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THEME

POLYMER & RHEOLOGY

HIGHLIGHTS

- The Importance and Challenges of Understanding Polymer Behavior in Extensional Flow
- Report on Two-day Workshop on Comprehensive Rheology

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January 2018 Issue 20

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Editorial

Message from the Managing Editor of Materials Mind

It is a great honour for me to be appointed as Managing Editor for this new term. I would like to take this opportunity to express my sincere gratitude towards Dr. Tay Chia Chay and Assoc. Prof. Dr. Melissa Chan Chin Han on their trust for giving me an opportunity to be part of the team. I wish to thank and congratulate the former Materials Mind Editorial Board for a successful editorial work and for their dedication to this magazine over the years. On behalf of the new editorial team, it is my privilege to welcome our beloved readers to our Materials Mind magazine. In this issue, we are glad to announce that we will begin with the theme starting with "Polymer and Rheology". To date, the polymer industry has grown to be larger than the metal industries and have a wide range of applications extending from adhesives, coatings, foams, and packaging materials to textile and industrial fibres, composites, electronic devices *etc.* While rheology nowadays become a standard for characterizing materials to develop new and better products with the desired processing and end-use properties. We are thankful for having the contributors in sharing and contributing their knowledge and thoughts regarding this theme for this issue. Apart from that, we also have reports on a few events and activities occuring during the last few months. I would also like to thank all the contributors and editors of the reports for their endless support and hard work to make this issue an interesting reading material. Finally, thanks to all the advertisers and sponsors who have been sponsoring IMM's events and publications. It would be great to work closely with our new and regular advertisers and sponsors moving forward. I hope you will find this issue of Materials Mind informative and entertaining, and I look forward to your contributions and comments.

Hairunnisa Ramli
Managing Editor

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COVER STORY

THE IMPORTANCE AND CHALLENGES OF UNDERSTANDING POLYMER BEHAVIOR IN EXTENSIONAL FLOW

D.G. HASSELL

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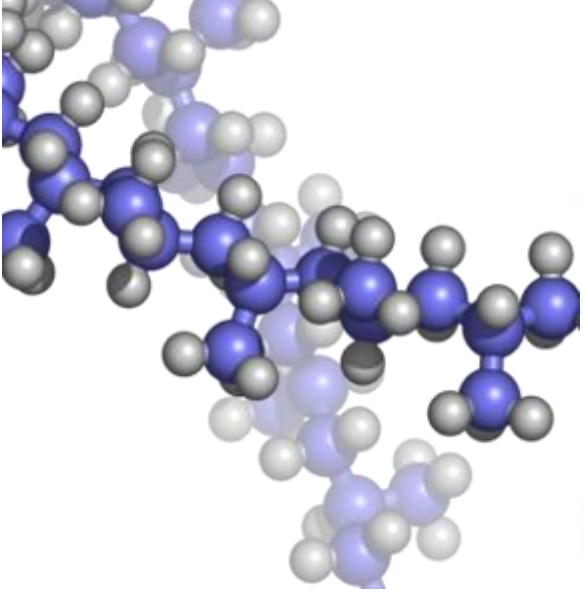
The flow of polymer materials is complex, and in general the behaviour is defined in terms of a linear and non-linear viscoelastic regime. For linear behaviour, the ratio of stress to strain is a function of time, and does not depend on the magnitude of the other parameters. Within the non-linear region the ratio between stress and strain varies as a function of deformation and this can loosely be attributed to changes in the materials molecular structure due to the applied deformation. This is shown in the Fig 1 where the additional of a small amount (3%) of Multi-walled carbon nanotubes (MWCNT's) in polycarbonate leads to a reduction in the linear viscoelastic region, represented by the constant relationship between the storage (G') and loss (G'') moduli. In this case the addition of the MWCNT's has resulted in a more sensitive material response to the applied strain used to measure the elastic and viscous behaviour of the material and the development of additional molecular structure at higher strain.



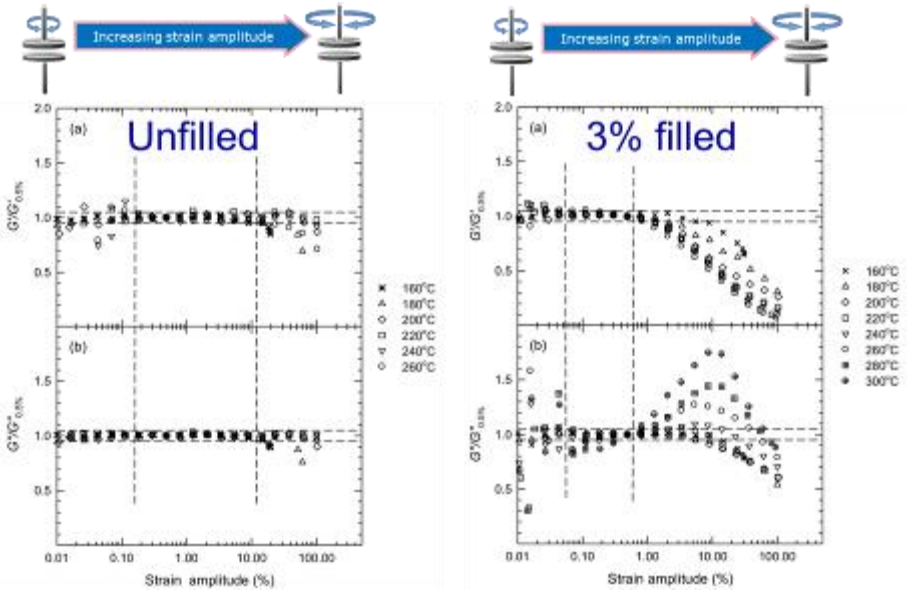
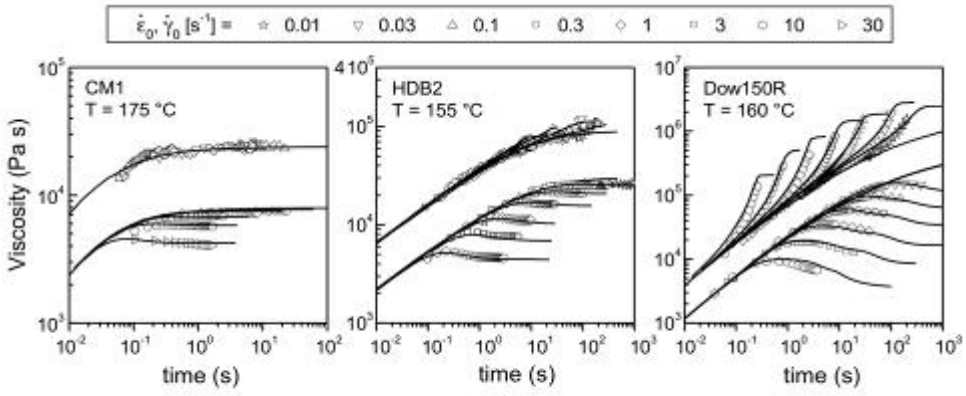


Figure 1: Frequency sweep values at 2 s-1 of storage (G') and loss (G'') for a polycarbonate material of molecular weight ~ 33,000 g mol-1 with (filled) or without (unfilled) the addition of multi-walled carbon nanotubes. Comparison values are to values at a strain of 0.5%. [Choong et al., 2013]

The storage and loss moduli of a polymer sample are normally determined using experiments conducted within the linear region, and the non-linear behaviour is evaluated rheologically in "simple" flows using either non-linear shear or non-linear extensional experiments. An example of this is provided in Fig 2 for three different polyethylene materials. In shear flow the materials are seen to exhibit an initial increase in viscosity with time before the value subsequent drops at higher times. However in extensional flow for the more branched low density polyethylene (LDPE) the viscosity is seen to significantly strain harden, with an increasing resistance to flow at higher times as the molecules become increasingly stretched. This strain hardening is an important physical behaviour of the material, and a result of the increasing level of molecular branching which causes higher levels of entanglement between adjacent molecules and hence additional resistance to motion. Also illustrated in Fig 2 is that the experiments don't always capture the material behaviour across the full range of time scales.



