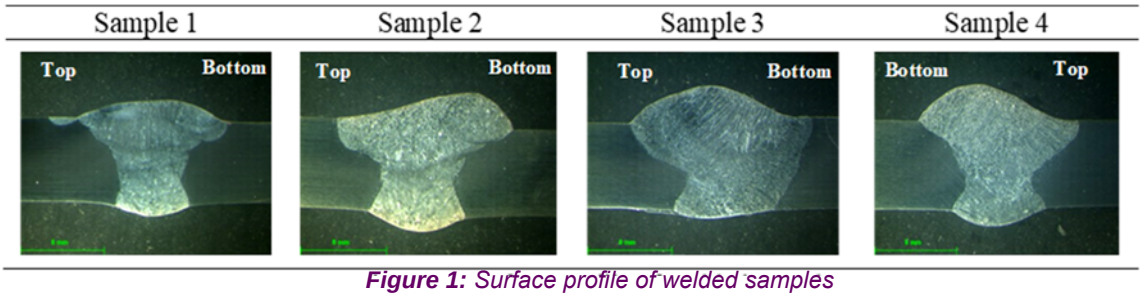


Figure 1: *Surface profile of welded samples*
Note: Sample 3 indicates the pipe section is being welded with nozzle diameter 9.5mm, other samples (1, 2 & 4) are welded with nozzle diameter 12.7mm

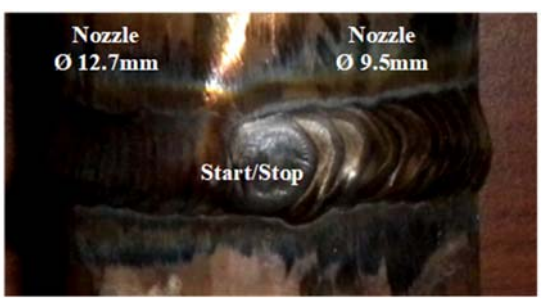


Figure 2: *Sample no. 3 weld bead geometry*
Note: Left weld cap is welded with nozzle diameter 12.7mm and right cap is weld with 9.5mm

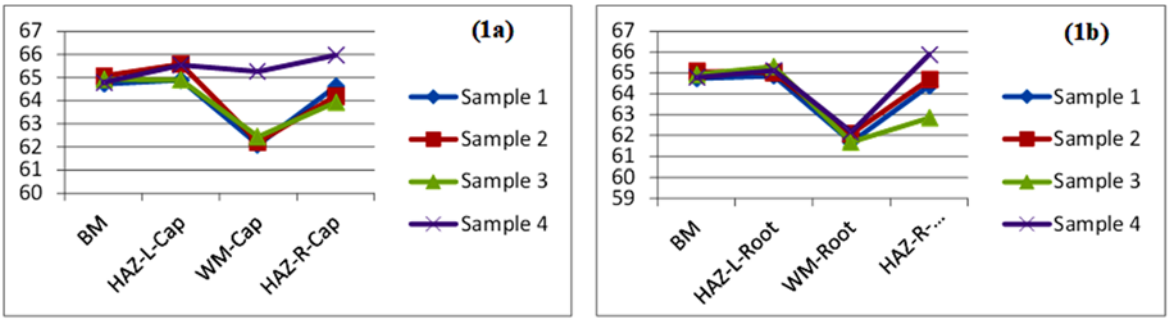
	Sample 1	Sample 2	Sample 3	Sample 4
				
WM	Light yellow	Light Brown	Dark Brown	Light Black
HAZ	Blue	Dark Blue	Dark Blue	Dark Brown

Figure 3 *Discoloration of welded samples*

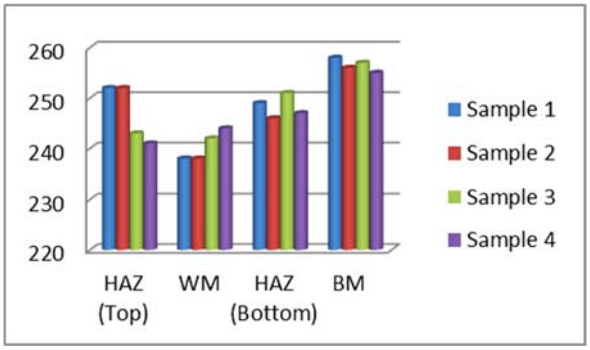
Mechanical Properties. Varying the welding parameters does affect the weld bead geometries and mechanical properties of weld joints. The results of tensile tests have indicated that all specimens have passed successfully with ductile failure with the evident of shear lips and necking modes. Sample 4 has shown the highest value of 800 N/mm^2, this can be concluded that the consistent volume of ferrite content at weld mental (Graph 1) has shown the remarkably influence the tensile strength; this is attributed to the fast cooling rate from the heat input [8] [10].

Both tensile and hardness experiments were also conducted. WM ferrite numbers have revealed higher values from 61.67% to 65.26%, these ferrite numbers/ values are considered high as compared to most of the company requirements which have the range from 30% to 70% in the weld metal [12][13]. In this case, it can be observed that the base metal itself is having higher proportion of ferrite of 64.73- 65.06% (Graph 1) in respective high hardness average 255 -258 HV10 (Graph 2).

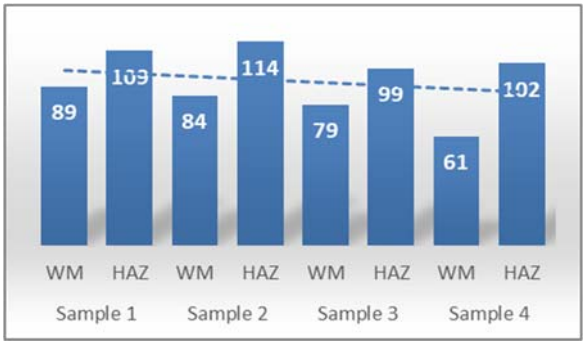
The other possibility contribution the higher ferrite in the weldment/welded joint is due to the lower heat input as shown in Table 2. The relationship of mechanical properties has been analyzed. It is confirmed that the tensile and the hardness values are directly proportional with ferrite count and it is also noted that the charpy impact values are reduced due to increase in ferrite proportion as shown Graph 3 [20]. The notch toughness test results have shown a consistent decreasing of impact energy (Joule) in lieu with the increment of ferrite contents as shown on Graph 2 [14]. Sample 4 has shown a drastic drop from average 80-90J to 60J, this can be reported the result of excessive dissolved nitrogen content (measured at 0.56 wt.%) in the WM-Cap, as indicated in Table 3. The recommended dissolved nitrogen content should not be more than 0.2 wt.% for S31803/SAF 2205 in accordance to ASTM A790. This will increase the hardness and ferrite values but lower the toughness properties of weld metal [11][15] as shown in Graph 3.



Graph 1 *Ferrite content for root and capping*



Graph 2 *Hardness test results*



Graph 3 *Charpy impact test results*

Table 3 *Nitrogen content at weld metals*

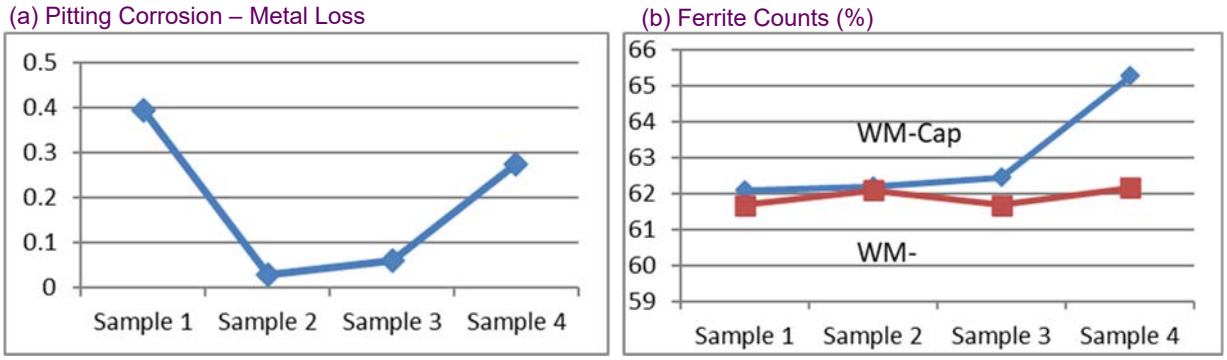
Location	Sample 1	Sample 2	Sample 3	Sample 4
Root	0.17	0.12	0.00	0.00
Cap	0.04	0.00	0.13	0.56

Weld Metal Dilution. The chemical elemental dilution effect across the weldment (i.e. the weld & the HAZ) of the base metal has significant influenced by the travel speed, cooling rate and heat intensity. It has been observed that the different travel speeds in between minimum and maximum in Table 4 have great influence to the dilution rates. These values will indicate the amount of heat absorbed into material and produced with the desired grain structures of HAZ due to length of heat exposed at the particular location. The sample 3 has shown the lowest value in different of travel speed (15mm/min). This indicated that heat absorption in the weld pool is more closer/tighter control in travel speed and the cooling rate is considered to be slower, therefore the dilution effect is greater (35.04%) as shown in Table 4 and Fig. 1. Any component that contributes to the increase in metal dilution is caused by a smaller weld nozzle that results in a greater jet stream flow. The samples 1, 2 and 4 have been observed with lesser dilutions (15.78% to 19.34%) these are influenced by inconsistency in the control of caused higher values in different travel speeds that affected variable cooling rates and thus reduce the area of dilution.

Pitting Corrosion. The results of this experiment have shown that the increment ferrite content will also affect the amount pitting corrosion test performance. The possible corrosion attacks will generally start on the ferrite grains around the precipitated free zone and this observation has also been reported Fourie [1] and discontinuity of passive film oxides at F.L. [17]. From this experiment, the evidence in Graph 4a shows that Samples 2, 3, and 4 have shown that metal losses generally increase with increasing ferrite values as indicated in Graph 4b. Sample 1 has experienced excessive weight loss (0.394 g/m^2) due to the breakdown of protective passive oxide film and the suspected formation of secondary austenite affected by reheating process in subsequent weld layers (Fig. 4a) resulting in the regions of ferrite in between island type secondary austenite phase which are easily corroded

Table 4 *Different in travel speeds correspondence with weld dilutions*

Sample	Current (A)	Travel Speed (mm/min)			Cooling Rate	Average Heat Input (kj/mm)	Dilution (%)
		Min	*Max*	*Diff.*			
1	80	48	66	18	Lower	0.98	15.78
2	105	55	80	25	Higher	1.08	19.17
3	140	90	105	15	Lower	1.04	35.04
4	164	124	145	21	Higher	0.88	19.34



Graph 4 *Mechanical properties of weld metals*

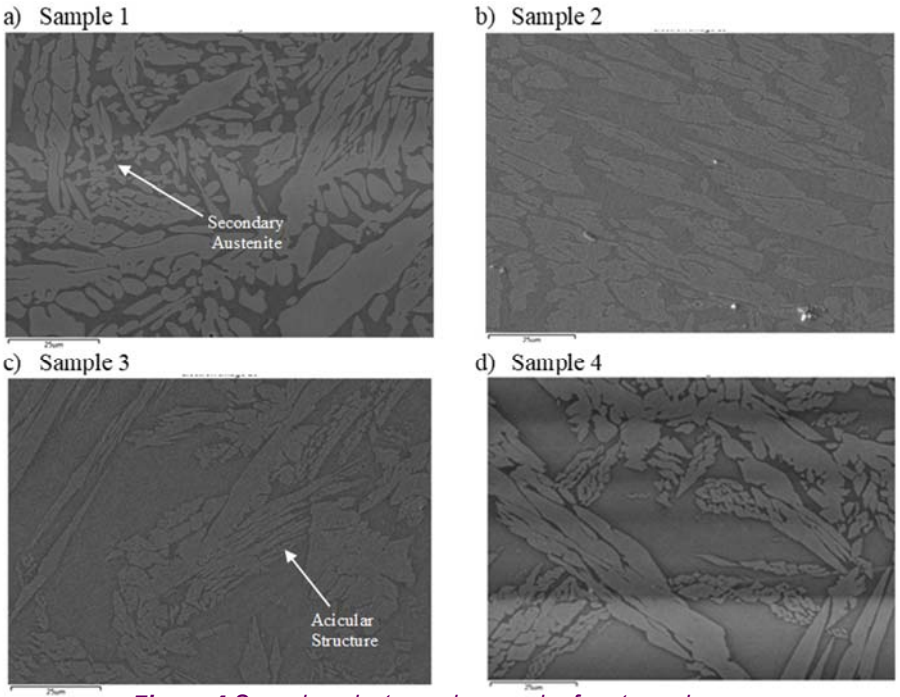


Figure 4 *Scanning electron micrograph of root specimens*

Conclusion

Varying the welding parameters does affect the weld bead geometries and mechanical properties of the weld joints. Based on the experiments and test results obtained, we can conclude the following remarks.

- Smaller weld nozzle diameter has significant impact on the roughness of surface profile and the effect of dilution is comparatively greater.
- Lowering heat inputs with faster travel speed will increase faster cooling rates and lead to a greater amount of ferrite formation and, it limits the transformation nucleation of austenite along the ferrite boundaries.
- The weight loss from the pitting corrosion test appears to be in proportional with ferrite count, the coarse grain zone with the secondary austenite also tends to be more susceptible to localized corrosion attacks leading weight loss too.

Recommendation for Further Works

Further investigation is needed to determine the trace of higher amount of nitrogen in weld metal sample no.4. The dissolved nitrogen is reported as high as 0.56% with no additional supplement nitrogen added to shielding gas. From many researchers, an amount greater than 0.2% wt% will cause an adverse effect to the welded joint due to its high hardness values with lower Charpy impact properties.

References

[1] Fourie J.W .and Robinson F.P.A, (1990) "Literature review on the influence of weld heat inputs on the mechanical and corrosion properties of duplex stainless steels", *Journal of The South African Institute of Mining and Metallurgy*, Vol. 90, No.3 , pp. 59-65.

[2] Qiao Y., Zou D., Li J. and Han Y., (2010), "Effect of solution temperature on microstructure of 2205 duplex stainless steel welded joints", *Materials Science Forum* Vol. 658, pp. 432-435.

[3] Shell Design and Engineering Practice, (1995), "Welding of metals manual", DEP10.10.60.18-Gen.

[4] Petterson C.O. and Fager S.A., (1995), "Welding practice for the sandvik duplex stainless steels SAF 2304, SAF 2205 and SAF 2507, *AB Sandvik Steel*, S-91-57-ENG.

[5] Shin Y.T, Shin H.S. and Lee H.W., (2012) "Effects of heat input on pitting corrosion in super duplex stainless steel weld metal", *Metal and Materials International* Vol.18 No.6 pp. 1037-1040.

[6] Malmuth N.D., Hall W.F., Davis B.I. and Rosen C.D, (1974) "Transient thermal phenomena and weld geometry in GTAW", *Welding Research Supplement*, pp. 388 – 400.

[7] Niles W. and Jackson C. E., (1975) "Welding thermal efficiency of the GTAW process", *Welding Journal Research Supplementary*, pp. 25-32.

[8] Yang L. J., Chandel R. S. and Bibby M. J., (1993) "The effects of process variables on the weld deposit area of submerged arc welds", *Welding Research Supplementary*, 1993, pp. 11-18.

[9] Kumar V., Lee C., Verhaeghe G., Raghunathan S., (2010), "CRA weld overlay - influence of welding process and parameters on dilution and corrosion resistance. Citing internet source *http://www.twi-global.com/technical-knowledge/published-papers/cra-weld-overlay-influence-of-welding-process-and-parameters-on-dilution-and-corrosion-resistance/ (accessed on 10 July 2014)*

[10] Muthupandi V., Srinivasan P.B., Seshadri S.K., Sundaresan S., (2003), "Effect of weld metal chemistry and heat input on the structure and properties of duplex stainless steel welds", *Materials Science and Engineering*, A358, pp. 9-16.

[11] Chakrabarti B., Das H., Das S. and Pal T.K., (2013), "Effect of process parameter on clad quality of duplex stainless steel using GMAW process", *Transaction of The Indian Institute of Metal*, Vol. 66, No.3, pp. 221-230.

[12] Norsok Standard M-601 (2004), "Welding and inspection of piping", Rev. 4, Clause 4.3.6.

[13] Kangas P., Walden B., Berglund G. and Nicholls M., (1999), "Ferritic-austenitic stainless steel and use of the steel", *Sandvik Aktieblog*, EP94919946A, pp. 5-6.

[14] Szumachowski E. R. and Reid H. F., (1978) "Cryogenic toughness of SMA austenitic stainless steel weld metals part I —role of ferrite, *Welding Research Supplement*, pp. 325-333.

[15] Ogawa T., Koseki T., Ohkita S. and Nakajima H., (1990), "4K Properties of high-nitrogen stainless steel weldments. Welding Journal, *Welding Research Supplement*, pp. 205-212.

[16] Kordatos J.D., Fourlaris G. and Papadimitriou G., (1999) "The effect of hydrogen and cooling on the mechanical and corrosion of saf 2507 duplex stainless steel welds, *Material Sciences Forum* Vols. 318-320, pp. 615-620.