Linear-PE LCB-HDPE LDPE

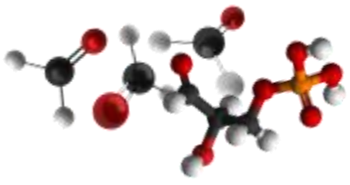
Figure 2: Transient shear (bottom) and uniaxial extension (top) for a linear polyethylene, long chain branched high density polyethylene and a low density polyethylene. The lines represent theory whilst the symbols represent experimental data. Experimental results for the full range of times were not achievable due to the polymer samples breaking. [Hassell et al., 2008]

For complex flows that mimic industrial applications, the use of a straight channel or contraction expansion slit geometry provides regions of high simple shear near the wall and extension along the inlet centreline. Results are useful in benchmarking molecular models prior to their use within industry (Agissant 2002) and a range of experimental observational techniques are used including flow induced birefringence, the brightfield technique (Collis and Mackley, 2005) and Laser Doppler Velocimetry (Combeaud et al., 2007). In these cases the Weissenberg number can be used to characterise the level of deformation experienced by the polymer, and is given by,

$$Wi = \dot{\gamma}_{app}\,\bar{\lambda} \qquad (1)$$

where is the viscosity weight average relaxation time of the material, given as a function of the moduli (gi) and relaxation times (λi) by,

$$\bar{\lambda} = \frac{\sum_{i=1}^{N} g_i \lambda_i^2}{\sum_{i=1}^{N} g_i \lambda_i} \qquad (2)$$



Most work in literature focuses on steady state flow patterns where the flow rates and Weissenberg number are limited to values that provide resolvable birefringence patterns. However this can limit the relevance to cases where the deformation rates can be very high, such as in the case of injection moulding. In this case it is possible to use the resulting stress relaxation after flow to provide an insight into the qualitative stress field present during flow.

Fig 3 illustrates the transient stress relaxation behaviour at the cessation of flow for a polydisperse polystyrene having undergone flow into a contraction geometry, and illustrates both the additional information which can be gained by stress relaxation comparisons and the impact on material behaviour of the extensional component of flow. For Wi ≈ 230 the principal stress difference (PSD) is resolved during flow and similar to other published work (Lee et al., 2001, Hertel et al., 2008) the region of highest stress is at the slit entrance corners. At higher values of Wi the PSD becomes unresolved during flow, however the general pattern of flow is captured during stress relation. It can be seen that at higher deformation rates the region of highest stress is no longer at the slit corner but rather in the region of high extension along the inlet centreline. These "inlet stress islands" resemble the "cusping" seen in Cross-Slot extensional flow (Verbeeten, 2001) which again occur as a result of extensional flow. This increased stress can be seen to correspond to a change in the velocity profile of the polymer entering the slit, shown in Fig 4, which is of relevance in understanding and predicting the flow behaviour of polymers entering confined geometries.

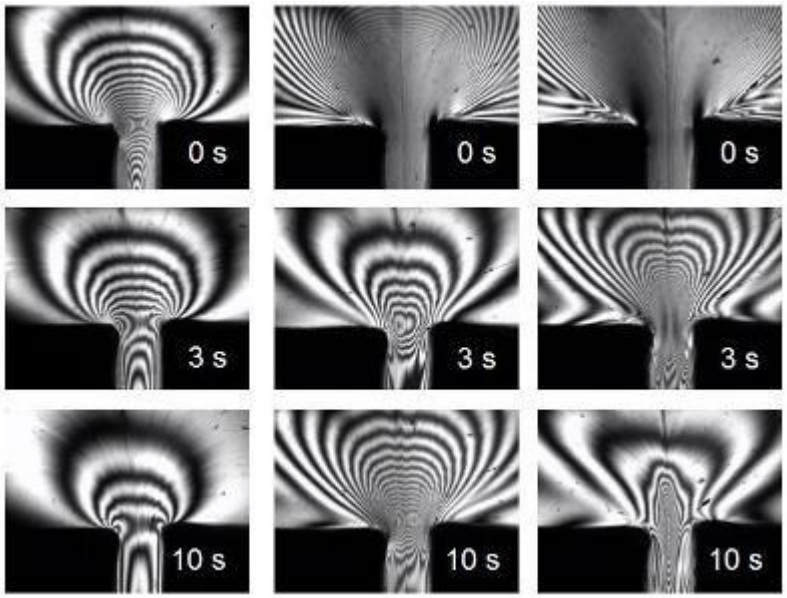


Figure 3: A sequence of images outlining relaxation of the flow induced birefringence in polystyrene at 170ºC at times after the cessation of flow for (a) $\dot{\gamma}_{app}$ » 2.36 s^{-1}, (b) $\dot{\gamma}_{app}$ » 23.6 s^{-1} and (c) $\dot{\gamma}_{app}$ » 47.1 s^{-1}. The flow direction was initially from top to bottom.

At lower Wi the velocity profile pattern along the inlet is similar to that reported in other work (Hertel et al., 2008) and the increase in upstream extension has little impact on the downstream flow profile. However at higher Wi the velocity profile changes, and a local minimum is observed in the centre of the slit inlet, with higher velocities either side of the centre-point. This seems to indicate that the "inlet stress island" presents a region of higher resistance to flow due to higher extensional viscosity and alters the velocity profile entering the slit. This change in velocity profile and stress pattern will ultimately affect the material properties downstream of the inlet, as the polymers molecular alignment is a consequence of past and present deformation. This is important in industries where polymers are subjected to high deformation rates and quick temperature cycle times that result in molten polymer morphology and stress becoming frozen into the final product. As a result, modern experiments and predictive tools including constitutive models should accurately capture this behaviour during extensional flows.

Fig 3 and 4 highlight the impact that extensional flow can have on polymer melt flow in complex geometries, whilst Fig 2 has indicated a limitation in conventional rheological characterisation of polymers during simple extensional flow. A number of recent studies have looked to bridge this gap and increase our understanding and characterisation of extensional flows. Auhl et al (2011) used a cross-slot geometry to probe material response in high strain extensional flows to characterise materials for which conventional uniaxial testing were not sufficient.

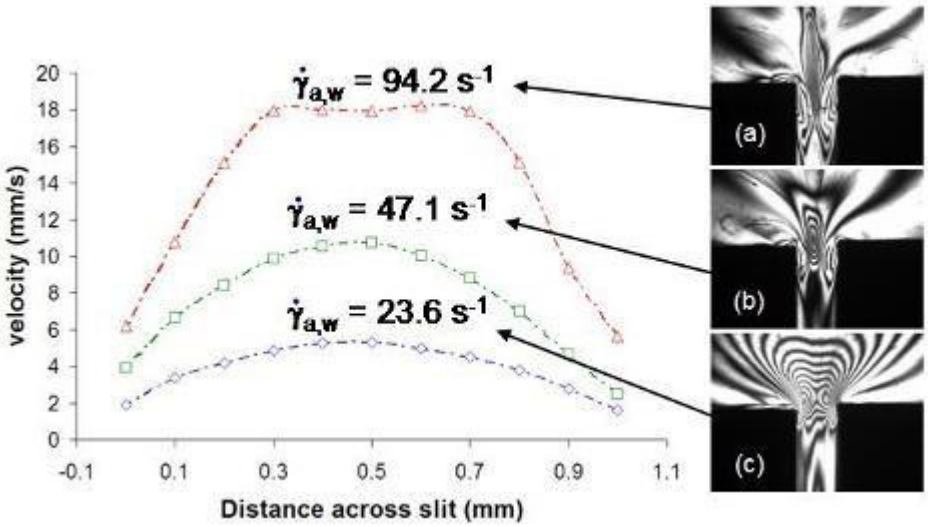


Figure 4: (left) Velocity profiles in polystyrene at 160ºC along the entrance line of the slit for three different flowrates; (diamond) $\dot{\gamma}_{app}$ » 23.6 s^{-1}, Wi ≈ 230; (square) $\dot{\gamma}_{app}$ » 47.1 s^{-1}, Wi ≈ 460 , (triangle) $\dot{\gamma}_{app}$ » 94.2 s^{-1}, Wi ≈ 920. (right) representative PSD images for flow from top to bottom, at a point during stress relaxation for each (a) $\dot{\gamma}_{app}$ » 23.6 s^{-1}; (b) $\dot{\gamma}_{app}$ » 47.1 s^{-1}, (c) $\dot{\gamma}_{app}$ » 94.2 s^{-1}.

Jotun Introduces New Thermosafe Range

Jotun launched its Thermosafe range, which enables customers operating at higher temperatures enhanced safety, efficiency and productivity.

With the long life of a coating system and effective protection of facility assets growing in importance, Thermosafe was developed to enhance operational efficiency, cut costs, reduce maintenance and increase on-site safety. Thermosafe compromises five products created to suit specific extreme environments – including temperature ranges from -196°C to 1000°C, thermal exposure, corrosion, fire, cryogenic spills and heat enabling better corrosion protection and reduced maintenance needs.

"We work hand-in-hand with our global customer base in order to gain an intimate understanding of their operations," said Miles Buckhurst, global concept director HPI at Jotun. "That insight tells us that the shift to higher temperatures, to help optimize processing and productivity, requires a new generation of coating."

Jotatemp 250 provides anti-corrosive protection for continuous operations of up to 250°, providing optimal cost efficiency for customers operating within this threshold. However, those with the potential to experience anything from the lowest liquid gas temperatures up the extremes of burning hydrocarbons can choose Jotatemp 1000 Ceramic for optimum protection up to 1000°.

The full Thermosafe range, which also features mesh free epoxy passive fire protection (PFP) solutions and thermal insulation for cryogenic spills, safeguards against a comprehensive spectrum of threats, from thermal exposure, to corrosion, fires and heat.

"We have used a significant amount of resources to develop unique solutions catering for the needs of this fast-growing segment," Buckhurst said. "The onshore oil, gas and chemical industries are some of the most demanding in the world, and they deserve coatings that can help them fulfill their potential."

Jotun is one of the world's leading manufacturers of decorative paints, marine, protective and powder coatings. The Group has 64 companies and 40 production facilities around the world, and more than 9 800 employees. The Jotun Group is organised into 4 segments and 7 geographical regions, and has its head office in Sandefjord, Norway.

Jotun's operations cover development, production, marketing, and sales of various paints systems and products to protect and decorate surfaces in the residential, commercial, shipping, and industrial markets. The brand name symbolizes reliability and trust with its core values focusing on health, safety, and the environment.

Whilst successful, this approach is not as straight forward as current uniaxial extensional testing, and currently requires more specialist rheological apparatus. Hoyle et al (2013) have also used a cross-slot geometry, alongside a filament stretching apparatus, to explain the formation of "W-cusps" in complex extensional flows shown in Fig 5 (Soulages et al., 2008, Hassell et al., 2009). Whilst expanding our understanding of the behaviour of polymers during extensional flow, this again requires more complex and varied apparatus than is usually required in a conventional testing laboratory. Extensional flow poses particular challenges in both measurement and understanding for polymer behaviour, and is of obvious relevance to industrial flows and product quality. The brief results presented here indicate that there is still work required to fully understand polymer behaviour in these highly extending and orientating flows, as well as develop experimental protocols to quickly and easily characterise polymer behaviour prior to industrial/further academic use.

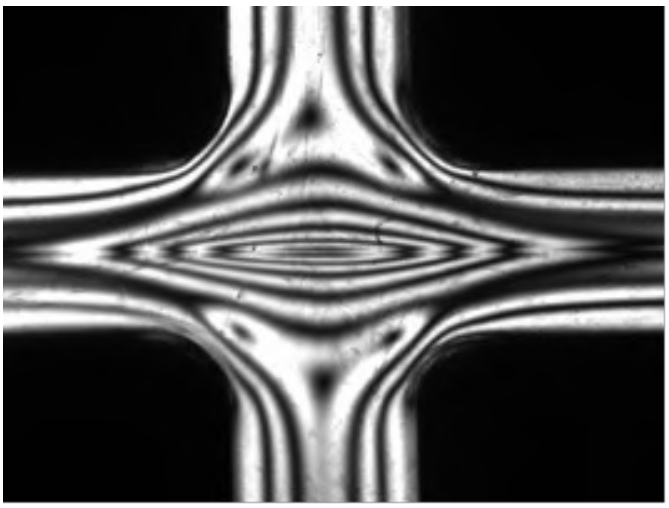


Figure 5: Visualisation of the formation of "W cusps" in the principal stress difference formed along the inlet outlet centre line of a cross slot geometry, in the region of maximum extension. The polymer is a long chain branched high density polyethylene at 155ºC.

Acknowledgements

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Failure Investigation from Chemist' Point of View

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Synopsis

Little did I know much about failure investigation when I completed my first/second Chemistry Degree. Three years have passed since I joined corrosion industry, and it appears that this 'detective' work is a very niche area to explore. Assessment of materials related to failure is commonly practiced in industries involving offshore platform, onshore facility, power plant and oil palm mill where the integrity of assets is of particular importance. This article excludes failure investigation in polymer and semi-conductor, although they are similar in some ways.

What is failure investigation all about?

Failure may originate from single or combination phenomena of corrosion, fatigue, stress, microbial attack (i.e. microbially influenced corrosion) and chemical attack (i.e. chloride, hydrogen sulfide precipitation, hydrogen embrittlement). The investigation is generally aimed at preventing (a) recurrence, (b) damage to assets and environment, (c) loss of lives, and sometimes at improving knowledge. In the nut shell, failure investigation utilizes non-destructive and destructive testing in order to understand the root cause of failure.

Where is the occurrence of failure?

Common metal failure can be found in boiler tubes, heat exchanger plates, insulated and non-insulated pipes, all types of valves and flanges internally or externally, bolts & nuts, welded joints and turbine blades.

Who can be investigator?

Unlike other areas of expertise (welding, blasting and painting, corrosion, etc.) that requires rigorous training and certification, there is no specific certification ever outlined to become a failure investigator. However at work site, one may need certifications such as OGSP (oil and gas safety passport), AESP (authorized entrant and standby person), OPITO BOSIET (basic offshore safety induction and emergency training), API 510 (pressure vessel inspector), API 570 (piping inspector) and API 571 (corrosion and materials). A failure investigator with academic background and above-mentioned certifications can either work independently or could pair up with metallurgist, chemist and (civil / mechanical / chemical / material / corrosion) engineer. The common ground that these experts must possess is their abilities to (1) understand how the materials behave in certain conditions (involving different processes and specific environment), (2) possess the skills to operate, analyze and troubleshoot various scientific instruments, and at times (3) understand human behavior. Since most of the failure on offshore platform is related to corrosion where harsh environment and complex processes are in place, the understanding of metal (metallurgy) and fracture mechanics is crucial. When the selection of material in specific process is wrong, failure investigation shall not proceed.