[17] Kocijan A., Donik C., Jenko M., (2009) "The corrosion behaviour of duplex stainless steel in chloride solutions studied by XPS", *Original Scientific Article,* MTAEC9, 43(4) 195, pp. 195-199.

[18] Metrode Products Limited, (2005), "Welding guildlines for duplex and superduplex stainless steels", Issue 1.

[19] Esab, "Welding duplex stainless steel the ESAB way", Register No. XA 00097320 12 2011.

[20] J. M. Gomez de Salazar, A. Soria M.I. Barrena (2007) "The effect of N2 addition upon the MIG welding process of duplex steel" *Journal Materials of Science.* Vol. 42: pp.2892-4898.

Your Answer To Protective Coating

We are 25 years old today

16th of May, 2022

We are grateful for your past and future support!

Blasting & Painting Services

Certified ISO 9001:2015

Since 2008

Grit Blasted Approximately 5 million sqm. Swedish Std SA 2.5

UCE

UNIVERSAL CORROSION ENGINEERING (M) SDN BHD

IMM COUNCIL MEMBERS & COMMITTEES

2022-2024 SESSION

Advisor:	Prof. Ts. Dr. Mohamad Kamal Harun (Razak School of Government)
President:	Dato' Dr. Ir. Ts. Haji Mohd Abdul Karim Abdullah (Serba Dinamik Group Berhad)
Deputy President:	Ts. Dr. Chew Khoon Hee (Tunku Abdul Rahman University College)
Honorary Secretary:	Prof. Ts. ChM. Dr. Melissa Chan Chin Han (Universiti Teknologi MARA)
Honorary Treasurer:	Ts. Dr. Mohamed Ackiel Mohamed (Serba Dinamik Group Berhad)
Immediate Past President:	Ts. Mohd. Azmi Mohd. Noor (Triple EEE Sdn Bhd)
Council Members:	Ir. Ong Hock Guan (Shell Malaysia Exploration & Production)
	Ir. Ts. Noor Hisham Yahaya (Safe Asbestos Solutions Sdn Bhd)
	Ir. Dr. Edwin Jong Nyon Tchan (Advanced Metallurgy & Welding Technology Sdn Bhd)
	Ts. Wan Mohd Arif Wan Ibrahim (Universiti Malaysia Perlis)
	Ir. Mohd Syukri Mohd Khalid (Sarawak Shell Berhad)
	Kang Kim Ang (CorrTrol Synergy Sdn Bhd)
	Ts. CEng. Dr. Bernard Maxmillan Sim (Bureau Veritas (M) Sdn Bhd)
	Nik Khairil Azman Nik Abdullah (Temperlite Insulation Sdn Bhd)
	Mark Hew Yoon Onn (Universal Corrosion Engineering (M) Sdn Bhd)
	Assoc. Prof. Dr. Tuty Asma Abu Bakar (Universiti Teknologi Malaysia)
	Devinakumar Ratanam (Topfields Borneo Sdn Bhd)
	Assoc. Prof. Dr. Lim Teck Hock (Tunku Abdul Rahman University College)
	Dr. Amalina Muhammad Afifi (Universiti Malaya)
	Ts. Brian Lim Siong Chung (Geopolitan Sdn Bhd)
	Daniel Sagoh (Mui Lee Enterprise Sdn Bhd)
	Danny Tan Kim Chew (Abadi Oil & Gas Services Sdn Bhd)
	Dr. Dasline Sinta (Dreamcatcher)
	Karen Cheng Siew Hoon (Serba Dinamik Group Berhad)
	Asst. Prof. Dr. Maxine Yee Swee Li (University of Nottingham Malaysia)
	Dr. Nazatul Liana Sukiman (Universiti Malaya)
	Ts. Dr. Nur Aimi Jani (Universiti Teknologi MARA)
	Ts. Ong Thai Kiat (Tunku Abdul Rahman University College)
	Assoc. Prof. Ts. Dr. Tay Chia Chay (Universiti Teknologi MARA)
	Ir. Ts. Dr. Tan Kim Seah (Oryx Advanced Materials Sdn Bhd)
	Asst. Prof. Ts. Dr. Yu Lih Jiun (UCSI University)

REGIONAL CHAPTER CHAIRPERSONS

Bintulu	Raymond Phen	Asean Bintulu Fertilizer Sdn Bhd
Miri	Ir. Dr. Edwin Jong Nyon Tchan	Advanced Metallurgy & Welding Technology Sdn Bhd
Southern	Assoc. Prof. Dr. Tuty Asma Abu Bakar	Universiti Teknologi Malaysia
Northern	Ts. Wan Mohd Arif Wan Ibrahim	Universiti Malaysia Perlis

WORKING COMMITTEE CHAIRPERSONS

Asset Integrity	Ir. Ts. Noor Hisham Yahaya	Safe Asbestos Solutions Sdn Bhd
Coating	Devinakumar Ratanam (Chairperson)	Topfields Borneo Sdn Bhd
	Mark Hew Yoon Onn (Co-Chairperson I)	Universal Corrosion Engineering (M) Sdn Bhd
	Daniel Anak Sagoh (Co-Chairperson II)	Mui Lee Enterprise Sdn Bhd
Corrosion	Ir. Ong Hock Guan	Shell Malaysia Exploration & Production
Insulation	Nik Khairil Azman Nik Abdullah (Chairperson)	Temperlite Insulation Sdn Bhd
	Danny Tan Kim Chew (Co-Chairperson)	Abadi Oil & Gas Services Sdn Bhd
Materials Fingerprinting	Prof. Ts. ChM. Dr. Melissa Chan Chin Han	Universiti Teknologi MARA
Polymer	Ts. Ong Thai Kiat	Tunku Abdul Rahman University College
Welding	Ts. CEng. Dr. Bernard Maxmillan Sim	Bureau Veritas (M) Sdn Bhd
Vibration	Ir. Mohd Syukri Mohd Khalid	Sarawak Shell Berhad
Continuous Professional Development (CPD)	Ts. Dr. Chew Khoon Hee (Chairperson)	Tunku Abdul Rahman University College
	Ir. Ts. Dr. Tan Kim Seah (Co-Chairperson)	Oryx Advanced Materials Sdn Bhd
Education	Ir. Max Ong Chong Hup	Norimax Sdn Bhd
Examination & Certification Panel	Dr. Nazatul Liana Sukiman	Universiti Malaya
Certification Panel	Ts. Brian Lim Siong Chung	Geopolitan Sdn Bhd
Examination Panel	Prof. Ts. ChM. Dr. Melissa Chan Chin Han (Acting Chairperson)	Universiti Teknologi MARA
IMM-MBOT Assessment Panel	Ts. Wan Mohd Arif Wan Ibrahim	Universiti Malaysia Perlis
Impartiality	Kang Kim Ang	CorrTrol Synergy Sdn Bhd
Industry, Professional Body and Government Agency Liaison	Ir. Ts. Noor Hisham Yahaya	Safe Asbestos Solutions Sdn Bhd
Materials Lecture Competition (MLC)	Dr. Nor Akmal Fadil	Universiti Teknologi Malaysia
Materials Mind Editorial Board	Assoc. Prof. Ts. Dr. Tay Chia Chay	Universiti Teknologi MARA
Membership	Ts. Dr. Chew Khoon Hee (Chairperson)	Tunku Abdul Rahman University College
	Mark Hew Yoon Onn (Co-Chairperson)	Universal Corrosion Engineering (M) Sdn Bhd
Standard Assurance	Assoc. Prof. Dr. Amalina Mohammad Afifi	Universiti Malaya
Standards Development	Asst. Prof. Ts. Dr. Yu Lih Jiun	UCSI University
Student Chapter	Assoc. Prof. Dr. Lim Teck Hock	Tunku Abdul Rahman University College
Young Professionals	Mohd Fairuz Mohd Salleh	Serba Dinamik Group Berhad

IMM COUNCIL MEMBERS & COMMITTEES

2022-2024 SESSIONS

COATING COMMITTEE

Secretariat Coordinator: Ainur Afini Puaze

Alternate: Aberamy Dayalam

Chairperson:	Devinakumar Ratanam	Topfields Borneo Sdn Bhd
Co-Deputy Chairman I:	Mark Hew Yoon Onn	Universal Corrosion Engineering (M) Sdn Bhd
Co-Deputy Chairman II :	Daniel Anak Sagoh	Mui Lee Sdn Bhd
Secretary:	Laurine Lecka Anak Kunting	Dynaciate Engineering Sdn Bhd
Treasurer:	Devyne Koh	Sabah Skills & Technology Centre
Public Liaison:	Chris Chong	Seacademy Sdn Bhd
Members:	Ahmad Badli Shah Abdul Aziz (alt)	International Paint (M) Sdn Bhd
	Karen Cheng Siew Hoon	Serba Dinamik Group Berhad
	Chantana Murugan	Freelance
	Chan Wai Sing	Material Protection Engineering Sdn Bhd
	Daving Ngau	Seacademy Sdn Bhd
	Choo Siang Wen	Kebabangan Petroleum Operating Company Sdn Bhd
	Junaidy Abdullah	Norimax Sdn Bhd
	Era Perumal Raman	PS Peruvision Sdn Bhd
	Ernest Lau Hong Kit	Innocorr Offshore Sdn Bhd
	Ting Lai Liong (alt)	Dutech Instrument Sdn Bhd
	Selvandran Vello (alt)	Hempel (M) Sdn Bhd
	Terry Chow Qiu Li	Flakeshield Sdn Bhd
	Ir. Max Ong Chong Hup	Norimax Sdn Bhd
	Yip Han Wei	Sarawak Shell Berhad
	Mohamad Ariff Sukur	Sarawak Shell Berhad
	Nurjaimi Ali	PETRONAS GTS
	Patricia Santa	Topfields Borneo Sdn Bhd
	Lee Kang Huey	Metalcoat Engineering Sdn Bhd
	Mohamad Ikmal Hisham Ashari (alt)	Materials Technology Education Sdn Bhd
	Dato' Udani Dato' Seri Mohamed Daud	Max Energy Sdn Bhd
	Selvandran Vello	Hempel (M) Sdn Bhd
	Tariq Mehtab Mohd Ishaq (alt)	T4 Energy

CORROSION COMMITTEE

Secretariat Coordinator: Ainur Afini Puaze

Alternate: Aberamy Dayalam

Chairperson:	Ir. Ong Hock Guan	Sarawak Shell Berhad
Deputy Chairperson:	Nik Khairil Azman Nik Abdullah	Temperlite Insulation Sdn Bhd
Secretary:	Syarifah Nazliah Syed Abdul Rahman	BSSTECH CP (M) Sdn Bhd
Treasurer:	Leow Chun Ho	Sarawak Shell Berhad
Members:	Danny Tan Kim Chew	Abadi Oil & Gas Services Sdn Bhd
	Dr. Azzura Ismail	Universiti Tun Hussein Onn Malaysia
	Chew Boon Kheng (alt/obs)	GPT Resources Sdn Bhd
	Yip Han Wei	Sarawak Shell Berhad
	Junaidy Abdullah	Norimax Sdn Bhd
	Kang Kim Ang	Corrtrol Synergy Sdn Bhd
	Karen Cheng Siew Hoon	Serba Dinamik Group Berhad
	Dr. Kee Kok Eng	Universiti Teknologi PETRONAS
	Kent Ooi	Chong Wah-NTIA Sdn Bhd
	Mark Hew Yoon Onn	Universal Corrosion Engineering (M) Sdn Bhd
	Ir. Max Ong Chong Hup (alt/obs)	Norimax Sdn Bhd
	Mohamad Ikmal Hisham Ashari (alt/obs)	Materials Technology Education Sdn Bhd
	Mohd. Khairi Kadir	Cosasco (M) Sdn. Bhd.
	Noraishah Mohamad Noor	Rapld Rail Sdn Bhd
	Ong Wei Rex	Corrodynamic Sdn Bhd
	Wee Ching Yun	Chong Wah-NTIA Sdn Bhd
	Dr. Yoga Sugama Salim	Cetim Asia Pacific Sdn Bhd
	Ts. Dr. Maxine Yee Swee Li	University of Nottingham Malaysia
	Chia Kok Chua	PTT Exploration and Production (PTTEP)
	Calvin Kok Wai Chee	CSI System Sdn Bhd
	Tariq Mehtab Mohd. Ishaq (alt/obs)	T4 Energy

CERTIFICATION PANEL

Secretariat Coordinator: Nurhasanah Sahri

Alternate: Aberamy Dayalam

Co-Chairperson:	Ts. Brian Lim Siong Chung	Geopolitan Sdn Bhd
Secretary:	Ts. Dr. Yvette Shaan-Li Susiapan	Asia Pacific University of Technology & Innovation (APU)
Treasurer:	Harvin Kaur Gurchran Singh	Asia Pacific University of Technology & Innovation (APU)

EDUCATION COMMITTEE

Secretariat Coordinator: Ainur Afini Puaze

Alternate: Aberamy Dayalam

Chairperson:	Ir. Max Ong Chong Hup	Norimax Sdn Bhd
Deputy Chairperson:	Assoc. Prof. Ts. Dr. Muhamad Azizi Mat Yazid	Universiti Teknologi Malaysia
Secretary & Treasurer:	Asst. Prof. Dr. Maxine Yee Swee Li	University of Nottingham Malaysia
Members:	Prof. Dr. Agus Geter Edy Sutjipto	Universiti Malaysia Pahang
	Assoc. Prof. Dr. Andri Andriyana	Universiti Malaya
	Assoc. Prof. Dr. Ang Bee Chin	Universiti Malaya
	Dr. Amirah Amalina Ahmad Tarmizi	Universiti Teknologi MARA
	Dr. Azzura Ismail	Universiti Tun Hussein Onn Malaysia
	Ts. Dr. Chew Khoon Hee	Tunku Abdul Rahman University College
	Ts. Dr. Mahmood Anwar	Curtin University Malaysia
	Assoc. Prof. Dr. Andrew Spowage	Queen Mary University of London
	Dr. Nazatul Liana Sukiman	Universiti Malaya
	Assoc. Prof. Eur-Ing. Nigel Patrick Brewitt	MTIS Sdn Bhd
	Prof. Ir. Dr. Rajkumar Durairaj	Universiti Tunku Abdul Rahman
	Dr. Sharifah Adzila Syed Abu Bakar	Universiti Tun Hussein Onn Malaysia
	Asst. Prof. Ts. Dr. Yu Lih Jiun	UCSI University
	Ts. Wan Mohd Arif Wan Ibrahim	Universiti Malaysia Perlis
	Dr. Choong Wai Heng	Universiti Malaysia Sabah
	Puan Nor Fazilah Abdullah	UCSI University
	Assoc. Prof. Dr. Puteri Sri Melor Binti Megat Yusoff	Universiti Teknologi PETRONAS
	Ir. Ong Hock Guan	Sarawak Shell Berhad
	Ir. Raymond Lam Choong Meng	PETRONAS Carigali
	Siti Haslina	PETRONAS GTS
	Nurjaimi Ali	PETRONAS GTS

EXAMINATION AND CERTIFICATION PANEL (ECP)

Secretariat Coordinator: Nurhasanah Sahri

Alternate: Aberamy Dayalam

Acting Chairperson	Dr. Nazatul Liana Sukiman	University Malaya
Member:	Dr. Goh Yingxin	University Malaya
	Dr. Muhammad Khairi Faiz Ahmad Hairuddin	University Malaya
	Dr. Chai Ai Bao	University of Nottingham Malaysia
	Dr. Shahira Liza Kamis	Universiti Teknologi Malaysia

IMM COUNCIL MEMBERS & COMMITTEES

2022-2024 SESSIONS

EXAMINATION PANEL

Secretariat Coordinator: Nurhasanah Sahri
Alternate: Aberamy Dayalam

Acting Chairperson	Prof. Ts. ChM. Dr. Melissa Chan Chin Han	Universiti Teknologi MARA
Member:	Ir. Ts. Dr. Tan Kim Seah	Oryx Advance Materials Sdn Bhd
	Dr. Andrew Ng Kay Lup	Xiamen University, Malaysia
	Dr. Mohd Lokman Ibrahim	Universiti Teknologi MARA

MATERIALS FINGERPRINTING COMMITTEE

Secretariat Coordinator: Nurhasanah Sahri
Alternate: Aberamy Dayalam

Advisor:	Prof. Ts. Dr. Mohamad Kamal Harun	Razak School of Government
Chairperson:	Prof. Ts. ChM. Dr. Melissa Chan Chin Han	Universiti Teknologi MARA
Deputy Chairperson:	Asst. Prof. Ts. Dr. Yu Lih Jiun	UCSI University
Secretary:	Suhaila Idayu Abdul Halim	Universiti Teknologi MARA
Treasurer:	Nurul Fatahah Asyqin Zainal	Universiti Teknologi MARA
Members:	Abdul Aziz Haron	SIRIM QAS International Sdn Bhd
	Ahmad Badli Shah Abdul Aziz	International Paint Sdn Bhd
	Aik Siaw Chuin	Eurofins NM Laboratory Sdn Bhd
	Goh Yong Sean (alt)	Eurofins NM Laboratory Sdn Bhd
	Ts. Dr. Chew Khoon Hee	Tunku Abdul Rahman University College
	Chow Mee Ling	Agilent Technologies Sales (M) Sdn Bhd
	Hairunnisa Ramli	Universiti Teknologi MARA
	Ismaliza Ismail	Malaysia Rubber Board
	Kenneth Way (obs)	Inno Lab Engineering Sdn Bhd
	Lee Choon Siong	Jotun (M) Sdn Bhd
	Leow Chun Ho (alt)	Shell Malaysia Exploration & Production
	ChM. Lim Chuan Gee (alt)	Retiree
	Assoc. Prof. Dr. Lim Teck Hock (alt)	Tunku Abdul Rahman University College
	Ts. Dr. Mahmood Anwar	Curtin University, Sarawak
	Ir. Max Ong Chong Hup	Norimax Sdn Bhd
	Mohamad Ariff Sukur	Sarawak Shell Malaysia
	Mokhtar Othman (alt)	International Paints (M) Sdn Bhd
	Mohamad Ikmal Hisham (obs)	Materials Technology Education Sdn Bhd
	Mohd Wahidduzzaman Zainal	PPG Coatings (M) Sdn Bhd
	Nurjaimi Ali	PETRONAS GTS
	Dr. Yoga Sugama Salim	Cetim Asia Pacific Sdn Bhd
	Renee Teo Yong Yin	Bruker (M) Sdn Bhd
	Selvandran Vello	Hempel (M) Sdn Bhd
	Teh Tiong Poh (alt)	Jotun (M) Sdn Bhd
	Norsyazlin Rashid	Universiti Teknologi MARA
	Ir. Zarina Rasmin	SIRIM QAS International Sdn Bhd

MATERIALS LECTURE COMPETITION COMMITTEE

Secretariat Coordinator: Hadi Hasmadi
Alternate: Aberamy Dayalam

Chairperson:	Dr. Nor Akmal Fadil	Universiti Teknologi Malaysia
Members:	Ts. Dr. Teo Pao Ter	Universiti Malaysia Kelantan
	Assoc. Prof. Dr. Rozyanty Rahman	Universiti Malaysia Perlis
	Ts. Dr. Norazean Shaari @ Md Noh	Universiti Selangor
	Assoc. Prof. Dr. Nurulakmal Mohd Sharif	Universiti Sains Malaysia
	Assoc. Prof. Ir. Dr. Chai Ai Bao	University of Nottingham Malaysia
	Ir. Dr. Christine Yeo Wan Sieng	Curtin University Malaysia
	Dr. Choo Hui Leng	Taylor's University
	Dr. Chou Pui May	Taylor's University
	Assoc. Prof. Ts. Dr. Ervina Efzan Mohd Noor	Multimedia University
	Dr. Hairul Effendy Ab. Maulod	Univeriti Teknikal Malaysia
	Assoc. Prof. Ts. Dr. Hamimah Abd. Rahman	Universiti Tun Hussein Onn Malaysia
	Dr. Andrew Ng Kay Lup	Xiamen University Malaysia
	Assoc. Prof. Ir. Dr. How Ho Cheng	University of Nottingham Malaysia
	Dr. Nashrah Hani Jamadon	Universiti Kebangsaan Malaysia
	Dr. Nazatul Liana Sukiman	Universiti Malaya
	Ts. Dr. Nik Roselina Nik Roseley	Universiti Teknologi MARA
	Assoc. Prof. Dr. Norkhairunnisa Mazlan	Universiti Putra Malaysia
	Ms. Nurfanizan Mohd Afandi	Universiti Tenaga Nasional
	Dr. Mohd Edeerozey Abd Manaf	Univeriti Teknikal Malaysia
	Ts. Dr. Mohd Salahuddin Mohd Basri	Universiti Putra Malaysia
	Mr. Ong Thai Kiat	Tunku Abdul Rahman University College
	Ts. Dr. Pua Fei Ling @ Grace Pua	Universiti Tenaga Nasional
	Assoc. Prof. Ts. Dr. Sazmal Effendi Arshad	Universiti Malaysia Sabah
	Dr. Yanny Marliana Baba Ismail	Universiti Sains Malaysia
	Dr. Abdillah Sani Bin Mohd Najib	Universiti Teknologi Malaysia
	Dr. Muhammad Khairi Faiz Bin Ahmad Hairuddin	Universiti Malaya
	Dr. Syazwani Binti Mohd Zaki	International Islamic University Malaysia
	Assoc. Prof. Chm. Dr. Yong Soon Kong	Universiti Teknologi MARA
	Dr. Kee Kok Eng	Universiti Teknologi Petronas

MIRI CHAPTER

Secretariat Coordinator: Syafika Azis
Alternate: Norita Othman

Chairperson:	Ir. Dr. Edwin Jong Nyon Tchan	Advanced Metallurgy & Welding Technology Sdn Bhd
Deputy Chairperson:	Giridharan Anandan	Velosi Sdn Bhd
Vice Chairperson I:	Prof. Dr. Beena Giridharan	Curtin University Malaysia
Vice Chairperson II:	Dr Bernard Maxmillan Sim	Bureau Veritas (M) Sdn Bhd
Honorary Secretary:	Ir. Andrew Ling Tuong Thai	Sarawak Shell Bhd
Assistant Secretary:	Yung Chik Kiing	Bureau Veritas (M) Sdn Bhd
Treasurer:	Lee Chung Khiong	Dayang Enterprise Holdings Berhad
Member:	Ir. Dr. Christine Yeo	Curtin University Malaysia
	Ir. Dr. Sung Aun Naa	Curtin University Malaysia
	Sheron Lim Gek Joo	Sarawak Shell Berhad
	Kelvin Wong Chong Soon	Advanced Metallurgy & Welding Technology Sdn Bhd

IMM COUNCIL MEMBERS & COMMITTEES

2022-2024 SESSION

	Devinakumar Ratanam	Topfields Borneo Sdn Bhd
	Ir. Desmond Chin Teck Eng	Ocean Line Dockyard Sdn Bhd
	Ts. Dr. Mahmood Anwar	Curtin University Malaysia
	Roslee Yusof	PC Sdn Bhd
	Shukri Johari	Bureau Veritas (M) Sdn Bhd
	Phang Yeen Yeem	Bureau Veritas (M) Sdn Bhd

STANDARD ASSURANCE COMMITTEE

Secretariat Coordinator: Syazana Shahabudin
Alternate: Norita Othman

Chairperson:	Assoc. Prof. Dr. Amalina M. Afifi	Universiti Malaya
Deputy Chairperson:	Dr. Nashrah Hani Jamadon	Universiti Kebangsaan Malaysia
Secretary:	Ir. Dr. Wong Yew Hoong	University of Malaya
Treasurer:	Dr. Suriani Ibrahim	University of Malaya
Members:	Assoc. Prof. Ir. Dr. Leo Choe Peng	Universiti Sains Malaysia
	Prof. Dr. Ir. Mariatti Jaafar @ Mustapha	Universiti Sains Malaysia
	Dr. Nor Ishida Zainal Abidin	University of Malaya
	Assoc. Prof. Dr. Nadras Othman	Universiti Sains Malaysia
	Norhashidah Talip	Malaysian Nuclear Agency
	Assoc. Prof. Dr. Roslina Binti Ahmad	University of Malaya
	Dr. Ummi Hani Abdullah	Universiti Putra Malaysia
	Dr. Tuan Zaharinie Tuan Zahari	Universiti Malaya

STANDARD DEVELOPMENT COMMITTEE

Secretariat Coordinator: Ainur Afini Puaze
Alternate: Aberamy Dayalam

Chairperson:	Asst. Prof. Ts. Dr. Yu Lih Jiun	UCSI University
Deputy Chairperson:	Dr. Jamuna Thevi Kalitheertha Thevar	SIRIM QAS International Sdn Bhd
Secretary:	Asst. Prof.Ts. Dr. Cik Suhana Hassan	UCSI University
Treasurer:	Victor Ananth Paramananth	Royal Malaysia Police
Members:	William Soon Guok Hau	Armacell Asia Ltd
	Dr. Andrew Ng Kay Lup	Xiamen University Malaysia
	Abdul Aziz Haron	SIRIM QAS International Sdn Bhd
	Ts. Dr. Mahmood Anwar	Curtin University Malaysia

STUDENT CHAPTER

Secretariat Coordinator: Hadi Hasmadi
Alternate: Norita Othman

Chairperson:	Assoc. Prof. Dr. Lim Teck Hock	Tunku Abdul Rahman University College
Deputy Chairperson:	Dr. Amirah Amalina Ahmad Tarmizi	Universiti Teknologi MARA
Secretary:	Ts. Dr. Ho Mui Yen	Tunku Abdul Rahman University College
Treasurer:	Assoc. Prof. Ts. Dr. Hamimah Abd Rahman	Universiti Tun Hussein Onn Malaysia (UTHM)
Members:	Ts. Brian Lim Siong Chung	Geopolitan Sdn Bhd
	Dr. Choo Hui Leng	Taylor's University
	Dr. Liew Chiam Wen	Tunku Abdul Rahman University College
	Ts. Dr. Mahmood Anwar	Curtin University Malaysia
	Ts. Ong Thai Kiat	Tunku Abdul Rahman University College
	Ts. Ng Chan Wah	Tunku Abdul Rahman University College

WELDING COMMITTEE

Secretariat Coordinator: Syafika Azis
Alternate: Norita Othman

Chairperson:	Dr Bernard Maxmillan Sim	Bureau Veritas (M) Sdn Bhd
Deputy Chairperson:	Ir. Dr. Edwin Jong Nyon Tchan	Advanced Metallurgy & Welding Technology Sdn Bhd
Secretary:	Abdul Alaziz	Sapura Energy Berhad
Treasurer:	Darren Lim	Euro Potential Sdn Bhd
Education:	Dominic Christopher	Brooke Dockyard Engineering Works Corporation
Public Liason:	Ahmad Adly	OceanMight Sdn Bhd
Members:	Biran Atu	Brooke Dockyard Engineering Works Corporation
	Daniel Liaw	PETRONAS Carigali Sdn Bhd
	Roslee Yusoff	PETRONAS Carigali Sdn Bhd
	Shukri Johari	Bureau Veritas (M) Sdn Bhd
	Haziq Ariffin	Malaysia LNG
	Ir. Desmond Chin Teck Eng	Ocean Line Dockyard Sdn Bhd
	Karen Cheng Siew Hoon	Serba Dinamik Group Berhad

Notes:

1) obs: observer
alt: alternate

Compiled by: IMM Secretariat,
The information was updated as of 27 July 2022

INSTITUTE OF MATERIALS, MALAYSIA

IMM CPD Application Form

FOR APPLICANT	
Description of Activity:	
Organizer/Committee:	
Date:	**Time:**
Venue:	
Topics covered:	
No. of Activity Hours Applied:	
Submitted by: **Signature:** ..... **Date:** ..... **Name of Applicant:** ..... *** A copy of itinerary of the event/brochure shall be submitted together with this form.*	
FOR IMM SECRETARIAT	
Professional Development: **Activity Code**	
No. of CPD Points Granted:	
IMM Secretariat: **Signature:** ..... **Date:** ..... **Name:**	

Remark:

_____

_____

Professional Development Activity Code	Professional Development Activity Scope	Weightage Factor
A	Attending Training Courses/Workshop/ Working Sub-committee Activity on Development of Examinations and/or Training Courses	4
B	Course Trainer/Facilitator/Examiner/ Conference Presenter	3
C	Attend Seminar/Conference/Webinars	2
D	Paper Author Main Author (max 30 hours/year) Co-author (max 10 hours/year)	2
E	Attend Committee Meeting	1

Introduction of IMM's Continuing Professional Development ("CPD") Scheme for Certified Personnel.

With effect from 1st January 2023, all IMM Certified Personnel will be required to submit their yearly Continuing Professional Development (CPD) report to qualify for renewal of their certification upon expiry. The objective of CPD is to encourage Certified Personnel to regularly improve themselves and keep themselves updated with latest developments in their industry. As such, IMM certified personnel must commence collecting CPD Points during the year 2022 to meet the required one-year CPD Points by January 2023.

CONTINUING PROFESSIONAL DEVELOPMENT ("CPD")
LOG TEMPLATE
(Supporting documents to be submitted wherever applicable)

Date or Period	Professional Development Activity Code & Description	Role	No. of Activity Hours	Weightage	No. of CPD Points

The CPD points calculation shall be based on the weightage factor shown below for each Activity Code.

Professional Development Activity Code	Professional Development Activity Scope	Weightage Factor
A	Attend Training Courses/Workshops/Working Sub-Committee Activity on Development of Examinations and/or Training Courses	4
B	Course Trainer/Facilitator/Examiner/ Conference Presenter	3
C	Attend Seminar/Conference/Webinars	2
D	Paper Author Main author (max 30 hours/year) Co-author (max 10 hours/year)	2
E	Attend Committee Meeting	1

The minimum number of CPD Points per year shall be **10 points**.
The minimum number of CPD Points per 5 year for re-certification shall be **100 points**.

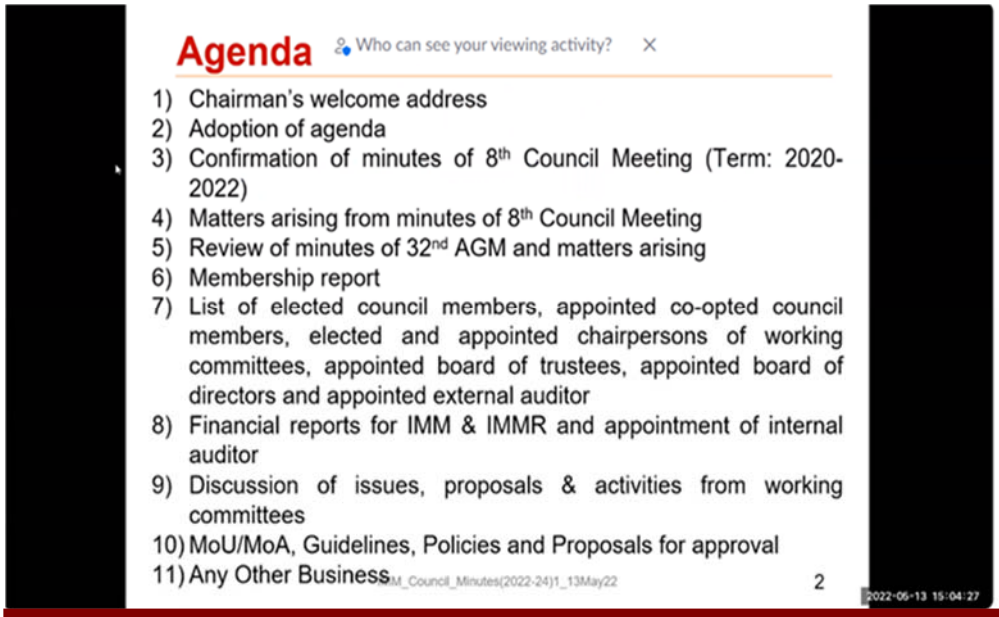
1st IMM Council Meeting

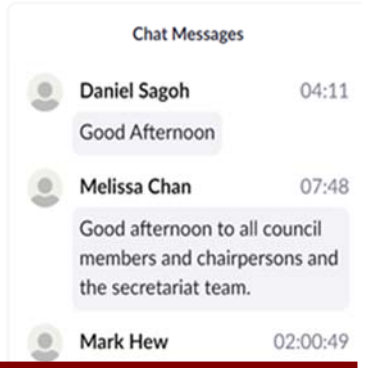
Term: 2022 - 2024

Date: **13th May 2022 (Friday)**

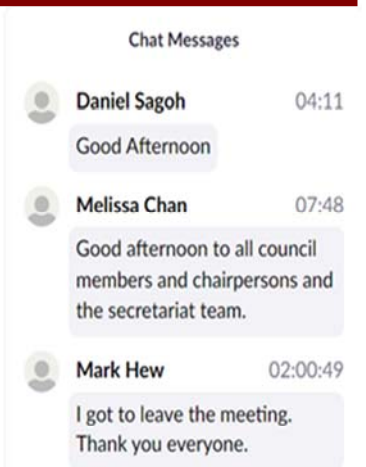
Mode: **Online via Zoom Meeting**

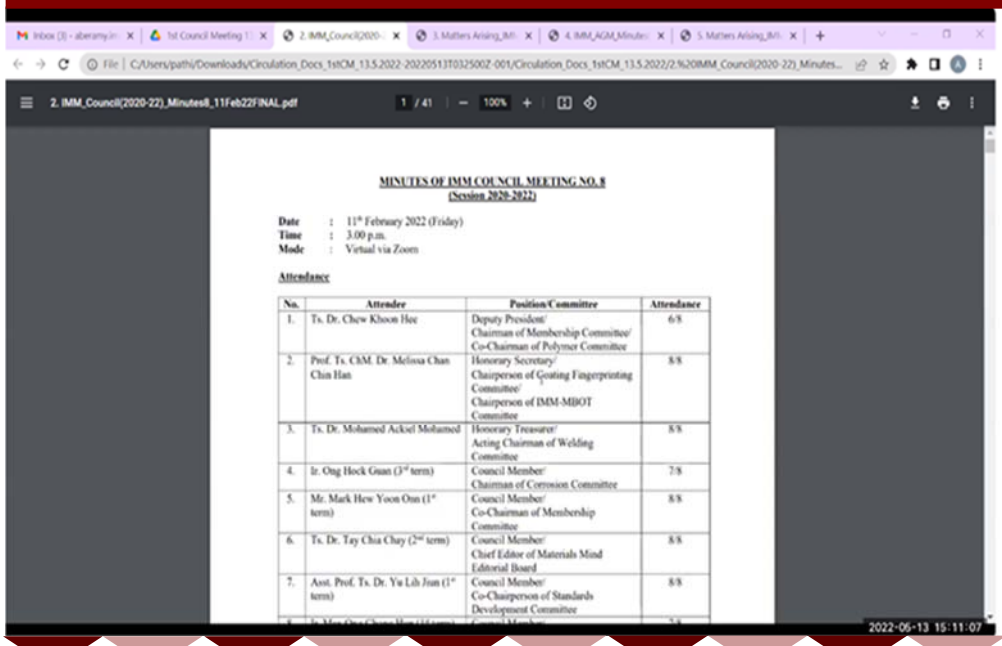
Time: **3.00 p.m.**

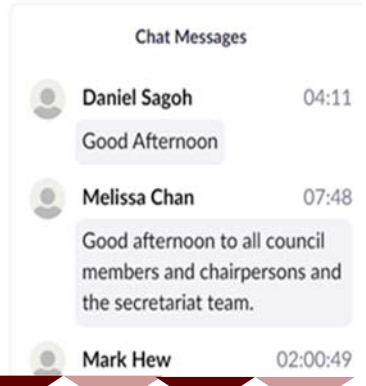

Agenda
Who can see your viewing activity?
1) Chairman's welcome address
2) Adoption of agenda
3) Confirmation of minutes of 8th Council Meeting (Term: 2020-2022)
4) Matters arising from minutes of 8th Council Meeting
5) Review of minutes of 32nd AGM and matters arising
6) Membership report
7) List of elected council members, appointed co-opted council members, elected and appointed chairpersons of working committees, appointed board of trustees, appointed board of directors and appointed external auditor
8) Financial reports for IMM & IMMR and appointment of internal auditor
9) Discussion of issues, proposals & activities from working committees
10) MoU/MoA, Guidelines, Policies and Proposals for approval
11) Any Other Business
2
2022-05-13 15:04:27