What are the challenges?

Every project has its own set of challenges. Time is an indispensable factor when a project leader chases for project completion. Insufficient time given to failure investigator could lead to deterioration quality of investigation. Placement of the right expertise also determines the quality of investigation. It should be noted that each investigation shall be treated exclusively and not just as a common procedure. Some cases require simple visual examination while others may require more complex surface analysis (i.e. scanning electron microscopy coupled with electron backscattered diffraction, electron diffraction x-ray, x-ray photoelectron spectroscopy, Auger electron spectroscopy, time-of-flight secondary ion mass spectrometry, etc.). The extent of investigation sometime goes up to computational modeling. The complexity of scientific instruments demands high maintenance cost and well-trained operator. In addition to the above-discussed limitations, a failure investigator usually needs to gather enough background information (i.e. P&ID drawings, service history, safety data sheet, process and environmental conditions) in order to support their analyses. Unfortunately, this information is not easily accessible from the client.

Dr. Yoga Sugama Salim graduated from the Universiti Malaya in 2016 (Ph.D., Polymer Chemistry) and Université de Rouen in 2015 (M.Sc., Physics, Mechanics, Engineering Sciences, Engineering and Materials Testing). He is currently working as Failure Analysis & Technology Solutions Specialist. He has over 9 years of combination experience in biodegradable polymers, fermentation technology, thermal and mechanical properties and failure investigation. His research interest is devoted to materials characterization. He was appointed as the member of Industry Expert Advisory Panel (IEAP) for M.Sc. Research at Universiti Tunku Abdul Rahman (2016–2019), editorial board for Materials Mind magazine published by the Institute of Materials, Malaysia (IMM) (2016-2018), member of IMM corrosion

INSTITUTE OF MATERIALS, MALAYSIA

Updated on 30th June 2018

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 the 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 18 materials committees, and 5 regional chapters, and supported by a secretariat with full time staffs.

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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 600 Coatings Inspectors have been trained and certified as well as 2500 Blasters & Painters, Supervisors, Corrosion Technician and Vibration Practitioners. Its certification programmes are recognized by PETRONAS and all oil & gas operators. Since January 2011, 72 Associate Welding Engineers, 80 Welding Engineers, 20 Senior Welding Engineers and 24 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 been 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, The Society for Protective Coatings, US (SSPC), 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.

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(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.

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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 June 2018

REGULATIONS GOVERNING ADMISSION AND TRANSFER OF MEMBER GRADES

The Council shall establish a Memberships Committee which will be responsible for review of applications for transfer of membership grades. The Memberships Committee shall recommend transfers for Council approval at Council Meetings. 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.

The Memberships Committee shall be responsible for drafting the "Regulations Governing Admission and Transfer of Member Grades" for Council approval. These regulations may be changed from time to time subject to Council approval.

Every application for membership shall be proposed and seconded according to these regulations and shall be forwarded to the Honorary Secretary who shall, at the first convenient opportunity, submit it to the Council for approval the Council may at its discretion reject any application without assigning any reason thereof.

Each company on admission shall be entitled to nominate one representative to exercise all rights of membership. Only representatives of Company membership, 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, and Blue Identity Card Holders 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 join 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.

LOPC 2017

IMM Vibration Conference 2017

ICMTE 2017

MLC 2017

FREE Ordinary Membership for Affiliates:

The Institute of Materials, Malaysia will recognize various professional institutions and societies for **free membership** at "Ordinary Grade". Members of the recognized professional institutions and societies can become Ordinary Members of the IMM without any annual subscriptions. The Council of the IMM approved the proposal in accordance to IMM Rules clause no. 3.2.3 and the members at its 21st Annual General Meeting unanimously approved the proposal on 19th March 2011.

Members of following institutions and societies are welcome to apply.

(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) National Association of Corrosion Engineers USA
(18) Persatuan Arkitek Malaysia
(19) Plastics & Rubber Institute of Malaysia
(20) Singapore Welding Society
(21) Society of Petroleum Engineers
(22) Steel Structures Painting Council USA
(23) The Welding Institute UK

FREE Company Membership for Affiliates:

The Institute of Materials, Malaysia will recognize various professional institutions and societies for free membership at "Company Grade". Company Members of the recognized professional institutions, societies & associations can become Company Members of the IMM without any annual subscriptions. The Council of the IMM approved the proposal in accordance to IMM Rules clause no. 3.2.3 at its Penultimate Council Meeting on 10th January 2014 which was endorsed at the 24th Annual General Meeting held on 21st March 2014.

List of Free Company Memberships for Trade Associations:-

(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)

Email : secretariat@iomm.org.my Website : www.iomm.org.my

Polymer Research and Postgraduate Training at Tunku Abdul Rahman University College

An interview with:

Dr. Phang Sook Waik,
Tunku Abdul Rahman
University College (TAR UC)

Dr. Sin Sau Leng,
Tunku Abdul Rahman
University College (TAR UC)

Prepared by:
Dr. Lim Teck Hock,
Tunku Abdul Rahman
University College (TAR UC)

Edited by:
Dr. Tay Chia Chay, UiTM

Polymers are macromolecules composed of many repeating units and can be of either natural or synthetic origin. Examples of natural polymers are DNA and proteins while polyethylene plastic bags, rubber and silicone are classified as synthetic polymers.

Polymers play an important and ubiquitous role in our daily life. From plastic bags used in food packaging, beauty products, controlled drug-delivery to advanced chemical resistance coating used in oil rig, products made of polymers could be found essentially in almost all aspects of human activities.

Due to their enormous potential in real-world applications and considerable commercial values, research in polymers in terms of synthesis, modification and polymer-based technologies has always been able to attract the attention of academia, governmental and industrial players.

Tunku Abdul Rahman University College (TAR UC), with its newly established research laboratories housed next to a beautiful pine-tree park in its East Campus in Kuala Lumpur, has witnessed the growth of its scientific research activities since its upgrade in 2013.

For this issue of Materials Mind, we interviewed two young and competent polymer chemists (Dr. Phang Sook Wai and Dr. Sin Sau Leng) and their Master students from the Department of Physical Science, Faculty of Applied Sciences of TAR UC, to discover their passions and interest in polymer research.

An interview with Dr. Phang Sook Wai, Principle Lecturer, TAR UC

1. Please describe your experience and expertise in polymer research.
   I have over 17 years of experience in the Synthesis of Conducting Polymer, for example polyaniline and polypyrole, and their applications. My research was supported by the total grants received amounted to RM430600 (over 6 projects) since my work in Japan.

2. Where did you work before joining TAR UC?
   I was in University of Malaya (UM) for five years before joining TAR UC. Prior to UM, I have also worked as a postdoctoral researcher at Henkel Research Center at Kinki University, Japan.

3. Which industry/ industries may benefit from the research output generated from your work?
   Our research is very application driven and I believe the output could find application in electronics industry (Electromagnetic Interference (EMI) Shielding), renewable energy (solar cells, solid polymer electrolyte) and waste management (heavy metal removal).

An Interview with the Master Student Ms. Khong Choy Hung

1. Could you provide a brief description of your area of research and what future industry your research output may find real applications?
   My study revolves around the Synthesis and Application of Conducting Polymer Composite as Solid Polymer Electrolyte (SPE) which could be viable future replacement for toxic and flammable liquid electrolyte (LE) used in rechargeable Li batteries. The use of SPE could help mitigate the environmental issues due to leakage of LE and to reduce production cost.