Chat Messages
Daniel Sagoh 04:11
Good Afternoon
Melissa Chan 07:48
Good afternoon to all council members and chairpersons and the secretariat team.
Mark Hew 02:00:49


Aberamy IMM
Chin Han Chan
Dr Edwin Jong
devin
NUR AMI JANI
Chew Khoon Hee
Maxine Yee
tay
Dasline Sinta
Daniel Sagoh
Institute of Materials...
Wan Arif
00:05:05 / 02:42:00
Speed
2022-05-13 15:01:29


Chat Messages
Daniel Sagoh 04:11
Good Afternoon
Melissa Chan 07:48
Good afternoon to all council members and chairpersons and the secretariat team.
Mark Hew 02:00:49
I got to leave the meeting. Thank you everyone.


2. IMM_Council(2020-22)_Minutes8_11Feb22FINAL.pdf
MINUTES OF IMM COUNCIL MEETING NO. 8
(Session 2020-2022)
Date : 11th February 2022 (Friday)
Time : 3.00 p.m.
Mode : Virtual via Zoom
Attendance
2022-05-13 15:11:07


Chat Messages
Daniel Sagoh 04:11
Good Afternoon
Melissa Chan 07:48
Good afternoon to all council members and chairpersons and the secretariat team.
Mark Hew 02:00:49

Participation in the IMM-Miri Awareness Seminar: "Behaviours of Steel Materials during Welding"

Reported by:
Ms. Sheron Lim, IMM-Miri Public Liaison Officer, c/o Sarawak Shell Berhad/Sabah Shell Petroleum Company, Miri, Sarawak and Ir. Dr. Christine Yeo, IMM-Miri Education Officer cum IMM-Curtin Student Advisor, Curtin University Malaysia, Miri, Sarawak.
Edited by: Ir. AP. Dr. Edwin Jong, IMM-Miri Committee Chairman AMW Technology Sdn Bhd, Miri, Sarawak

Through the outcomes from the IMM-Miri's Second Committee Meeting on 26th March 2022 via virtual Google Meet Platform and following the co-leaderships and initiatives, Ms Sheron Lim, Public Liaison Officer and Ir. Dr. Christine Yeo, Education Officer cum IMM-Curtin Student Advisor, IMM-Miri Regional Chapter have successfully organized a half-day welding technology awareness seminar entitled, **"Behaviours of Steel Materials during Welding"** on 30th May 2022 from 1.00pm until 5.00pm (as depicted in Figure-1), venued at SK3-206, Curtin University Malaysia (CUM) via both physical and virtual google meet platform as illustrated in Figures 2 to 4. The venue set-up by IMM-CUM student chapter and the complete set of systems/facilities at SK3-206 have been kindly provided by CUM management free of all charges.

Figure 1 *IMM-Miri Regional Chapter organized the first awareness seminar on 30th May 2022*

Figure 2 *showing a view of the awareness seminar hall at SK3-206 in CUM with some participants physically participated in the seminar hall.*

Figure 3 *Showing a group photo of the participants including the trainer, Ir. AP. Dr. Edwin who were physically present in the seminar hall.*

Figure 4 *A view showing those participants on-line via the Google Meet Platform*

The objectives of this unique event are primarily to provide some insight technical knowledge on the behaviours of various types of steels during heat treatment processes at different elevated high temperatures in relation to the Fe-C binary equilibrium phase diagram and thus to appreciate its practical applications in welding production, especially in the weld quality control in fulfilment of the relevant welding codes and specifications. Hence, this awareness seminar can also provide an unique opportunity for all working participants from various Malaysian industries to network and exchange their understanding with highly influential decision-makers especially in the practical applications of steel materials including the commonly used groups of stainless steels.

From the record of registration, all 15 registered participants, who are mainly operations and maintenance engineers from the oil and gas sector of the industries have participated in the half-day awareness seminar. Furthermore, from this half-day technical session, IMM-Miri was required to strictly adhere the CUM's mandatory safety and health requirements in order to conduct for both in-person/face-to-face and hybrid attendees connecting virtually with other seminar attendees simultaneously during the midst of the COVID-19 pandemic restrictions. However, the seminar has successfully and practically covered the essential technical knowledge of engineering materials especially on various types of commonly used steels in the Malaysian industries, the interpretation and applications of Fe-C Binary Phase Equilibrium Diagram on various heat treatment processes as well as during and after welding processes, changes of materials properties (for both carbon steels and stainless steels) across weldment including weld metal, heat affected zone (HAZ) and base metals, interpretation and possible predictions using carbon equivalent, C_{eqn} on the weldment harnesses with reference to the materials' chemical compositions. And, the relation between weld cracking susceptibility and Chemical Composition of steel can also be evaluated by weld cracking parameter, P_c that consists of weld cracking susceptibility index, P_{cm} in order to predict whether cold cracking may possibly encounter during normal welding process.

In general, feedbacks from participants are considered to be excellent with many affirmative remarks and further requesting IMM-Miri for more technical webinars of this nature to nurture our local Malaysian community.

Last but not least, this half-day awareness seminar has successfully completed with a short session for questions and answers at 5.20pm. Before seminar being adjourning, the organizing chairperson, Ir. Dr. Christine presented the certificates of participation to participants as illustrated in Figure-5. Likewise, Ms Sheron also sent out the e-copy of certificates of participation to those on-line participants via their registered e-mails respectively too.

Figure 5 *Photos showing the presentation of certificates to participants after the half-day awareness seminar*

The 9th Sabah Oil & Gas Conference & Exhibition 2022 (9th SOGCE 2022)

Reported by: Nurhasanah Sahri, IMM Secretariat
Reviewed by: Aberamy Dayalam, Assistant Manager of IMM Secretariat
Edited by: Mr. Wong Wing Kiong, General Manager of IMM Secretariat

Date: 9th – 10th June 2022
Venue: Sabah International Convention Centre, Kota Kinabalu, Sabah

The Sabah Oil & Gas Conference & Exhibition (SOGCE) is the only oil and gas conference and exhibition aimed at providing an industry platform for oil and gas companies to meet and discussed pivotal industry issues to help grow and explore opportunities in the Sabah Oil and Gas Industries. The 9th SOGCE 2022 was organised across two days of the full-day conference, with various interesting individual topics of paper presentations as well as panel sessions and a 2-day exhibition that showcased the latest equipment, technology and solutions to demonstrate competitive advantages and competencies that include international and regional energy companies, service providers and oil companies.

The Institute of Materials, Malaysia (IMM) had the opportunity to become one of the exhibitors at the SOGCE 2022. IMM booth was located at C11 and exhibited co-jointly with Materials Technology Education Sdn. Bhd. (MTE) (Associate Training Partner), Advance Multiskills Training Centre Sdn. Bhd. (AMTC) (Authorised Training Body) and Eurofins NM Laboratory Sdn. Bhd. (Recommended 3rd-party testing laboratories in relation to Coating Fingerprint Certificate for retained paint sample). We attracted and engaged more than 100 visitors by promoting IMM certification programs such as coating, coating fingerprinting etc., conferences organized by IMM, IMM memberships and *etc*. IMM participation met with an enthusiastic response from the visitors. The Coating Inspector and Protective Coating Technician are the two most popular IMM Certification Programs that were highly enquired by visitors at the SOGCE 2022.

During the walkabout session, the Deputy Chief Minister cum Minister of Industrial Development of Sabah, Datuk Dr. Joachim Gunsalam and the SOGCE 2022 Organising Chairperson, Ms. Dolly Jimayol were honoured to drop by the IMM booth and provided a certificate of participation of SOGCE to IMM. Overall, the SOGCE 2022 was a successful event where IMM received lots of responses and enquiries, especially on the IMM Certification Programs.

Figure 1 *Centre: Mr. Chan Wai Sing (IMM Coating Committee Member) visited the IMM booth at SOGCE 2022. Left: Aberamy Dayalam (IMM Assistant Manager) Right: Nurhasanah Sahri, (IMM Admin Executive).*

Figure 2 *Ms. Aberamy Dayalam promoted the IMM Certification Schemes to the visitors at SOGCE 2022.*

Figure 3 *Aberamy Dayalam gave an explanation of the IMM Certification Schemes to Datuk Dr. Joachim Gunsalam and Ms. Dolly Jimayol.*

Figure 4 *A group photo at IMM Booth. From Left: Ms. Dolly Jimayol (SOGCE Organising Chairperson), The Honourable Datuk Dr. Joachim Gunsalam (Deputy Chief Minister and Minister of Industrial Development, Sabah), Ms. Karen Cheng (Director of Material Technology Education Sdn. Bhd.), Aberamy Dayalam (Assistant Manager, IMM), Mr. Windri Lewi Tukin (Manager Sales & Marketing, Eurofins NM Laboratory Sdn. Bhd.) and Mr. Henry Siban (Managing Director, AMTC).*

IMM TRAINING AND CERTIFICATION PROGRAM OVERVIEW

The Institute of Materials, Malaysia (IMM) offers engineering & technical professionals and practitioners a range of Certification Schemes and technical training courses to meet the requirements of the oil & gas, refining, petrochemical, transport, construction and other industries. Our programs have been developed together with the industry, academia and relevant stakeholders to ensure that the technical training and certification provided meet the relevant industry standards and requirements.

PROGRAM: COATING

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
• Certified Protective Coating Technician (Blaster and/or Painter) Level 1 and Level 2 • Certified IMM-B1/B2 Assistant Blaster & Painter • Certified Coating Inspector Level 1 • Certified Coating Inspector Level 2 • Certified Blasting and Painting Supervisor • Certified Thermal Spray Coating Applicator • Certified Coating Quality Control Technician	• Refresher Course of Certified Protective Coating Technician (Blaster and/or Painter) Level 1 and Level 2 • Refresher Course of Certified Coating Inspector • Basic Knowledge on Corrosion Protection for Technicians and Engineers • Corrosion Control by Protective Coating • Basic Corrosion & Coating Course

PROGRAM: COATING FINGERPRINTING

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
• Certified Coating Fingerprint Quality Controller Level 1 • Certified Coating Fingerprint Quality Controller Level 2 • Certified Coating Fingerprint Trainer	• Coating Fingerprint Foundation Course • Refresher Course of Certified Coating Fingerprint Quality Controller Level 1/Level 2

PROGRAM: CORROSION

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
• Certified Corrosion Monitoring Practitioner Level 1 • Certified Corrosion Monitoring Practitioner Level 2 • Certified Corrosion Monitoring Practitioner Level 3 • Certified Cathodic Protection Practitioner Level 1 • Certified Cathodic Protection Practitioner Level 2 • Certified Cathodic Protection Practitioner Level 3 • Certified Cathodic Protection Engineer	• Corrosion Control by Cathodic Protection

PROGRAM: VIBRATION

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
• Certified Vibration Practitioner Category 1 • Certified Vibration Practitioner Category 2 • Certified Vibration Specialist Category 3 • Certified Vibration Specialist Category 4	-

PROGRAM: MECHANICAL JOINT INTEGRITY (MJI)

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
• Certified Technician in Mechanical Joint Integrity (MJI) for Flange Bolted Connection • Certified Technician in Mechanical Joint Integrity (MJI) for Small Bore – Piping, Tubing, Valves	• Mechanical Joint Integrity • Pressure Safety Valve • Small Bore Tubing

PROGRAM: THERMAL INSULATION

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
• Certified Thermal Insulation Installer	• Introduction to Thermal Insulation

PROGRAM: WELDING

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
• Certified Welding Inspector • IMM-JWES Certified Associate Welding Engineer • IMM-JWES Certified Welding Engineer • IMM-JWES Certified Senior Welding Engineer	• Repair Welding of Pressure Equipment in Refineries & Chemical Plants • Welding & Joining Technology for Non-Welding Personnel • Steel Technology for Non-Technical Personnel

MISCELLANEOUS MATERIALS SCIENCE AND TECHNOLOGY (NON-CERTIFICATION) COURSES

Technical Training Courses	Technical Training Courses
• Materials Selection & Corrosion • Metallurgical Failure Investigation • Basic Course on Operation of Mobile Air Compressor • Competent Mobile Industrial Compressor Operator • Competent Mobile Industrial Equipment Inspector • Practical Approach to Inspection and Maintenance of Steam Turbine	• Practical Approach to Precision Alignment Methods • Practical Approach to Precision Balancing Methods • Reciprocating Compressors: Operations, Maintenance, Inspection and Troubleshooting • Troubleshooting Techniques for Rotating Equipment • Valve Operations, Maintenance and Inspection Including Flange Breaking

Note: A certifcate of attendance will be issued to all participants of non-certifcation professional development training courses while candidates who pass the assessment/examination of IMM-certification schemes will be certified with the issue of IMM competency certificate and IMM certification ID card in addition to the certificate of attendance.

More information on training and certification is available on IMM's website at www.iomm.org.my.

For further enquiries:
Call : +603 7661 1591
Email : secretariat@iomm.org.my
WhatsApp : +6018 911 3480

INSTITUTE OF MATERIALS, MALAYSIA
Suite 1006, Level 10, Block A, Kelana Centre Point, No. 3 Jalan SS 7/19,
47301 Petaling Jaya, Selangor.

IMM AUTHORIZED TRAINING BODY (ATB)/ AUT
TRAINING PARTNER (ATP) FOR I

AUTHORISED TRAINING BODIES (ATBs)

(Offer IMM Certification Training Programs and Courses)

ATBs	Training Programs & Courses
	Coating
Seacademy Sdn. Bhd. (Sarawak) **Topfields Borneo Sdn. Bhd.** (Sarawak) **Sabah Skills & Technology Centre** (Sabah) **SRC Global Resources Sdn. Bhd.** (Peninsular Malaysia) **Advance Multiskills Training Centre Sdn. Bhd.** [Excludes courses marked with *] (Sarawak)	Certified Assistant Blaster & Painter Level 1 & Level 2 Certified Protective Coating Technician (Blaster and/or Painter) Level 1 & Level 2 Certified Blasting and Painting Supervisor Certified Coating Inspector Level 1 & Level 2 Certified Quality Control Technician* Certified Thermal Spray Coating Applicator* Basic Knowledge on Corrosion Protection for Technicians and Engineers* Corrosion Control by Protective Paints* Corrosion Control by Protective Coating*
	Mechanical Joint Integrity
Sabah Skills & Technology Center (Sabah) **SRC Global Resources Sdn. Bhd.** (Peninsular Malaysia)	Certified Mechanical Joint Integrity for Small-bore Piping, Tubing and Valves Certified Mechanical Joint Integrity for Flange Bolted Connections
	Thermit Welding
Prasarana Malaysia Berhad (Malaysia)	Certified Thermit Welding Practitioner (Level 1) Certified Thermit Welding Senior Practitioner (Level 2)

Note: The respective coverage area is indicated in brackets.

AUTHORISED TESTING CENTRE (ATC)

(Offers IMM Examination and Assessments)

ATC: JOTAC Academy Sdn. Bhd.
(Peninsular Malaysia)

Certification Examination/Assessments

- Certified Protective Coating Technician (Blaster and/or Painter) Level 1 & Level 2
- Certified Coating Inspector Level 1 & Level 2
- Certified Corrosion Monitoring Practitioner Level 1
- Certified Cathodic Protection Practitioner Level 1

HORIZED TESTING CENTRE (ATC)/ AUTHORIZED IMM COURSES & CERTIFICATION

ASSOCIATE TRAINING PARTNER (ATP)

(Offers IMM Certification Training Programs and Courses)

ATP: Materials Technology Education Sdn Bhd
(Malaysia and Overseas)

IMM Training Programs & Courses

Coating

- Certified Protective Coating Technician (Blaster and/or Painter) Level 1 & Level 2
- Refresher Course for Certified Protective Coating Technician (Blaster and/or Painter) Level 1 and Level 2
- Certified Assistant Blaster & Painter Level 1 & Level 2
- Certified Blasting and Painting Supervisor
- Certified Coating Inspector Level 1 & Level 2
- Refresher Course for Certified Coating Inspector Level 1 and Level 2
- Certified Coating Quality Control Technician
- Certified Thermal Spray Coating Applicator
- Basic Knowledge on Corrosion Protection for Technicians and Engineers
- Corrosion Control by Protective Paints
- Corrosion Control by Protective Coating

Coating Fingerprinting

- Coating Fingerprint Foundation Course
- Certified Coating Fingerprint Quality Controller Level 1
- Certified Coating Fingerprint Quality Controller Level 2
- Refresher Course of Certified Coating Fingerprint Quality Controller Level 1/Level 2

Train-the-Trainer

- Certified Trainer

Corrosion

- Certified Corrosion Monitoring Practitioner Level 1
- Certified Corrosion Monitoring Practitioner Level 2
- Certified Corrosion Monitoring Practitioner Level 3
- Certified Cathodic Protection Practitioner Level 1
- Certified Cathodic Protection Practitioner Level 2
- Certified Cathodic Protection Practitioner Level 3
- Certified Cathodic Protection Engineer
- Corrosion Control by Cathodic Protection

Thermal Insulation

- Introduction to Thermal Insulation
- Certified Thermal Insulation Installer

Vibration

- Certified Vibration Practitioner Category 1
- Certified Vibration Practitioner Category 2
- Certified Vibration Specialist Category 3
- Certified Vibration Specialist Category 4

Welding

- Certified Welding Inspector
- Repair Welding of Pressure Equipment in Refineries & Chemical Plants
- Welding & Joining Technology for Non-Welding Personnel
- Steel Technology for Non-Technical Personnel

IMM-JWES Courses

- Certified Associate Welding Engineer (AWE)
- Certified Welding Engineer (WE)
- Certified Senior Welding Engineer (SWE)

Mechanical Joint Integrity

- Certified Mechanical Joint Integrity for Small-bore Piping, Tubing and Valves
- Certified Mechanical Joint Integrity for Flange Bolted Connections
- Valve Operations, Maintenance & Inspection Including Flange Breaking

Loss of Primary Containment

- Mechanical Joint Integrity
- Pressure Safety Valve
- Small Bore Tubing

Rotating Equipment

- Competent Mobile Industrial Compressor Operator
- Competent Mobile Industrial Equipment Inspector
- Inspection & Maintenance of Pumps
- Practical Approach to Inspection and Maintenance of Stream Turbine
- Practical Approach to Precision Alignment Methods
- Practical Approach to Precision Balancing Methods
- Reciprocating Compressors: Operations, Maintenance, Inspection & Troubleshooting
- Troubleshooting Techniques for Rotating Equipment

Other Materials Courses

- Materials Selection & Corrosion
- Metallurgical Failure Investigation
- Basic Course on Operation of Mobile Air Compressor

Technical Article 2

Rapporteurs' Report of 1-DAY Rheology Workshop on Polymers

Studio live streaming at Cloud Events Sdn Bhd, (1378708-K), Unit C-2-20, Damen USJ Komersial, Persiaran Kewajipan, USJ 1, 47500, Subang Jaya, Selangor, Malaysia

Date: 28th September 2021
Time: 9.00am – 5.00pm

Reported by:
Nurul Fatahah Asyqin binti Zainal – Centre of Foundation Studies, UiTM
Hairunnisa Ramli – Centre of Foundation Studies, UiTM
Nigel Foong – Anton Paar, Malaysia
Thomas G. Mezger – Anton Paar, Germany
Markus Nemeth – Anton Paar, Germany
Prof. Ts. ChM. Dr. Chan Chin Han – Faculty of Applied Sciences, UiTM

UiTM 1-day rheology workshop on Polymer highlights: https://fb.watch/8B1fAy16sG/

A 1-Day Rheology Workshop on Polymers was successfully held on September 28, 2021 at Cloud Events Sdn. Bhd. studio, Damen USJ Komersial, Subang Jaya, Selangor, Malaysia. The workshop was organized by the Postgraduate Chemistry Club (PCC), Faculty of Applied Sciences (FSG), Universiti Teknologi MARA (UiTM), and jointly organized by the Malaysian Institute of Chemistry (IKM). Anton Paar (M) Sdn. Bhd., Institute of Materials, Malaysia (IMM) and Malaysian Institute of Food Technology (MIFT) were the collaborating partners of this workshop. The workshop was conducted live at the Cloud Events Sdn. Bhd. studio and *via* the Zoom platform. Up to 190 participants from higher learning institutes and private companies attended the full day virtual workshop.

Summary of the presentation sessions:

1) Prof. Ts. ChM. Dr. Chan Chin Han explained the basic concept and the classification of polymers.
2) Mr. Nigel Foong demonstrated the measurement of polymeric samples using a rheometer. He emphasized on good practice and precautions for sample analysis and data analysis.
3) Ms. Nurul Fatahah Asyqin Zainal touched on the basic interpretation of rheological data of immiscible polymer blends.
4) Ms. Hairunnisa Ramli presented a hands-on session on data analysis.
5) Mr. Thomas G. Mezger and Mr. Markus Nemeth highlighted general result interpretation of polymers and some experimental designs such as amplitude sweep, frequency sweep that includes TTS function & temperature sweep.

Q & A Session

Q1: Can cheese be considered a thermoset?

A1: Thermosets form after curing the resins by the formation of covalent bonds between polymer chains. This is an irreversible process. Cheese is a mixture of networks and depending on the ratio of water and oil, they there are many possible different structures. Different kinds of cheese might behave differently. Cheese begins as a solid or more or less pasty but when heated (but not overheated) can become more or less viscous liquid. When the melted cheese is cooled, it regains a solid form. Reheat it and it flows again. It behaves like thermoplastics. In that sense, cheese is not a thermoset.

Q2: Can we consider a *graft*-copolymer as a branched polymer or a crosslinked polymer?

A2: Branched polymer is a linear polymer with side polymer chains. Crosslinked polymer is the polymer chains that are linked with covalent or ionic bonds, which form network-like structure. Graft-copolymer is a segmented copolymer with a linear polyA as a backbone and polyB as graft-chains. Normally, polyA and polyB do not mix. Graft-copolymer can be considered as a special type of branched polymer but not as a crosslinked polymer.

Q3: What is the effect of molar mass of a polymer to its thermo-physical properties (*e.g.,* solid or liquid phase)?

A3: Almost all properties of polymers depend on the molar mass, molar mass distribution and dispersity. Low and high molar mass polymers have vastly different mechanical and thermo-physical properties. Oligomers (low molar mass) are soft or rubbery solids or low viscous liquids and possess little or no strength whereas high molar mass polymers are solid and have much improved mechanical properties. In general, one observes a steep rise in the mechanical and viscoelastic properties with increasing molar mass until a certain molar mass is reached, beyond which the properties are nearly independent of the molar mass.

Q4: Explain further on viscoelasticity and their applications.

A4: Viscoelasticity of polymers affect their properties under different conditions for different applications. Some examples:

- squeezing toothpaste out of its tube
- rubbing facial cream between palms
- applying body shampoo on your body
- spreading soft butter
- pouring out tomato ketchup
- mixing a cake batter
- stirring paint and brushing paint on wall

Q5: For sustainability, any suggestion on recycling the thermosets?

A5: Thermosets (*e.g.,* crosslinked epoxies, polyurethanes, rubbers *etc*) are found in many products that have to be durable and heat-resistant for applications. One drawback to thermosets is that they typically cannot be easily recycled or broken down after use. Reducing the usage of thermosets should be prioritized for sustainability.

Some strategies to recycle thermosets:

1) Modify thermosets with a chemical linker that makes the materials much easier to break down, but still allows them to retain the mechanical strength that makes them so useful [1].
2) Using a combination of pressure, heat and a supercritical solvent to decrosslink thermosets, such as crosslinked polyethylene (XLPE), XLPE foam and phenolic or epoxy resins [2].
3) *Etc*.

Q6: Can rheology analysis be used to identify different classes of polymers (*e.g.,* thermoplastic, thermoset, elastomer *etc*).

A6: One suggestion is running oscillatory test with temperature sweep. Observation in **Figure 1** may be recorded. Refer to reference [1].

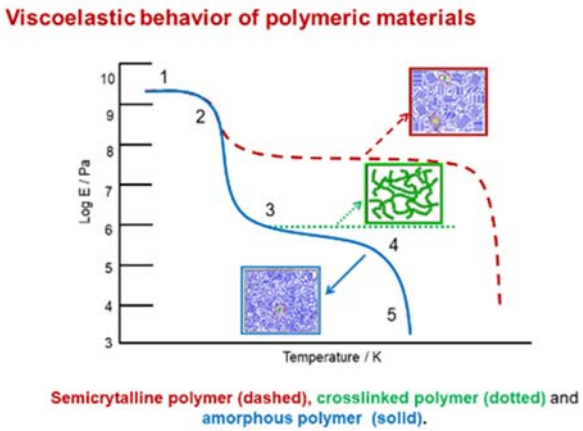


Figure 1 *Viscoelastic behavior of semicrystalline, crosslinked and amorphous polymer*

Q7: Can rheological analysis be used to differentiate polyA with different molar masses?

A7: One suggestion is running oscillatory test with frequency sweep. Observation in **Figure 2** may be recorded.

Q8: Can you explain the creep test for gel using rheometer?

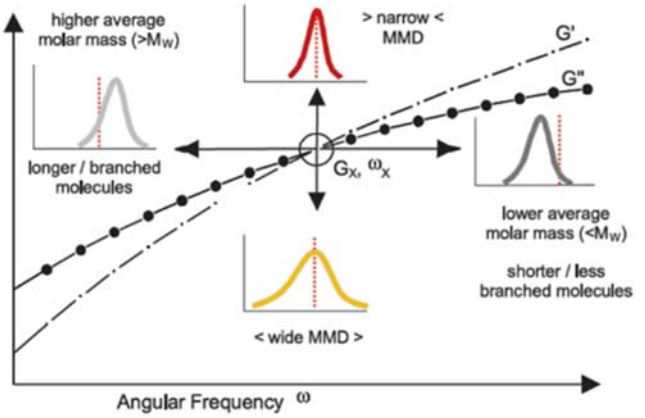


Figure 2 *Correlation between molar mass and molar mass distribution and the viscoelastic behaviour of polymers. Adopted from reference [2].*

A8: Creep test is a test whereby shear stress is applied at a certain duration. The stress later will be relieved and the deformation is observed by the shear strain detected by the deformed sample.

For more info on past Anton Paar Webinar: https://www.anton-paar.com/my-en/services-support/webinars/detail/event/creep-testing-of-polymers-as-a-characterization-method-complementing-dynamic-mechanical-analysis-fo/

Q9: For the density to be inserted into the software, is it the density of the solid or the melt?

A9: It depends on the sample's state whether it is in solid or melt. If the measurement is for solid, you must input the density of the solid and likewise for melt sample.

Density value changes according to temperature and hence the state of sample will affect the calculation that involves density parameter.

Q10: How to measure cheese sample using the instrument?

A10: We can measure cheese sample depending on its state; liquid, gel or solid. From there, you may choose to evaluate viscosity or viscoelastic behaviour through tests offered by rheometer.

For more info on Anton Paar application note: https://www.anton-paar.com/corp-en/services-support/document-finder/application-reports/rheological-characterization-of-cheese/

Q11: How much should the solid sample's thickness (like PE plastic film) be placed in the rheometer?

A12: In order to follow the measurement principle according to DIN 53019 and ISO 3219, the measurement gap for plate system should be approximately 1 mm.

For more info on Anton Paar website description: https://www.anton-paar.com/corp-en/products/details/rheological-measuring-systems/

Q13: For a very low viscous sample (watery sample), a negative result of viscosity is obtained during the rheological test. What are the suitable settings to be used for this type of sample?

A13: You can use the measuring system/spindle/ geometry that has the largest surface area in contact to sample. This will increase the sensitivity of the decoder of rheometer/viscometer. The setting in terms of shear rate should be from medium to high shear rate as low shear rate does not give reasonable results.

For more info on Anton Paar application note:
https://www.anton-paar.com/corp-en/services-support/document-finder/application-reports/joe-flow-measurement-range-limits/

Q14: Why did this inconsistency happen in the analysis?

A14: The inconsistency may be due to the type of test template used for your test. Please recheck the settings such as test parameter and data acquisition setting.

Q15: What is the frequency range to be used in a frequency sweep measurement? What can we observe from the frequency sweep measurement?

A15: Most of the rheometer in the market has the range of 0.01 to 100 Hz. If the frequency studied is beyond the stated range, you need to perform a Time-Temperature Superposition (TTS) experiment.

For more info on Anton Paar application note:
https://www.anton-paar.com/corp-en/services-support/document-finder/application-reports/measurements-at-higher-frequencies-strategies-for-increasing-accuracy/

Q16: For a temperature sweep measurement, do we fix the strain and frequency? How do we decide on these values?

A16: You need to perform amplitude sweep on the sample at starting temperature and ending temperature and obtain their respective linear viscoelastic (LVE) range. Once you obtained them, you can apply in logarithm manner with temperature ramping.

Q17: Should we change to a fresh sample each time when moving from viscosity measurement, amplitude sweep measurement, and frequency sweep measurement, even though we are doing the tests at room temperature?

A17: It is always recommended to use fresh sample for every measurement. This will ensure that measurement is applied to the original sample state.

Q18: What is the suitable temperature to be used for the rheological experiment to study the flow behaviour of polymers?

A18: To study the flow behaviour of a semicrystalline polymer, the temperature used shall be above the melting temperature (10 or 20 °C above the melting temperature). At this temperature, the polymer is at its molten state. One should also take note that the temperature should not exceed the degradation temperature of the polymer. One needs to check the degradation temperature of a polymer (by performing the thermogravimetry analysis by TGA) before the rheological experiment.

Q19: What happens in the transition zone as *G"* > *G'*?

A19: In the transition zone, the period of oscillation is similar to that of one or other molecular movements in the polymer chains. The molecular movements lag the imposed oscillation and dissipate a large amount of energy and thus giving a high loss modulus (*G*"), hence contributing to a greater viscous component as shown in **Figure 3.**

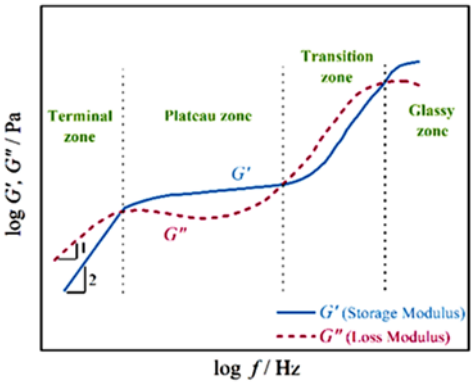


Figure 3 *A typical viscoelastic spectrum of a polymer*

Q20: In your rheological experiment, did you apply the standards procedure stated in the ASTM D3835 or ASTM D4440?

A20: No, in this fundamental work we do not apply the procedures from both standards.

Q21: What is the suitable amount of sample needed for a rheological test?

A21: In this rheological test, we used the 20-mm parallel plate geometry in the oscillation test. It means that the sample diameter is 20 mm, and the thickness of the polymer films are roughly between 0.3 – 0.4 mm.

Q22: What is the difference between the crosslinked and uncrosslinked polymers in terms of the *G* values?

A22: In a frequency sweep test, a crosslinked polymer shows the *G'* > *G"* over the entire frequency range. The two curves do not display a crossover point, but are quite close to each other. On the other hand, for the uncrosslinked polymer, the *G"* > *G'* is observed at lower frequencies, where it shows a viscous behaviour. At higher frequencies, *G'* > *G"* is observed.

Q23: Must the slopes of the *G'* and *G"* curves be determined using a log-scale graph?

A23: Yes, both of the *G'* and *G"* curves against frequency must be plotted in a bilogarithmic graph. This is because the slopes of *G'* and *G"* curves in the lower frequency range is based on power law equations.

Q24: In your opinion, what are the direct applications of this blend [poly(ethylene oxide)/natural rubber-*graft*-

poly(methyl methacrylate) (PEO/NR-*g*-PMMA)] and why is it important to obtain the *G'* and *G"* slopes?