Figure 1: Conducting Polymer Composite which could be readily prepared in the form of thin film suitable for SPE applications.

2. What inspired you to pursue your MSc in Polymers Related Research?
   I took an interest in conducting polymers during my final year project during my BSc. (HONs) in Analytical Chemistry degree at TAR UC. I found my supervisor very caring and TAR UC is also very supportive.

An interview with Dr. Sin Sau Leng, Senior Lecturer, TAR UC

1. Please describe your experience and expertise in polymer research.
   I specialize in polymer synthesis and application and currently we are working on the green synthesis of

polyurethane which is funded by Fundamental Research Grant Scheme, MOHE.

2. Where did you work before joining TARUC?
I was a researcher at the Institute Materials Research and Engineering, A*STAR in Singapore. Prior to A*STAR, I worked in several chemical companies.

3. Which industry/ industries may benefit from the research output generated from your work?
Polyurethane with improved physical strength and chemical resistance should find applications in the offshore oil and gas industry as high performance coating materials are much needed.

An Interview with the Master Student Ms. Wong Kai Yi

1. Could you provide a brief description of your area of research and what future industry your research output may find real applications?
My research focuses on the green synthesis of polyurethane and improving its physical and optical properties. Polyurethane is used widely in various applications. However, the raw materials of the polyurethanes are not environmental-friendly, hence, I would like to produce an environmental-friendly polyurethane without changing its original properties.

Figure 2: Ms. Wong Kai Yi uses the newly purchased rheometer from Anton Paar installed in TAR UC to measure the viscosity and study the rheological behavior of polyurethane.

2. What inspired you to pursue your MSc in Polymers Related Research?
My choice to pursue my postgraduate study at TAR UC is motivated by supervisor, Dr. Sin Sau Leng, an expert in polymer research. She has many years of research experiences. Adding to this, TAR UC also has good facilities and is well stocked with equipment and instruments for research. Moreover, TAR UC has provided a scholarship for me to pursue my master degree.

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Two-day Workshop on Comprehensive Rheology

Reported by: Ts. Dr. Chew Khoon Hee, Tunku Abdul Rahman University College (Chairperson of IMM Polymer Committee)
Edited by: Assoc. Prof. Dr. Melissa Chan Chin Han, Universiti Teknologi MARA (Hononary Secretary of IMM)

Date: 25-26th April 2018
Venue : Waters Analytical Instruments Sdn Bhd

Have we ever asked ourselves the following questions,

"What happen to my hand cream if I rubbed it with my palm?"

"Why we usually need to shake the bottle of ketchup before we can pour it out?"

These are some examples of our daily routine. They are so common that we perform them under the auto-pilot mode without further thinking of the reasons behind those actions. However, as a materials engineer or technologist, we need to understand the flow behavior of these materials and the answers to these questions were revealed at the 2-day Comprehensive Rheology Workshop held on 25 and 26 April 2018 at Waters Analytical Instruments Sdn. Bhd. in Petaling Jaya.

This workshop was jointly organized by TA Instruments, a Division of Waters Analytical Instruments Sdn. Bhd., Polymer Committee of Institute of Materials (IMM), Malaysia and Institution of Chemical Engineers (IChemE), UK. This workshop had attracted 16 participants from various backgrounds, ranging from paint to ink industries; from rubber to adhesive industries and from palm oil to post-graduate students.

Rheology cannot be considered as a new or emerging science for materials. In order to let the participants have an overview what rheology is, the speaker, Dr. David Hussell started the workshop by showing a video on rheology which was recorded 64 years ago. Dr. David Hussell possesses a PhD in the area of microfluids and fluid mechanics. He also worked on microscale polymer processing to evaluate the behavior of polymer.

Figure 1: Mr. Chan Yian Kit of TA Instruments is testing the strength of plastic beg with different molecular alignments

Throughout the workshop, various examples in our daily life were used to explain the concept of rheology, videos were also used to help the participants to have a better understanding on rheology.

Instead of sitting passively listening to the lecture, participants were grouped into small groups for discussion as well as conducting the rheological test on the samples given to them by the organizers.

Introduction to rheology, basics of fluid flow and non-Newtonian flow behavior, characterization of basic flow behavior were among the topics covered in the first day of the workshop. While on the second day, the focus was on viscoelastic behavior of polymeric materials.

Figure 2: Mr. Josh Lai of TA Instruments is demonstrating to the participants on how to conduct rheological testing

During the break between the sessions, the Hon. Secretary of IMM, Assoc. Prof. Dr. Melissa Chan Chin Han took the opportunity introduce IMM to the participants.

With the vast experience of Dr. David Hussell, participants have gained a better insight on rheological behavior of various materials.

The workshop was concluded by the giving-away of the Certificate of Participation to the participants by Assoc. Prof. Dr. Melissa Chan Chin Han of IMM.

Figure 3: Presentation of Certificate of Participation to participants by Assoc. Prof. Dr. Mellissa Chan

Figure 4: Participants of the Comphrehensive Rheology Workshop

Organized by TA instruments

Co-organized by IMM **&** IChemE Education Special Interest Group

IMM Corrosion Committee Members Half Day Seminar "Corrosion Controls and Prevention" and Site Visit to Navy Base, Lumut



Reported by: Ir. Ong Hock Guan, Shell Malaysia Exploration & Production (Chairperson of IMM Corrosion Committee)
Ms. Syarifah Nazliah Syed Adul Rahman, BSSTECH CP (M) Sdn Bhd (Secretary of IMM Corrosion Committee)

Edited by: Ir. Max Ong Chong Hup, Norimax Sdn Bhd (Chairperson of Education Committee)

Date: 14th May 2018 (9:00 am – 4:00 pm)
Venue : Cawangan Penguasa Kejuruteraan Armada Pangkalan TLDM, Lumut, Perak

One of the IMM Corrosion Committee 2018 activities is to organise a half-day seminar on "Corrosion Controls and Prevention" and site visit to Cawangan Penguasa Kejuruteraan Armada Pangkalan TLDM, Lumut, Perak. The Navy base visit on 14th May 2018 was successfully organized by Institute of Materials, Malaysia (IMM), IMM Corrosion Committee. The Navy Base site visit was attended by a total of seven (7) participants which comprised of IMM Corrosion Committee members.


Figure 1a & 1b: CAPT Ir. Hj Ahmad Fahmi Jahaya's opening and welcoming speech and IMM Corrosion Committee Chairperson, Ir. Ong Hock Guan, delivered his opening speech


Figure 2: IMM presentations sessions by Pn. Syarifah Nazliah Syed Abdul Rahman and En. Rais Sabiyah

Figure 3: Group Photo with Navy staff outside their site office in Lumut

CAPT Ir. Hj Ahmad Fahmi Jahaya first welcomed the delegates with his opening speech at 9:30 am. Ir. Ong Hock Guan also gave a speech to thank CAPT Ir. Hj Ahmad Fahmi Jahaya for the opportunity to organise the half-day seminar and site visit to his Navy Base. The participants from the Navy base were mostly from their engineering division. After a round of introduction, CAPT Ir. Hj Ahmad Fahmi gave a presentation on the overview of the Navy Base and its facilities/activities.

Technical presentations based on "Corrosion Controls and Prevention" were given by the following IMM Corrosion Committee members to the participants to provide generate awareness on mitigation of corrosion threats in their Navy base facilities.

10.30am - The Applications of Cathodic Protection by Mr. Rais Sabiyah – Corrtrol Synergy Sdn Bhd

11.00am - Anodes Manufacturing and Related Issues by Ms. Syarifah Nazliah – BSSTECH CP (M) Sdn Bhd, Secretary of IMM Corrosion Committee

11.30am - New Technologies Solutions to Combat Corrosion by Ir. Ong Hock Guan – Shell Malaysia Exploration & Production, Chairman of IMM Corrosion Committee

The participants had a good lunch with the host. At 2.30 p.m., a tour of the Navy base was conducted. We were invited to board the KD PERANTAU vessel. The personnel onboard Lt. Khairul and Lt. Ramli explained to us the activities at the Navy base and the functions of Hydrographic Vessel. The tour took slightly over two hours. After the tour, light tea was provided by the host Lt. Khairul and Lt. Ramli before the tour end at 4.30 pm.

Figure 4: Photo session in front of Navy KD Perantau Vessel

Last but not least, IMM Corrosion Committee chairman would like to express our appreciation to their host, CAPT Ir. Hj. Ahmad Fahmi Jahaya, and his engineering team for giving them the opportunity to visit the Navy base. The half day seminar and the site visit and tour provided the participants with better understanding of how Navy base function.

We would like to also express our appreciation to those who participated in the Navy base visit: -

Ir. Ong Hock Guan, IMM Corrosion Committee Chairperson
Ms. Syarifah Nazliah Syed Adul Rahman, IMM Corrosion Committee Secretary
Mr. Chew Boon Kheng
Mr. Junaidy Abdullah
Mr. Rais Sabiyah
Mr. Aizul Ariff Ali
Ms. Rosmaini Ismail

Malaysia Board of Technologist (MBOT) Strategic Technology Field Optimization Workshop


Reported by: Dr. Mohamed Ackiel Mohamed, Serba Dinamik Group Bhd (IMM Council Member)
Edited by: Assoc. Prof. Dr. Melissa Chan Chin Han, Universiti Teknologi MARA (Hononary Secretary of IMM)

Date: 4-6th May 2018
Venue : WP Hotel, Kuala Lumpur

Malaysia Board of Technologist (MBOT) recently held a Strategic Technology Field Optimization (STFO) Workshop with participants from a wide range of industries. The main agenda for this workshop was to refine the technology field definition, technology field optimization and analysing the future technology profession in Malaysia as well as defining the assessment for professional technologist and certified technicians. Apart from the organizing secretariat, the workshop was attended by industrial experts, academicians, various ministries handling technical and vocational studies in Malaysia as well industrial professional bodies. IMM was represented by the Honorary Secretary, Assoc. Prof. Dr. Melissa Chan from Universiti Teknologi MARA; and Council Member and the Welding Committee Deputy Chair, Dr. Mohamed Ackiel Mohamed from Serba Dinamik Group Bhd.

The first day was mostly spent on updating and refining the definition of 21 technology fields currently short-listed by MBOT. The first session started with the partcipants being divided into various groups with each group being assigned to 4 technology fields. They were then asked to update potential industry or organizations that MBOT should engage with in order to develop the respective technology fields. Topics such as updating the current talent supply and demand data and how MBOT can get to assist its members' on talent development was also deliberately dicussed. The outcome of each group was then presented and discussed in detail.

Figure 1: STFO Partciapnt's engaging in groups discussion

Figure 2: Group discussion (Dr. Mohamed Ackiel Mohamed – left; Assoc. Prof. Dr. Melissa Chan Chin Han – right)

The second day was mostly spent on identifying and setting the professional development for MBOT's CPD, courses needed for assessment as well as the related law or legislation that can help MBOT to grow and expand the respective technology field. Although the participants had to face long hours of intense discussions, everybody seemed to be in high spirits to charter a new pathway for technologists in Malaysia. The discussion lasted throughout the day, and after a well-deserved dinner break, the night session was consumed on getting feedback for MySET's research on Future Technology Profession in Malaysia as well as identifying how MBOT's existence can be a catalyst to the future technology professions. Although originally scheduled to finish at 9.30 pm, the discussion was so intense and interesting that it finished only at 11.30 pm.

The third day was dedicated to finalising all the findings and having a dialogue session with the president of MBOT, Tan Sri Dr Ts. Ahmad Zaidee Laidin. Arriving at 9.30 am, the president gave an inspiring speech. He went down memory ane and recalled the moments when he was called by the Dewan Bahasa dan Pustaka (DBP) to define the word "Engineering" in Malaysia's context almost 60 years ago. He continued his speech in appreciation of all the participants for their role in the workshop and said that, some day, the nation will look back at all the names that once helped define and charter the path for Technologists in Malaysia. The output of this workshop will be published into a booklet and Guide for MBOT's technology Fields. The day ended with a group photography session and lunch. Regardless of the fatigue faced by the participants throughout the workshop, their faces were filled with excitement, happiness and contentment with the final findings and achievements of the SFTO workshop. Kudos to MBOT for organizing a very well thought and organized workshop.

Figure 3: Partcipants posing with the MBOT president for a group photo session

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Materials Lecture Competition 2018 Final

Reported by: Assoc. Prof. Dr. Astuty Amrin, Universiti Teknologi Malaysia (Chairperson of MLC 2018)
Dr. Nor Akmal Fadil, Universiti Teknologi Malaysia (Co-Chairperson of MLC 2018)
Dr. Nor Hasrul Akhmal Ngadiman, Universiti Teknologi Malaysia (Co-Chairperson of MLC 2018)
Edited by: Prof. Dr. Esah Hamzah, Universiti Teknologi Malaysia (Chairperson of IMM-MLC Committee)

Date: 3rd May 2018
Venue : Universiti Teknologi Malaysia (UTM), Kuala Lumpur Campus

On May 3rd, five finalists from universities across the nation came together at the Azman Hashim Hall, UTM Kuala Lumpur campus to compete in the Materials Lecture Competition 2018 (MLC 2018). The finalists were the top five winners of the MLC 2018 semi-final competition, which was held on the 5th April 2018 at UTM Kuala Lumpur. The event was jointly organised by UTM School of Graduate Studies, Institute of Materials Malaysia (IMM) and Institute of Materials, Minerals, and Mining (IOM3). The MLC 2018 semi-final and final events were sponsored by IMM, Serba Dinamik Group Bhd, UTM School of Graduate Studies and Zeta Scientific Sdn. Bhd. The MLC was aimed at stimulating students' communication competencies development in delivering ideas pertaining to material science and engineering.

The Pro Vice-Chancellor of UTM Kuala Lumpur campus, Prof. Dr. Shamsul Sahibuddin was on hand to officiate the national MLC 2018 final competition. A panel of judges, from both academia and industries as listed in Table 1, selected the winners based on the participants' personal enthusiasm for the subject, presentation's structure, technical content and clarity, along with their competence in handling questions. Mr. Andrew Ng Kay Lup from Universiti Malaya (UM) was announced as the first-prize winner, while Ms. Norkhalizatul Akmal Mohd Jamil from UTM and Ms. Raffaella Pian Cheau Mei from Universiti Teknologi Petronas (UTP) came as the first runner-up and second runner-up, respectively. The winners walked away with a cash prize of RM3000, RM 2000 and RM 1000 together with plaques awarded by the President of IMM, Mr. Mohd. Azmi Mohd. Noor. Consolation and cash prizes of RM500 were also given to the last two finalists. The first-prize winner will represent Malaysia in the Young Persons' World Lecture Competition (YPWLC) 2018, which will be held in South Africa in October 2018.

This half-day competition ended with closing remarks by the President of IMM, who had also announced Universiti Teknikal Melaka (UTeM) as the host for the MLC 2019 which will be held next year (2019) in UTeM, Melaka.