A24: This PEO/NR-*g*-PMMA blend may be potentially used as polymer host in polymer electrolyte applications. At molten state, the PEO may serve as the ion-percolation phase. The NR component in NR-*g*-PMMA may serve as an impact resistance component and PMMA may provide the mechanical strength. The information of *G'* and *G"* slopes for the blends may describe the viscoelastic behaviour (*i.e.,* flexibility or restriction of the polymer chain). However, further investigation on this blend should be done, thus, it is important to understand the flow behaviour of different blend compositions before dwelling on the applications.

Q25: In a temperature sweep test, the transition temperature of *G'* curve is observed due to the phase transition of a polymer. Can you explain this in terms of the molecular phase changes?

A25: If we run a temperature sweep (low to high temperature) test for a semicrystalline polymer, we will observe *G'* > *G"* in the low temperature region. At this stage, there are some regions where the molecules show an ordered crystalline region which are surrounded by amorphous regions. Next, the *G"* curve increases with temperature until it reaches its maximum. The glass transition temperature, T_g is evaluated at *G"* maximum. With increase in temperature, a rubber-elastic plateau (plateau of *G'* and *G"* curves) is observed where the amorphous part is already molten, but most parts of the crystalline phase are not completely molten yet. Finally, the *G'* and *G"* curves will cross each other and the melting temperature, T_m is evaluated at the crossover point of G' and *G".* At this stage, the polymer now is completely at molten state.

Q26: What is the relationship of the relaxation time with the behaviour of the polymeric materials in the low frequency region?

A26: Based on the Maxwell model, a polymer melt is fully relaxed when *G'* and *G"* obey the power law dependence in the low-frequency region with the slopes equal to 2 and 1, respectively. The viscoelastic properties in the low-frequency region reflected the long-range motion of polymer chains. Larger deviation of the power law exponent from the Maxwell model causes the polymer chains do not return to equilibrium (or not fully relax) due to restriction of the long-range motion of polymer chains.

Q27: Why do we need to have R^2 close to 1 when you fit the data using linear regression? What does it mean if the R^2 value is very low (not close to 1)?

A27: In regression, the R^2 means coefficient of determination which is a statistical measure of how well the regression predictions approximate the real data points. An R^2 of 1 indicates that the regression predictions perfectly fit the data. In general, the higher the R^2, the better the model fits your data.

Q28: Referring to the case study 3 (neat NR-*g*-PMMA, melted at *T* = 140 °C), how can we estimate the terminal slope since the low frequency region now is no longer at the terminal zone?

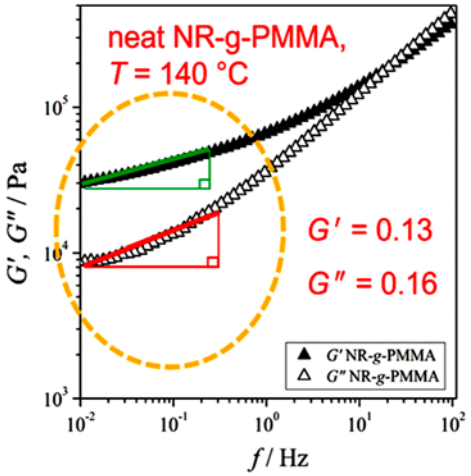


Figure 4 *Case study 3 (neat NR-g-PMMA melted at T = 140 °C)*

A28: In this case, at low frequency region (*f* range = 10^{-2} to 10^{-1} Hz), the *G ′* > *G ″* which means the solid-like behaviour is dominant than the liquid-like behaviour and this shows the trend as in at the plateau zone. Hence, even if the slopes of G' and G" are estimated as in **Figure 4**, these are the values which cannot be assumed to be the terminal slopes at low frequency region within the experimental condition of this sample.

Q29: Why do we need to change the scale from linear graph to $\log_{10}$ graph?

A29: $\log_{10}$ plots display data in two dimensions where both axes (*x* and *y*-axes) use logarithmic scales. When one variable changes as a constant power of another, a $\log_{10}$ graph shows the relationship as a linear graph. For example, if the data points do not follow a linear line, we should know that both *x* and y-axes do not have a power law relationship.

Q30: In the case study 1 (neat PEO, melted at *T* = 140 °C), the slope of the *G′* = 1.09 while according to Maxwell model, *G'* should equal to 2. Is the deviation acceptable as long as the *G"* > *G'* value at the terminal zone?

A30: Maxwell model is considered as an ideal case. Variation of the slope values are depending on the temperatures chosen to melt the viscoelastic material. The deviation from the Maxwell indicates the material do not behave ideally but at the terminal zone, it is always *G"* > *G'* where the viscous part dominant than the elastic part.

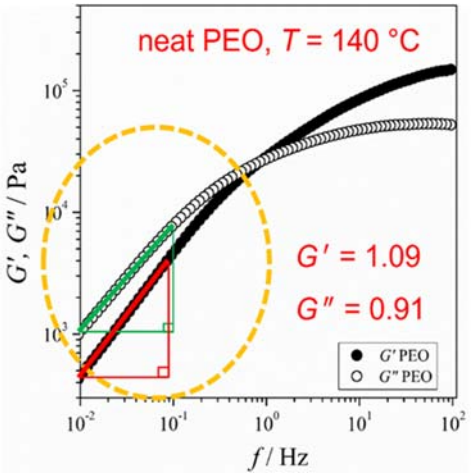


Figure 5 *Case study 1 (PEO melted at T = 140 °C)*

Q31: What can you deduce from the terminal and plateau zone for the behaviour of the viscoelastic polymer?

A31: Liquid-like behaviour showing viscous dominant, where *G"* > *G'* can be observed in the terminal zone (low frequency region) while in the plateau zone, it is always the *G'* > *G"*, where the elastic behaviour (solid-like) is dominant. Refer to **Figure 3**.

Other than that, the frequency at crossover between *G'* and *G"* at the transition frequency of terminal to plateau zone indicates the chain relaxation at long-range (low frequency) motion.

Q32: How do we determine T_g from the *G'* and *G"* profile?

A32: Recommendation to determine T_g from a diagram *G'* and *G"* versus the temperature *T*: (1) at the *G"* peak (*e.g.,* according to ASTM D4065, D4092, E1640); (2) sometimes the tan d peak can also be used to determine T_g.

Q33: Is frequency sweep (FS) test similar to temperature sweep (TS) test?

A33: No. FS show values of rheology parameters (*e.g., G'* and *G"*) over a selected range of frequencies *f* at a constant temperature *T* (*e.g.,* to evaluate the time-dependent behaviour at this temperature). TS show these values over a desired *T* range at a constant frequency, *f* (and *e.g.,* constant deformation amplitude). If you measure both you can show it in a 3D-diagram, and on the three axes may be: *G'* & *G"* / *f* / *T*

Q34: Is the T_g value determined by rheometer be much different from DSC?

A34: DSC values are measured at rest and oscillatory data, however, at a certain frequency (*i.e.*, in motion). The lower the preset frequency the more comparable will be the obtained results.

Q35: Is creep analysis suitable for particle type sample such as swelled microgel?

A35: In principle, creep tests are suitable for gels. However, we prefer oscillatory tests, and in this case especially amplitude sweeps, since we get more useful data in a clearly shorter time.

Q36: Is it appropriate to measure creep properties of material under magnetic influence?

A36: If the rheometer is equipped with a magneto-rheological device (MRD) you can perform all kinds of tests (*e.g.,* rotation, oscillation, creep, relaxation) at a desired constant or variable magnetic field strength. It is useful to keep one part of the measuring condition constant (magnetic field or shear load).

References

[1] Shieh, P., Zhang, W., Husted, K. E. L., Kristufek, S. L., Xiong, B., Lundberg, D. J., Lem, J., Veysset, D., Sun, Y., Nelson, K. A., Plata, D. L., and Johnson, J. A., *Cleavable comonomers enable degradable, recyclable thermoset plastics.* Nature, 2020. **583**(7817): p. 542-547.)

[2] Yao, Y., Fenton, I., Di Mondo, D., and Azimi, G., *Method for purification of depolymerized polymers using supercritical fluid extraction*, US Patent, 2020, GreenMantra Recycling Technologies Ltd.: US10723858B2

[3] International Organization for Standardization. *Plastics: Determination of Dynamic Mechanical Properties. General Principles. Principes Généraux*. ISO, 2001.

[4] Syranidou, E., Karkanorachaki, K., Amorotti, F., Repouskou, E., Kroll, K., Kolvenbach, B., Corvini, P. F. X., Fava, F., and Kalogerakis, N., *Development of tailored indigenous marine consortia for the degradation of naturally weathered polyethylene films.* PLOS ONE, 2017. **12**(8): p. e0183984.

Co – Organised by

IMM Institute of Materials Malaysia Under IMM Corrosion Committee

MTE Materials Technology Education Sdn Bhd

Eligible for MBOT CPD Points

ONE-DAY IMM CORROSION CONFERENCE 2022

HOLISTIC CORROSION PREVENTION & MANAGEMENT

20th October 2022

08:00am – 17:10pm

Level 10
Ballroom A – Conference
Ballroom B – Exhibition
DoubleTree by Hilton Hotel Kuala Lumpur
The Intermark, 348, Jalan Tun Razak,
Kampung Datuk Keramat,
50400 Kuala Lumpur

Corrosion has been a rising challenge to the power, energy and oil & gas industrics, ranging from new fasilities operating in harsher corrosive environment, to maintaining ageing assets to safely operate beyond their original designed lives. A holistic and proactive corrosion management is therefore essential in dealing with this issue as there is no one-size-fits-all recipe in managing the corrosion and assets integrity. The current knowledge base alone will not be sufficient to address the ever-changing challenges in current times. Innovative approach and emerging digital technology are steadily reshaping the practice models among the corrosion fraternities.

Hence, this one-day conference, with the theme ***"Holistic Corrosion Prevention and Management"***, aims to explore the various latest technologies, research, digitalization, data analytics, best practices, and innovative solutions that can translate effective corrosion control practices into broader organizations.

Who should attend?

Technicians, Engineers, Managers, Academicians, Data Scientists, Sales & Technical Service Personnel, Students, HSE Personnel, Purchasing Personnel, and IMM Certified Professionals in the following fields:

- Oil, Gas, Energy and Utilities
- Chemical & Petrochemical
- Data Sciences, Machine Learning
- Process Manufacturing
- Pipeline, Power
- Marine, Transportation, Construction
- Technical and Vocational Training Institute
- College & University

IMM CORROSION CONFERENCE ORGANISING SUB-COMMITTEES (2022)

TECHNICAL :
Dr Kee Kok Eng *(Universiti Teknologi PETRONAS)*
Dr Azzura Binti Ismail *(Universiti Tun Hussein Onn Malaysia)*
Ir. Ong Hock Guan *(Sarawak Shell Berhad)*
Ir. Max Ong Chong Hup *(NORIMAX Sdn. Bhd.)*

PUBLICITY :
Dr. Yoga Sugama Salim *(Matcor Technology & Services Pte Ltd)*
Karen Cheng Siew Hoon *(Serba Dinamik Group Bhd.)*
Leow Chun Ho *(Sarawak Shell Bhd.)*
Syarifah Nazliah Syed Abdul Rahman *(BSSTech CP (M) Sdn. Bhd.)*
Ong Wei Rex *(ICP Engineering Sdn. Bhd.)*
Junaidy Abdullah *(NORIMAX Sdn. Bhd.)*
Mohd Khairi Kadir *(Cosasco (M) Sdn. Bhd.)*
Kok Wai Chee *(CSI System Sdn. Bhd.)*
Danny Tan Kim Chew *(Abadi Oil and gas Sdn. Bhd.)*

SPONSORSHIP :
Ir. Max Ong Chong Hup *(NORIMAX Sdn. Bhd.)*
Ong Wei Rex *(ICP Engineering Sdn. Bhd.)*
Nik Khairil Azman Nik Abdullah *(Temperlite Insulation Sdn. Bhd.)*
Dr. Yoga Sugama Salim *(Matcor Technology & Services Pte Ltd)*
Ir. Ong Hock Guan *(Sarawak Shell Berhad)*
Kang Kim Ang *(Corrtrol Services Sdn. Bhd.)*
Mark Hew Yoon Onn *(Universal Corrosion Engineering (M) Sdn. Bhd.)*
Karen Cheng Siew Hoon *(Serba Dinamik Group Bhd.)*

TIME	PROGRAMS
	Morning
08:00 am	Registration & Light Breakfast
09:00 am	Welcome Note by Emcee & Safety Briefing by Hotel Staff
09:10 am	Opening Speech by IMM President
09:20 am	**Digitalization Of Cathodic Protection System-Remote Monitoring**
09:35 am	Q&A
	by Juinady Abdullah (Norimax Sdn Bhd)
09:40 am	**Do You Have Enough Data To Make The Right Decision?**
	The Application Of Ultra-high Resolution Data To Support Pipeline Corrosion Management
09:55 am	Q&A
	by Razwan Arshad & Kah Soon Chia (ROSEN)
10:00 am	**Driving World Class Corrosion Management Implementation Via Proactive Assurance & Benchmarking**
10:15 am	Q&A
	by • *Ir. Muhammad Zaid Bin Kamardin (GTS, PETRONAS)* • *Azniza Binti Azmy (COE, PETRONAS)* • *M Shahril Atiqi Bin M Sharip (GTS – East Coast Office, PETRONAS)* • *Anis Amilah Binti Ab Rahman (GTS – East Coast Office, PETRONAS)*
10:20 am	Tea Break | Visit To Exhibition
10:50 am	**Effect Of Thermal Insulation On Stress Corrosion Cracking Of Austenitic Stainless Steel**
11:05 am	Q&A
	by Dr Kee Kok Eng (Universiti Teknologi PETRONAS) Sponsored by Universal Corrosion Engineering (M) Sdn Bhd
11:10 am	**Reverse Engineering Approach For CUI Early Detection Tools – A Framework**
11:25 am	Q&A
	by Muhammad Akmal B Azizan (Universiti Tun Hussein Onn Malaysia) Sponsored by Integrated PDP Sdn Bhd
11:30 am	**Corrosion Under Insulation: Mitigation Through The Use Of The Right Insulation**
11:45 pm	Q&A
	by Debapratim Dinda (Rockwool)
11:50 pm	**SMEP Asset CUI Challenges & New Technologies Deployment**
12:05 pm	Q&A
	by Sheron Lim (Sarawak Shell Bhd)
	Afternoon
12:10 pm	**Group Photo**
12:30 pm	Lunch | Visit To Exhibition
14:30 pm	**Advantages Of Thermoplastic Materials For Cable Trays And Ladders In Harsh Environments**
14:45 pm	Q&A
	by Albert Casas (UNEX)
14:50 pm	**Determining The Risk Of Microbiologically Influenced Corrosion (MIC)**
15:05 pm	Q&A
	by Douglas Bennet (ITS Testing Services (M) Sdn Bhd (INTERTEK))
15:10 pm	**Combatting Repetitive Failures At Cfu Overhead Balancing & Noncondensable Lines**
15:25 pm	Q&A
	by Rohana Binti Jaafar & Nurjaimi Binti Ali (GTS PETRONAS)
15:30 pm	Tea Break | Visit To Exhibition
15:50 pm	**Robotics In Blasting**
16:05 pm	Q&A
	by Kevin Wong (Blastone Asia Sdn Bhd)
16:10 pm	**True Surface Tolerant Coating: Anytime, Anywhere , Anyone**
16:25 pm	Q&A
	by Marcus Yap, In-situ Maintenance Services Sdn Bhd
16:30 pm	**Panel Discussion**
	Chaired by • *Ir Ong Hock Guan, Shell Malaysia Exploration & Production* • *Chairman Of IMM Corrosion Committee*
17:00 pm	**Closing Remarks**
	by Ir Ong Hock Guan, Chairman Of IMM Corrosion Committee
17:10 pm	Adjourn

Institute of Materials Malaysia
Under IMM Corrosion Committee

MTE
Materials Technology Education Sdn Bhd

REGISTRATION FORM

REGISTRATION FORM			
Name	(Prof. / Dr. / Ir. / Ts. / Mr. / Ms.)		
Institution / Company Name			
Institution / Company Address			
Tel No (Office)		Mobile No	
Email address			

		FEES (RM)	Please tick (✔)
Delegates	IMM member	RM 350.00	
	Non-IMM member	RM 450.00	
Exhibitor		**	

EXHIBITOR (Please tick ✓)

☐ **TABLE-TOP EXHIBITION STAND – RM2,000.00**

A. Package includes :

- 1 Promotional table with 2 chairs
- 2 Free passes Exhibition Promoters

B. Please reserve _____ (Table Top Number) for us. (Refer to Exhibition Layout Plan for Table Top Exhibition stand number)

Note: a) Additional pass will be charged RM300.00 (IMM Member) or RM400.00 (Non IMM Member)
b) Exhibition stand does not come with a wall. Exhibitors are advised to bring in their own promotional materials

PAYMENT must be made by Electronic Transfer, Telegraphic Transfer, Cheque or Bank Draft to

Account Name: **Materials Technology Education Sdn Bhd**
Account No: **5621 0669 2397**
Bank Name: **Maybank Berhad**
Bank Branch: **Shah Alam Branch**
Country: **Malaysia**

**Note:*
1) Payment must be made at least 2 weeks before the conference
2) Onsite payment is not acceptable
3) Proof of payment to be sent via email to ***zaimah@mte.com.my***

For any enquiries, please contact:

Ms. Zaimah
012 503 1410
zaimah@mte.com.my

Ms. Karen
012 295 2668
karen@mte.com.my

info@mte.com.my

Materials Technology Education Sdn Bhd
13-2, Pusat Dagangan Shah Alam
Lot 13, Persiaran Damai,
Seksyen 11, 40100 Shah Alam, Selangor
Tel : +603 5524 3704
website: www.mte.com.my

Abstract

The ever-increasing demand for energy, especially electricity has drawn the attention of people over the past decade as most of the electricity that the world uses today is generated largely by non-renewable energy sources. Therefore, searching for renewable energy sources is desirable. This study provides an overview of the various methods employed to synthesize and characterize indium sulphide nanoparticles (In_2S_3 NPs). This promising photocatalytic can efficiently convert solar energy into electricity and photocatalytically can degrade harmful compounds. This study aims to compare methods currently available for the fabrication of In_2S_3 NPs in terms of their advantages and disadvantages as well as how the methods are fair in terms of their fit to the green chemistry concept and scalability. Methods for synthesizing In_2S_3 NPs such as digestive ripening, colloidal, solvothermal, and hydrothermal methods were compared. It concludes that co-precipitation and hydrothermal methods are two of the best candidates among others, when the feasibility of upscaling and green chemistry approaches are considered. In light of the conclusions, a room temperature co-precipitation method was recommended as a novel method to synthesize In_2S_3 NPs that save energy when compared to a hydrothermal approach since no heating is required. Preliminary testing of the proposed method was carried out and it was found to have the potential to be implemented in the near future after the completion of a future complete study.