Table 1: : STFO Panel of Judges of MLC 2018 final

Name of Judges	Affiliation
Assoc. Prof. Ir. Dr. Abu Bakar Sulong	Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia
Ir. Dr. Azmi Mohammed Nor	PETRONAS Research Sdn Bhd
Assoc. Prof. Dr. Chan Chin Han	Faculty of Applied Sciences, Universiti Teknologi MARA
Mr. Kang Kim Ang	Corrtrol Co.

Figure 1: : Five finalists of MLC 2018 (back row) with (front row) the President of IMM, UTM-MLC 2018 Chairperson, UTM-MLC 2018 Advisor and panel of judges

Figure 2: : The winners of MLC 2018 final. From left: 2nd runner-up, Ms. Raffaella Pian Cheau Mei (UTP), first-prize winner, Mr. Andrew Ng Kay Lup (UM) and 1st runner-up, Ms. Norkhalizatul Akmal Mohd Jamil (UTM)

IMM Vision-Mission Workshop at University of Malaya


Reported by: Dr. Yong Song Kong, Universiti Teknologi MARA (Chairperson of IMM Website Committee)
Mr. Brian Lim Siong Chung, Geopolitan Sdn Bhd (Chairman of Examination, Certification and Accreditation Panel)

Edited by: Assoc. Prof. Dr. Melissa Chan Chin Han, Universiti Teknologi MARA (Hononary Secretary of IMM)

Date: 21st April 2018
Venue : The Cube, Level 2, Block L, Engineering Tower, Faculty of Engineering, University of Malaya

Advisor, Datuk Ir. Dr. Abdul Rahim Hashim has welcomed members of IMM. The president, En. Azmi M. Noor has briefed the floor on IMM's vision and mission, before breaking into two groups. In the first breakout session, Group one have discussed various challenges in membership and strategic partnership. Currently, active membership in IMM is around 1000, most of which are from the training programme that mandates its trainee to be an IMM member. Ironically, IMM's brand is not visible in various industries, possibly due to its long association with the oil and gas industry. Moreover, the number of student members is still low. Currently there is only five universities that have student chapter with IMM (i.e. Sarawak Politeknik, Unimas, UTAR, UTM, Curtin University).

Group one has proposed several strategies to retain existing members as well as to increase new members:

1. Enhanced value proposition for new members
2. Creation of employment and internship avenue for IMM members
3. Conversion of student members into full membership
4. To follow up with existing members to renew membership after expiration
5. Increase company memberships drive
6. Organise Innovation, Invention and Design competitions, poster competition, and MLC that offers prize money and sponsorship to raise IMM profiles
7. Increasing visibility through social media campaign
8. Expand portfolio of working committees that includes biomaterials etc.
9. Setup booth in career fairs
10. Expand the number of student chapter in large universities, such as UiTM, UM, USM, UKM, UniKL, UTP, UIA etc.

The second assignment for Group one is to address strategic partnership for IMM. Institution such as MBOT, CIDB, HRDF, MOSTI, Federation of Manufacturers Malaysia were identified as potential partners on course accreditation, certification, solicitating funds etc.

Finally, during the presentation, Dr. Zulkifli and Mr. Danny Tan have raised concerns on the perception of academia, companies, federations, and other NGOs of IMM brand, and has proposed that an internal survey among various cluster to be performed to gauge the self-perception of IMM identity.

A fruitful discussion session focussed on five main areas was covered by Group two led by Dato' Udani M Daud. The five scopes comprised the setup of special task force, identification of the committee's SOP, revise of roles and functions of Examination, Certification and Accreditation Panel (ECAP) and Authorized Training Body (ATB), and collaboration with other institutes or corporates in near future. Other members of Group two included Dr. Zulkifli Kedah, Assoc. Prof. Dr. Melissa Chan Chin Han, Danny Tan and Brian Lim Siong Chung.

Figure 1: Members of Group one brainstorming during the breakout session (From left: Tan Su Anne, Mohd Hafiz Abd Karim, Dr. Tay Chia Chay, Mohd Fairuz Mohd Salleh, and Dr. Eric Lim Teck Hock)

List of members of Group one:

Dr. Yong Soon Kong
Dr. Dasline Sinta
Dr. Mohamed Ackiel Mohamed
Dr. Eric LimTeck Hock
Dr. Tay Chia Chay
Mr. Mohd Fairuz Mohd Salleh
Mr. Mohd Hafiz Abd Karim
Ms. Tan Su Anne

All five areas had been thoroughly discussed. The responsible parties and the timelines of short (Quarters 2, 3 and 4 of 2018), medium (within two years) and long terms (within 5 years) had also been scheduled and identified. The first focus of the meeting was to setup a special task force to plan and manage the milestones and progress of all activities decided by the group members. Danny Tan was elected as the chairman of the special task and it was agreed by all members of Group 2. Other members of the special task force consist of one representative of IMM management committee (IMM President), IMMR directors, one legacy member (Karen), one ECAP member, one member from each technical committee, one academia and maximum of three young professionals.

Second task of Group two is to study and come out with the SOP of the current working system and process to suit the requirements of new IMM ecosystem proposed by IMMR. Organization structure, benchmarking on other professional institutes and limit of authority (LOA) are the key items that had been brainstormed during the discussion.

Deliberation of functions and roles of ECAP and ATB includes the topics of creation of new course, rank course popularity, Central Training Unit (CTU) in IMMR, creation of database and moving towards ISO 17024 (Certification). ECAP will have to monitor the progress of the mentioned areas.

Upcoming and future collaborations with other institutes or corporates that will benefit IMM was also discussed. This involves the forming of MBOT Working Group under ECAP, formulate IMM strategy and plan for the requirement of MBOT and engagement with MBOT.

Memorandum of Understanding Signing Ceremony of IMM-MBOT


Reported by: Mr. Brian Lim Siong Chung, Geopolitan Sdn Bhd (Chairperson of Examination, Certification and Accreditation Panel)
Edited by: Assoc. Prof. Dr. Melissa Chan Chin Han, Universiti Teknologi MARA (Hononary Secretary of IMM)

Date: 1st June 2018
Venue : Malaysia Board of Technologists (MBOT), Putrajaya

A Memorandum of Understanding (MoU) signing ceremony was held at Malaysia Board of Technologist on 1st June 2018. MBOT is a body corporate with the main function of recognizing Technologist and Technicians as professionals. MBOT had shown its interest to collaborate with IMM that consists of a broad range of technologists from various technical backgrounds during a meeting held in 2017.

A 3-day workshop was organized by MBOT on 4-6th May 2018. The workshop was scheduled with the purpose to exchange their ideas with the industrial technical experts and collect valuable feedback from all attendees. The workshop also allowed all industrial partners to understand the functions and roles of MBOT in recognizing qualified technician and technologies. Assoc. Prof. Dr. Melissa Chan Chin Han and Dr. Mohamed Ackiel Mohamed were the two representatives of IMM attended the workshop.

The first milestone of the collaboration is marked by the MoU signing between the two parties. The President of IMM, Mr. Mohd Azmi Mohd Noor and the President of MBOT, Tan Sri Dato' Academician Dr. Ts. Ahmad Zaidee bin Laidin represented both parties in the signing of the MoU. It was witnessed by the Chairperson of ECAP of IMM, Mr. Brian Lim Siong Chung, and the Registrar of MBOT, Ts. Mohd Nazrol Marzuke. Representatives from various industries especially those who had attended the MBOT workshop in May 2018 were also invited to the signing ceremony.

With the signing of the MoU, MBOT will appoint IMM as a member of Technology Expert Panel (TEP) in the related technology field recognized by MBOT. As the TEP of MBOT, IMM will assist and provide necessary advice to the Technology and Technical Accreditation Council (TTAC) for any technology program accreditation. Other functions of TEP are to develop and propose professional assessment framework, develop and propose the practicing provisions or best practices for professionals in the respective technology field and perform the scope of work in accordance to the TEP's Terms of Reference and any mutually agreed scope of work which will be defined from time to time.