Objectives

- To compare methods that are currently available for the fabrication and characterization of In_2S_3 NPs.
- To evaluate and provide recommendations on future perspectives and trends relating to the application of In_2S_3 NPs, including the challenges faced.
- To propose a green and sustainable method to synthesize In_2S_3 NPs which addresses the SDGs targets advocated by United Nations.

Literature Review

Methods for the Fabrication of Indium Sulphide Nanoparticles

A bottom-up approach engaging established colloidal chemistry represents one of the most versatile means of synthesizing nanoparticles. These methods are relatively simple without costly and high-end equipment that may be challenging to maintain. Furthermore, the bottom-up approach allows tailoring of surface chemistry by exploring the molecules or surfactants bound to the surface of nanoparticles to impart colloidal stability, solvent dispersibility and even chemical recognition which could prove valuable when linked to biomedical applications.

Shinjita et al. (2012) reported the successful synthesis of β-In_2S_3 nanosheets by using high-temperature colloidal method, where indium diethyl dithiocarbamate trihydrate (In-DDTC) was first synthesized from indium chloride and sodium diethyl dithiocarbamate trihydrate, follow by adding of hexadecylamine (HDA) or octadecylamine (ODA) and an inert atmosphere were created by purging in nitrogen gas for 15 minutes before heating the solution to 200 ℃ for 30 minutes and 300 ℃ for 2 hours. Since the nanosheets produced by colloidal methods are formed by self-organization and orientation of nanocrystals, hence the thickness of the nanosheets' is controllable by choosing the right ligand.

Solvothermal synthesis is a bottom-up process where the synthesis is conducted under high temperature and pressure, for example, in an autoclave, carried out on a non-aqueous solution (Feng & Li, 2017). Selvaraj et al. (2011) reported the synthesis of three dimensional (3D) β-In_2S_3 hollow microsphere built up by In_2S_3 nanosheet using indium nitrate and thiosemicarbazide (TSC) as a precursor. Firstly, indium nitrate and TSC were dissolved in 1:1 ethanol/water and stirred for 30 minutes, followed by autoclaved at 180 ℃ for 10 to 24 hours, and finally centrifuged and washed with deionized water and ethanol before dried in the oven at 70 ℃ for 24 hours. In addition, a similar approach to the synthesis In_2S_3 NPs solution also had been reported by Xu et al. (2018), where indium chloride was first dissolved in oleylamine and cyclohexane, at the same time sulphur sublimed was dissolved in oleylamine and N-dodecyl mercaptan. Then, the indium chloride solution was added drop by drop into sulphur sublimed solution and stirred for 30 minutes before being placed into an autoclave at 180 ℃ for 2 hours. Lastly, the mixture was mixed with methanol and allowed to stand for 1 hour, followed by centrifuging at 9000 rpm for 10 minutes to obtain In_2S_3 precipitate.

Due to its reliability and relatively simple procedure, the hydrothermal method can be one of the most common methods to synthesize In_2S_3 NPs. In a study done by Chen and Liu (2018), indium chloride and thiourea were used as the precursor, with the facilitation of indium tin oxide (ITO) glass to allow the NPs growth on its surface and In_2S_3 NPs with different thicknesses as well as size were obtained when the reaction carried out for the different duration. Table 1 summarises the differences and compares the pros and cons of methods classified under bottom-up liquid phase syntheses.

Characterisation of Indium Sulphide Nanoparticles

In_2S_3 nanoparticles can be characterized by using UV-Vis spectroscopy, transmission electron microscopy (TEM), scanning electron microscopy (SEM) with energy-dispersive X-ray (EDX) spectroscopy and powder X-ray diffraction (XRD). The UV-Vis spectral of In_2S_3 nanoparticles has an absorption band at 375 nm and by overviewing most of the journals that reported the synthesized of In_2S_3 NPs, the most common crystal faces are (311), (400), and (440). A typical XRD diffraction peak of In_2S_3 NPs also can be determined by the presence of strong peak at 2θ = 27.5, 33.0, 44.0 and 48.5.

Table 1 Comparison of Synthesis Methods.

Method	Advantage	Disadvantage
Digestive Ripening	Size of the produced nanoparticles can be controlled by parameter such as temperature or binding ligand	Required high-end equipment like Schlenk system and high temperature for reaction to occur
Colloidal	Simple to set up and able to control the size of nanoparticles formed	Not green chemistry approach as many solvent will be used and hard to be recovered
Solvothermal	Able to control the size of nanoparticles produced	Time consuming, high temperature and expensive equipment like autoclave are required
Gases Phase Synthesis	Green chemistry approach, able to control size of nanoparticles produced and product usually have high crystallinity structure	Hard to be apply in major scale synthesis process and the safety hazard that might happen due to the usage of toxic, corrosive, flammable, and/or explosive precursor gases
Hydrothermal	Simple procedure to synthesis nanoparticles, and the size of nanoparticles are controllable base on reaction time	High temperature and pressure as well as expensive equipment like autoclave are required

Future Perspective, Trend and Recommendation

In_2S_3 NPs are a promising semiconducting material which has the potential to be used in a wide array of applications. However, there are several downsides of this material that need to be overcome. Currently, a lot of effort was put into modulating In_2S_3 through defective engineering, doping and coupling of In_2S_3 with other inorganic materials or polymers to maximize the photoconversion properties of In_2S_3, hence suggesting an uptrend for In_2S_3 based nanomaterials. The challenges facing In_2S_3 NPs to be addressed are as follow:

Firstly, the surface structures of the semiconductors will cause a significant effect on the charge carriers, thus affecting the electrons excitation and holes generation which will be responsible for the further chemical reaction (Sun et al., 2019). Consequently, defective engineering has come to the place, where atom coordination number, electronic structure and vacancies distribution in crystalline structure or 2D nanosheets of semiconductor will be modified, hence improving its photocatalytic properties (Zhang et al., 2019). In the research work of Gao et al. (2018), they found out that the surface defective β-In_2S_3 nanoplates that are treated by acid have an enhanced absorption range in the visible-light region and significant improvement in terms of photoelectrocatalytic activity compared with untreated β- In_2S_3 nanoplates. Due to smaller charge transfer resistance, higher efficiency of charge transfer at the surface, higher carrier density and greater carry transport. Much other research works also had been done and proven that the photocatalyst characteristic of indium sulphide can be improved by designing the right defective surface structure.

Secondly, doping is one of the most common and reliable ways to enhance the properties of semiconductors, and it also had been applied to In_2S_3 NPs to enhance their photocatalytic activities. According to Tiss et al. (2018), they had successfully synthesized silver (Ag) doped In_2S_3 thin film. It showed excellent performance with as high as 90% optical transmittance in visible light and near-infrared light region together with an increase of direct band gap energy from 2.63 to 2.97 eV, making it a good material for an optical window in photovoltaic cells. In addition, findings of doping of In_2S_3 thin films with Ag also had been carried out by Aydin et al. (2014), in higher photosensitivity, an increase in charge carrier concentration and improvising the electrical conductivity. Research has also been carried out to dope In_2S_3 with aluminium (Al), copper (Cu) and many other rare earth elements.

Last but not least, coupling of In_2S_3 with another compound or semiconductor, also known as heterostructure hybridization of In_2S_3, could be the future research trend of this semiconductor. In 2015, Chen et al. reported the successfully synthesize of bismuth sulphide/indium sulphide (Bi_2S_3/In_2S_3) composite superstructure, which show improvement in the photocatalytic activities of both semiconductors due to the enhancement of light absorption ability as well as photogenerated electron−hole pairs separation and transportation in the semiconductors. These effects are likely due to the synergistic effect between two semiconductors and the defective surface of In_2S_3 that cause multiple light reflection between 2 semiconductors' surface, hence improving the light-harvesting properties of Bi_2S_3/In_2S_3 composite.

Moreover, hybridization of In_2S_3 with zinc sulphide (ZnS) to form a ZnS@ In_2S_3 core@shell composite had been reported by Liu et al. (2017). By using polyvinylpyrrolidone (PVP) and thioacetamide (TAA) as the surfactant for the composite, the structure of this hybrid semiconductor becomes a hollow spherical-like shape, which enhances the intensity of light scattering within the semiconductor. At the same time, it provides more active sites for reactant and oxygen, hence increasing the photocatalytic efficiency of the material. We also noted that the thickness of hybrid semiconductors has to be considered when such a hybrid semiconductor is being synthesised, since the thickness of semiconductor will affect its degree of transparency, hence affecting its light absorption coefficient.

In short, all three methods stated above are effective to improve the characteristics of In_2S_3 as a semiconductor. They can change the intensity of light scattering, increase the electrical conductivity, light absorption efficiency and carriers' mobility of In_2S_3, making the semiconductor a better material for photoconversion application.

Challenges

- Reliability – long-term reliability of In_2S_3 NPs in photoactivity and photoconversion related fields might decay overtime
- Environmental and safety issue – hard to degrade/oxidize in nature and toxicity toward living organisms remains uncertain
- Hard to upscale synthesize –complexity, cost or environmental related problems

Preliminary Study

Methodology

First, a water soluble surfactant dissolved in 25 mL of distilled water was mixed well with water-soluble indium chloride (solution 1). On the other hand, fresh sodium sulphide solution was prepared by dissolving sodium sulphide in 5 mL of distilled water (solution 2). Solutions 1 and 2 were mixed to produce colloidal In_2S_3 nanoparticles, evidenced by the appearance of a bright yellow solution. The In_2S_3 nanoparticles were then purified and isolated via centrifugation at 9000 rpm and 4 °C for 10 minutes. The yellow product was re-dispersed in distilled water via ultrasonication prior to characterization using ultraviolet-visible spectroscopy (UV-Vis)(Hitachi U-2900) scan ranging from 200 nm to 800 nm, dynamic light scattering (DLS)(Anton Paar Litesizer 500) and zeta potential (Anton Paar LitesizerTM500).

Results and Discussion

In the synthesis of In_2S_3 NPs, the mole ratio of In^{3+} ions to S^{2-} ions is 2:3, while PVP was used as a surfactant to control the size of the nanoparticles to prevent them to aggregate together. The overall equation of the reaction is as follows:

$$2\ InCl_3\ (aq) + 3\ Na_2S\ (aq) \rightarrow In_2S_3\ (aq) + 6\ NaCl\ (aq)$$

Figure 1 *Concentrated In_2S_3 NPs Solution*

Ultraviolet-visible spectroscopy (UV-Vis), dynamic light scattering (DLS) and zeta potential was done to characterize the solution. The UV-Vis absorption peak matched well with the UV-Vis absorption peak of In_2S_3 NPs reported by other researchers, but with a slightly blue shift where the peaks move to a shorter wavelength. This condition might be due to a too high concentration of In_2S_3 NPs solution or the presence of PVP as surfactant. Further dilution of In_2S_3 NPs solution needs to be done to determine the reason for the blue shift. The Tauc curve of our product seems to be imperfect as it suggested the product has a band gap of 2.84 eV, which varies a lot from the band gap of In_2S_3 NPs (2 to 2.3 eV). This might be due to the solution concentration that is not diluted enough, as we can see a step increase in absorbance intensity in the UV-Vis absorption spectrum, which reflects the step in the Tauc curve.

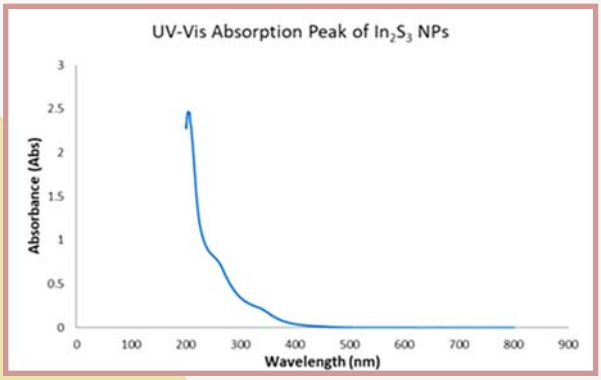


Figure 2 *UV-Vis Absorption Peak of In_2S_3 NPs*

On the other hand, the DLS of the product suggested that the hydrodynamic diameter of the particles is 82.59 nm, which is the range of nanosize. However, this result cannot be counted for the actual size of our particles, but it is only a preliminary study on the size of the particles. The result from DLS also suggests that our particles are monodispersed, with a low polydispersity index of 25.3%.

Finally, the zeta potential of the product compound suggested that our particles are relatively stable as a nanoparticle since the mean zeta potential is -23.3 mV. The negatively charged on the surface of our particles repel each other and prevent them from aggregating, so the particles are stable.

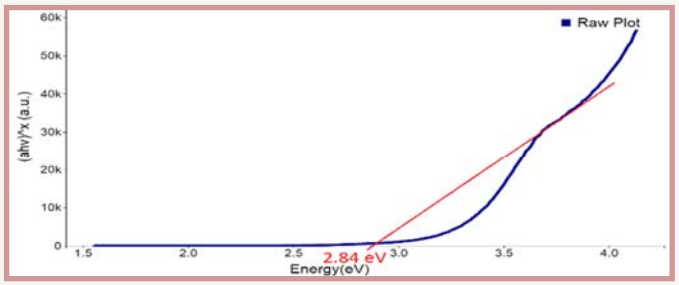


Figure 3 Tauc Curve of In_2S_3 NPs

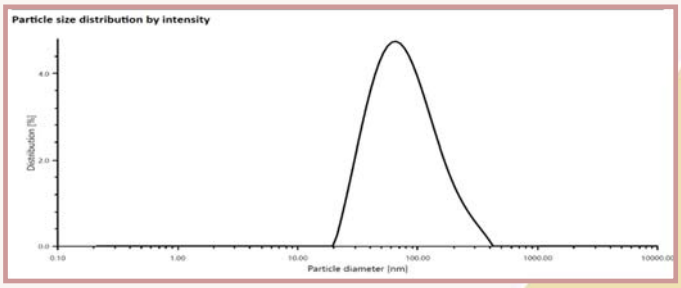


Figure 4 Results of DLS

Data output

Hydrodynamic diameter	82.59 nm	**Polydispersity index**	25.3 %
Intercept g1²	0.8747	**Mean intensity**	141.3 kcounts/s
Filter optical density	0.4988	**Baseline**	1.024
Focus position	-0.8 mm	**Angle used**	Side scatter
Processed runs	7	**Transmittance**	87.4 %
Diffusion Coefficient	5.9 µm²/s		

Figure 5 Particle Size Distribution

Conclusion

In summary, a bottom-up hydrothermal method is evaluated as the best method for the synthesis of In_2S_3 NPs with excellent industry scale-up potential. The proposed solution-based synthesis closely related to hydrothermal synthesis constitutes a simpler and greener method to synthesize In_2S_3 NPs with well-controlled qualities which are summarized as follows:

1) Average hydrodynamic diameter = 82.59 nm
2) Average zeta potential = -23.2 mV
3) Estimated band gap = 2.84 eV

Future work on more detailed structural characterization and evaluation of other optical properties should be conducted.

Reported by:

Liew Jian Hong
Department of Physical Science, Faculty of Applied Sciences, Tunku Abdul Rahman University College
(Postgraduate Student)

References

[1] Aydin, E., Sankir, M., and Sankir, N. D. (2014). Influence of silver incorporation on the structural, optical and electrical properties of spray pyrolyzed indium sulfide thin films. Journal of Alloys and Compounds 603, pp.119–124.

[2] Chen, D. and Liu, Z. (2018). Efficient Indium Sulfide Photoelectrode with Crystal Phase and Morphology Control for High-Performance Photoelectrochemical Water Splitting. ACS Sustainable Chemistry & Engineering 6(9), pp.12328-12336.