Figure 1: Signing Ceremony of MoU
Front line (From left): Ts. Mohd Nazzrol bin Marzuke, Tan Sri Dato' Academician Dr. Ts. Ahmad Zaidee bin Laidin, Mr. Mohd Azmi Mohd Noor, Mr. Brian Lim Siong Chung

Figure 2: Exchange of MoU
Tan Sri Dato' Academician Dr. Ts. Ahmad Zaidee bin Laidin [left] and Mr. Mohd Azmi Mohd Noor [Right]

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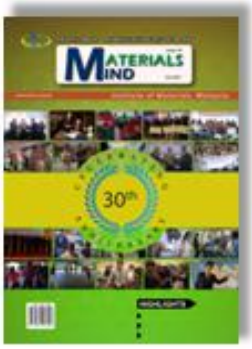

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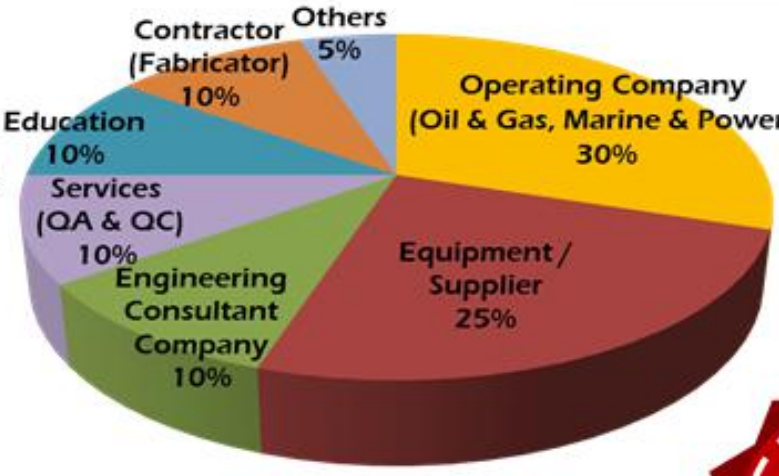

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Compiled by: IMM Secretariat, Edayue Muhammad Fanashim
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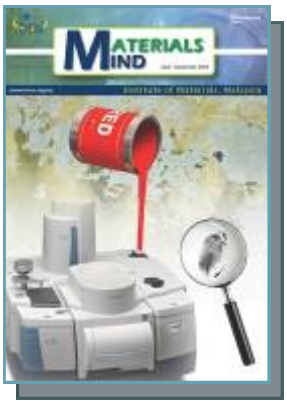

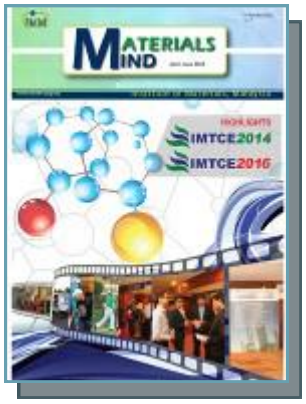



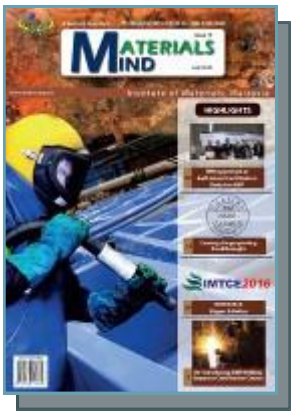

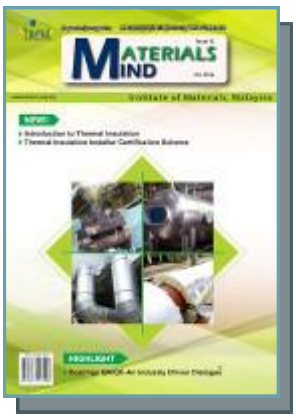



Magazine of IMM Showcase of IMM activities & sharing of technology advancement…
Advertising oppoturnities…

1991 - 1994 1997 - 1998 1999 - 2011 2012 – now (in-print and online)

IMM TRAINING & CERTIFICATION PROGRAM

Coating Certification Scheme

1. Certified Protective Coating Technician (Blaster and/or Painter) Level 1 & Level 2
2. Certified Blasting and Painting Supervisor
3. Certified Coating Inspector Level 1 & Level 2
4. Certified Coating Quality Control Technician
5. Corrosion Control by Protective Paints
6. Certified Thermal Spray Coating Applicator
7. Basic Knowledge on Corrosion Protection for Technicians and Engineers
8. Certified IMM-SSPC C6 Surface Preparation and Paint Application for Power Tool Cleaning Operators and Brush and Roll Paint Applicators
9. Certified IMM-SSPC C7 Abrasive Blasting [a]
10. Certified IMM-SSPC C12 Spray Application [a]
11. Certified IMM-SSPC CAS L1 Coating Applicator Specialist Level 1 [a]
12. Certified IMM-SSPC CAS-L2 Coating Applicator Specialist Level 2 [a]
13. Certified IMM-SSPC CAS L3 Coating Applicator Specialist Level 3 [a]
14. Certified IMM-SSPC C7 (Blasting) & C12 (Painting) Instructor [a]

Materials Courses

1. Materials Selection & Corrosion
2. Metallurgical Failure Investigation
3. Basic Course on Operation of Mobile Air Compressor

Coating Fingerprint Certification Scheme

1. Coating Fingerprint Foundation Course
2. Certified Coating Fingerprint Quality Controller
3. Certified Coating Fingerprint Trainer
4. Refresher Course of Certified Coating Fingerprint Quality Controller

Welding Certification Scheme

1. Certified Welding Inspector
2. IMM-JWES Welding Engineers Certification Courses (AWE/WE/SWE) [b]
3. Repair Welding of Pressure Equipment in Refineries & Chemical Plants
4. Welding & Joining Technology for Non-Welding Personnel
5. Steel Technology for Non-Technical Personnel

Flange Integrity Certification Scheme

1. Certified Flange Integrity Technician

A.P.I Courses

1. A.P.I 510 Pressure Vessel Inspector
2. A.P.I 570 Piping Inspector
3. A.P.I 653 Above Storage Tank Inspector

Vibration Certification Scheme

1. Certified Vibration Practitioner Category 1 [c]
2. Certified Vibration Practitioner Category 2 [c]
3. Certified Vibration Specialist Category 3 [c]
4. Certified Vibration Specialist Category 4 [c]

Corrosion Certification Scheme

1. Certified Corrosion Technician Level 1 & Level 2
2. Certified Cathodic Protection Technician Level 1 & Level 2
3. Certified Cathodic Protection Engineer
4. Corrosion Control by Cathodic Protection
5. Basic Corrosion & Coating Course
6. Certified Cathodic Protection Technologist

Thermal Insulation Certification Scheme

1. Introduction to Thermal Insulation
2. Certified Thermal Insulation Installer

Thermal Analyst Certification Scheme

1. Thermal Analyst Foundation Course
2. Certified Thermal Analyst
3. Certified Thermal Analyst Trainer
4. Refresher Course of Certified Thermal Analyst

and many more !!

[a] non-IMM course; certification scheme of the IMM in collaboration with The Society for Protective Coatings (SSPC) based on SSPC certification requirements.

[b] non-IMM course; certification scheme of the IMM in collaboration with the Japan Welding Engineering Society (JWES).

[c] based on ISO 18436

Updated on 23rd Mar 2018