[3] Chen, Y., Tian, G., Guo, Q., Li, R., Han, T. and Fu, H. (2015). One-step synthesis of a hierarchical Bi2S3 nanoflower\In2S3 nanosheet composite with efficient visible-light photocatalytic activity. CrystEngComm 17 (45), pp.8720–8727.

[4] Feng, S.and Li, G. (2017). Chapter 4 - Hydrothermal and Solvothermal Syntheses. Modern Inorganic Synthetic Chemistry 2, pp.73-104.

[5] Gao, Y., Zhang, S., Bu, X., & Tian, Y. (2018). Surface defect engineering via acid treatment improving photoelectrocatalysis of β-In 2 S 3 nanoplates for water splitting. Catalysis Today 327, pp.271-278.

[6] Liu, B., Hu, X., Li, X., Li, Y., Chen, C., & Lam, K. (2017). Preparation of ZnS@In2S3 Core@shell Composite for Enhanced Photocatalytic Degradation of Gaseous o-Dichlorobenzene under Visible Light. Scientific Reports 7(1).

[7] Selvaraj, R., Selvaraj, V., Tai, C., Kim, Y., Eveliina, R. and Mika, S. (2011). Self-Assembled Mesoporous Hierarchical-like In2S3 Hollow Microspheres Composed of Nanofibers and Nanosheets and Their Photocatalytic Activity. Langmuir 27(9), pp.5534-5541.

[8] Shinjita, A., Suresh, S. and Narayan, P. (2012). Subnanometer Thin β-Indium Sulfide Nanosheets. The Journal of Physical Chemistry Letters 3(24), pp.3812-3817.

[9] Sun, X., Luo, X., Zhang, X., Xie, J., Jin, S., Wang, H., Zheng, X., Wu, X. and Xie, Y. (2019). Enhanced superoxide generation on defective surfaces for selective photooxidation. Journal of the American Chemical Society 141(9), pp.3797-3801.

[10] Tiss, B., Erouel, M., Bouguila, N., Kraini, M., and Khirouni, K. (2018). Effect of silver doping on structural and optical properties of In2S3 thin films fabricated by chemical pyrolysis. Journal of Alloys and Compounds 771, pp.60-66.

[11] Xu, Z., Wu, J., Yang, Y., Lan, Z. and Lin, J. (2018). High-Efficiency Planar Hybrid Perovskite Solar Cells Using Indium Sulfide as Electron Transport Layer. ACS Applied Energy Materials, 1(8), pp.4050-4056.

[12] Zhang, Y. C., Nisha Afzal, Pan, L., Zhang, X. and Zou, J. J. (2019). Structure Activity Relationship of Defective Metal-Based Photocatalysts for Water Splitting: Experimental and Theoretical Perspectives. Advanced Science 6(10), 1900053.

INSTITUTE OF MATERIALS, MALAYSIA

Updated on 30th December 2021

Institute of Materials, Malaysia (IMM) is a non-profit professional society that promotes honourable practice, professional ethics and encourages education in materials science, technology and engineering. Engineers, academicians, technicians, skilled workers and professionals are amongst its members exceeding 6800.

Registered with the Registrar of Societies on 6th November 1987, the Malaysian Materials Science & Technology Society (MMS) changed its name to the Institute of Materials, Malaysia (IMM) on 16th June 1997. The objectives of IMM include the training and development of individuals and companies in Malaysia to attain professional recognition in various fields of materials science, technology and engineering.

IMM is administered by a council of 30 members, with volunteers leading more than 15 materials committees and more than 4 regional chapters, and supported by a secretariat with full time staff.

IMM Vision

To be internationally recognised leading institution in Materials Science and Technology.

IMM Mission

(1) To be the technical authority on material science and technology
(2) To develop an enhance competency and skills for all categories and practitioner
(3) To become an internationally recognized certifying body
(4) To be the forum for industry and academia collaboration
(5) To positively contribute to society and quality of life

The IMM membership is categorised into 6 different grades and open to anyone above the age of 17 years - individuals and companies keen in developing and contributing towards the growth of materials science, technology and engineering in Malaysia.

Over the years, IMM have conducted courses on coatings, coatings fingerprinting, corrosion, welding, vibration etc in support of the oil and gas industry in Malaysia. Over 750 Coatings Inspectors have been trained and certified as well as more than 3300 Blasters & Painters, Supervisors, Corrosion Technician and Vibration Practitioners. Its certification programmes are recognized by PETRONAS and all oil & gas operators. Since January 2011, more than 80 Associate Welding Engineers, more than 90 Welding Engineers, more than 30 Senior Welding Engineers and more than 45 Coating Fingerprint Quality Controllers were trained and certified.

IMM has also organised 10 International Materials Technology conferences (IMTCE) on a biennial basis, and numerous technical seminars, educational programmes, technical visits, and materials awareness programmes since 1988.

Public courses, such as Microbiologically Influenced Corrosion (MIC) and Welding Technology for Non-Welding Personnel, are being offered occasionally. Training on materials awareness has also been conducted in public listed companies.

The courses and programmes are being organised by Authorized Training Body/Bodies and Authorized Event Organizer/Organizers.

Collaborations with the Asian Welding Federation, Sabah Skills Technology Centre (SSTC), and local universities continue to be part of IMM's vision and long term mission to educate, train and serve the materials fraternity.

GENERAL INFORMATION ON MEMBERSHIP

The IMM Membership is open to all individuals and companies in developing the contribution of Materials science, technology and engineering towards industrial growth in Malaysia. The technology of materials is advancing day-to-day throughout the world. Membership to the IMM will enable networking and exchange of knowledge from a very wide variety of specialised areas of expertise. Please feel free to download or print a copy of the application form together with the IMM regulations. If you have any doubt, please do not hesitate to contact our secretariat through the phone; +603-76611591 or email to secretariat@iomm.org.my

Annual subscriptions shall be payable in advance on 1st January of each year. Those admitted into the IMM between 1st July and 31st December in any year shall pay only half the annual subscription. Seniors (above 55 years old) get 50% discount off their annual subscriptions.

We have an online application for membership for selected grades. Membership application forms in document format can be accessed from www.iomm.org.my.

Kindly fill the form and email to secretariat@iomm.org.my or send it to :

IMM SECRETARIAT
Suite 1006, Level 10, Block A, Kelana Centre Point,
No. 3 Jalan SS 7/19,
47301 Petaling Jaya, Selangor

IMM MEMBERSHIP BENEFITS

(1) IMM activities offer members to interact and network with representative from the industry, academia and government related to the Materials profession.

(2) Members will gain knowledge on career opportunities for their children, friends etc as IMM offers certification courses in skilled trades *e.g.* Welding, Painting, Inspection, Corrosion *etc.*

(3) IMM-JWES Welding Engineer Certification program leading to a Welding Engineer Certification which offers great employment opportunities in the oil & gas, heavy industry, marine and energy sectors.

(4) IMM publications – quarterly magazine plus annual conferences offer presenters an opportunity for their technical research or industry-academia papers to be published in ISI- and Scopus-index journals.

(5) IMM organizes many free technical events for members to acquire new knowledge and networking opportunities. Participants to these events will also receive Certificate of Attendance for their Continuing Professional Development records.

IMM MEMBERSHIP FEES SCHEDULE AS PER BELOW:

Description	Amount			
	Entrance Fee	Processing Fee	Transfer Fee	Annual Subscription
Fellow (F.I.M.M)	-	RM 300.00	RM 10.00	RM 150.00
Professional (M.I.M.M)	-	RM 150.00	RM 10.00	RM 100.00
Associate (A.M.I.M.M)	-	RM 150.00	RM 10.00	RM 80.00
Company	RM 50.00	-	-	RM 200.00
Ordinary	RM 20.00	-	-	RM 40.00
Student	RM 10.00	-	-	RM 10.00
Ordinary/ Company for affiliates	RM 40.00/ RM 50.00	-	-	NIL

INSTITUTE OF MATERIALS, MALAYSIA

Updated on 30th December 2021

REGULATIONS GOVERNING ADMISSION AND TRANSFER OF MEMBER GRADES

The Council shall establish a Membership Committee which will be responsible for these Regulations and for review of applications for new membership and transfer to other grades (upgrades). The Membership Committee shall recommend for Council approval for admission and transfer of membership. All grades of memberships are awarded at the discretion of the Council and may be withheld or withdrawn in the event of conduct likely to prejudice the standing of the Institute. Every member shall receive a membership certificate.

Every application for membership, individual or company, shall be proposed and seconded according to these regulations and shall be forwarded to the IMM Secretariat who on behalf of the Honorary Secretary will process for consideration and approval of the Membership Committee before tabling for Council's endorsement. The Council may at its discretion reject any application without assigning any reason thereof. The Council may use its discretion to exempt the need for proposer and seconder for Student, Ordinary and Company membership.

Each company on admission as a member shall be entitled to nominate one representative to exercise all rights of membership. Only representatives of Company membership, as well as Fellows (F.I.M.M.). Professional Members (M.I.M.M.) and Ordinary members shall have the right to vote and to hold office in IMM.

Only Malaysian Citizens can become Ordinary Members, Associate Members (A.M.I.M.M.), Professional Members (M.I.M.M.) and Fellow Members (F.I.M.M.) with voting rights. Foreigners can have membership to similar grades but shall have no voting rights.

MEMBERSHIP GRADE & REQUIREMENT

Honorary Fellow (Hon. F.I.M.M.)
The Council shall have the power to elect Honorary Fellows who shall be persons of eminence in science or industry. The election shall be based on a majority vote within the Council. Honorary fellows shall enjoy such privileges as may from time to time be determined by the Council.

Fellow (F.I.M.M.)
A person at least 35 years of age with approved academic qualifications, training and 8 years relevant responsible experience who has made significant contributions to the science and practice of profession of Materials Science and Engineering or has given distinguished service to industry or education.

Professional Member (M.I.M.M.)
A person at least 25 years of age, with approved academic qualifications and training, having at least 3 years responsible experience in Materials Science and Engineering, or a person at least 40 years of age, with at least 15 years of experience with practical responsibility, as demonstrated by thesis/dissertation or report and interview.

Associate Member (A.M.I.M.M.)
A person at least 25 years of age, who possesses an interest in Materials Science and Engineering but have not acquired the necessary experience or obtained the qualification, governing entry to Member grade. An Associate Member, on obtaining the necessary qualifications, may apply for transfer to Member grade.

Company Member
Any company that is involved or has interest in Materials Science and Engineering will be qualified to join as a company member.

Ordinary Member
Any Malaysian Citizen and above the age of 18 years engaged in activities related to research, development and applications in Materials Science and Engineering shall qualify for Ordinary Membership. Only Ordinary Members who meet the necessary minimum requirements may apply for transfer to membership grades of Fellow, Member and Associate Member and may use the abbreviated titles upon transfer.

Student Member
A student member shall be a person not under 17 years of age who at the time of application satisfies the Council that he has received a good general education and is studying subjects related to Materials Science or Engineering. A student member shall transfer to the grade of Ordinary Member after graduation provided he or she is suitably qualified and as soon as he or she is earning a full-time salary. A Student shall not become member of the IMM without the prior approval of the Vice-Chancellor or Head of Department of the university or relevant authority concerned.




IMM Week 2021: The Evolution of Material, Science and Technology in The Post-Covid Era

1-Day Rheology Workshop on Polymers

Materials Lecture Competition 2021 (MLC 2021)

FREE Ordinary Membership for Affiliates:

The Institute of Materials, Malaysia will recognize members of various professional institutions and societies for membership at "Ordinary Grade" without any annual subscriptions. Such members shall submit to IMM proof of their current membership of the respective institutions together with their application.

Members of the following institutions and societies are eligible to apply for affiliate membership:

1. American Welding Society
2. Asian Welding Federation
3. Board of Architects Malaysia
4. Board of Engineers, Malaysia
5. Engineering Institutes under the Engineering Council of UK
6. Geological Society of Malaysia
7. Institut Kimia Malaysia
8. Institute of Corrosion UK
9. Institute of Materials Singapore
10. Institute of Physics Malaysia
11. Institution of Engineers, Malaysia
12. Jabatan Minerals & Geoscience
13. Malaysian Medical Association
14. Malaysian Nurses Association
15. Malaysian Society for Non-Destructive Testing
16. Malaysian Welding & Joining Society
17. Persatuan Arkitek Malaysia
18. Plastics & Rubber Institute of Malaysia
19. Singapore Welding Society
20. Society of Petroleum Engineers
21. The Welding Institute UK

FREE Company Membership for Affiliates:

The Institute of Materials, Malaysia will recognize various professional institutions and associations for membership at "Company Grade" without any annual subscriptions.

Companies registered with the following Trade Associations are recognized for Affiliate Company Memberships:

1. Federation of Malaysian Manufacturers (FMM)
2. Malaysian Offshore Contractors Association (MOCA)
3. Malaysian Oil & Gas Engineering Council (MOGEC)
4. Malaysian Oil & Gas Services Council (MOGSC)

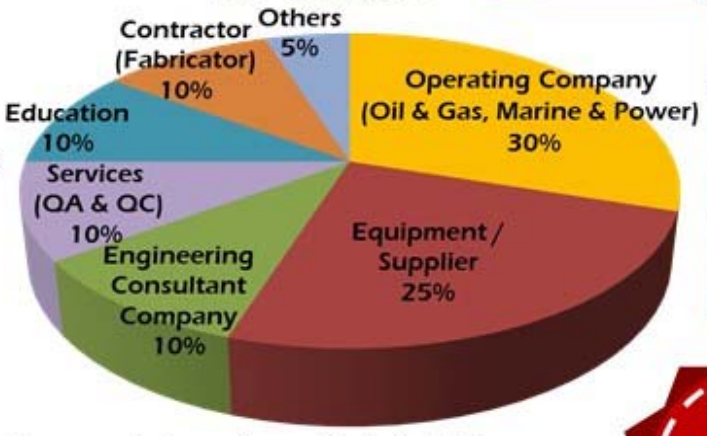
The companies shall submit to IMM proof of their current membership at the respective trade associations together with their application.

NOTE: The above provisions for affiliate membership for individuals and companies was approved by the IMM Council in accordance with the powers vested in the Council as per Clause 6.1.3 of the IMM Constitution and was subsequently endorsed by members at its 21st Annual General Meeting held on 19th March 2011.

MATERIALS MIND

Quarterly Magazine of Institute of Materials, Malaysia

Our Readers



General Information

Frequency: Quarterly Magazine
Format: Print & Online Editions
Reader: ~ 8000
ISSN: 2289-9030

Magazine Content

Event & Activity Reports, Conference Information, Technical Papers, Information on IMM, IMM Course Details, Advertorial, IMM Supporting Events and many more…..

DIGITAL EDITION FREE

Advertisement Rates

Code	In Print (Book Format)	Online (Webpage)	Price / Duration
A	**Standard Full Page** Size: A4 210 (w) mm × 297 (h) mm	**Bottom right side bar** Size: 60 (w) mm × 60 (h) mm	**RM 600** / 3 months
B	**Standard Full Page** Size: A4 210 (w) mm × 297 (h) mm	**Bottom right side bar** Size: 60 (w) mm × 60 (h) mm	**RM 2,000** / 1 year
C	**Back Outside Cover** Size: A4 210 (w) mm × 297 (h) mm	**Central banner** Size: 200 (w) mm × 80 (h) mm	**RM 1,000** / 3 months
D	**Back Outside Cover** Size: A4 210 (w) mm × 297 (h) mm	**Central banner** Size: 200 (w) mm × 80 (h) mm	**RM 3,000** / 1 year

* Introductory price, advertisers enjoy 50% discount on IMM Materials Mind homepage

+6018-9113480
www.iomm.org.my
secretariat@iomm.org.my
Institute of Materials Malaysia

ICPAC KOTA KINABALU 2022

22nd - 27th November 2022

International Congress on Pure & Applied Chemistry
Kota Kinabalu, Sabah, Malaysia

"Chemistry & Chemical Innovations for Sustainable Development in Rapidly-Emerging Economies"

Incorporating

20th Malaysian International Chemistry Congress 2022 (20MICC)
&
International Symposium on Advanced Polymeric Materials 2022 (ISAPM 2022)

Organised by

Institut Kimia Malaysia

Foundation for Interaction Between Science and Technology

In collaboration with

UMS UNIVERSITI MALAYSIA SABAH

ACC
Asia Chem Corporation (Japan)

https://icpackk2022.org

TEMPERLITE®

Insulation

Why Use PERLITE?

- Water Repellant
- Corrosion Resistant
- Combat Corrosion Under Insulation (CUI)
- Non Combustible
- Low Thermal Conductivity
- Asbestos Free
- Acid / Alkali Resistant
- Stable to 650°C
- Lightweight
- All-Weather & Takes Foot Traffic

TEMPERLITE INSULATION SDN BHD (227465-T) (formerly known as ITW Insulation Systems Malaysia Sdn. Bhd)
Lot PT33, Jalan 2, Kawasan Perindustrian Salak Tinggi, 43900 Sepang, Selangor, Malaysia

CALL +60387062486 **VISIT** www.temperlite.com.my **EMAIL** sales@temperlite.com.my **FAX** +60387062485