For Members Only
Issue 8

MATERIALS MIND

July - Sept 2014

www.iomm.org.my

Institute of Materials, Malaysia

IMM COURSES

COATINGS COURSES	DURATION (DAYS)
▪ Blasting & Painting Training Course	5
▪ Protective Coatings Technician Certification Scheme	1
▪ Blasting & Painting Supervisor	2
▪ Corrosion Control by Protective Paint	2
▪ Coating Inspection Certification Scheme Level 1	4
▪ Coating Inspection Certification Scheme Level 2	1
▪ Thermal Spray Coatings Applicator	4
▪ Thermal Spray Inspector Level 3	4

WELDING COURSES	
▪ IMM Welding Inspection Scheme	5
▪ Associate Welding Engineer (JWES)*	6
▪ Welding Engineer (JWES)*	6
▪ Senior Welding Engineer (JWES)*	6
▪ Welding and Joining Technology for Non Welding Personnel	1
▪ Calculation of Strength of Welded Members	1
▪ Cost & Estimation of Welding Projects	1
▪ Interpretation of Weld Quality by Welding Codes	1
▪ Interpretation of Weld Quality by Radiographic Method	1

CORROSION COURSES	
▪ Corrosion Technician	4
▪ Corrosion Control by Cathodic Protection	2
▪ Cathodic Protection Technologist	4

VIBRATION SPECIALISTS	
▪ The Importance of Vibration	1
▪ Vibration Specialist Level 1	4
▪ Vibration Specialist Level 2	4
▪ Vibration Specialist Level 3	4
▪ Vibration Specialist Level 4	4

COURSES AVAILABLE UPON REQUEST	
▪ Welding – SMAW, GMAW, GTAW (1G - 6G)	5
▪ API-570 Piping Inspector	5
▪ API-510 Pressure Vessel Inspector	5
▪ API-653 Above Storage Tank Inspector	5
▪ Diploma of Applied Science (Coatings Technology)	10

** Registration and full payment of course must be made atleast 2 months prior to the course.*
** Registration to be made through MOS (www.primos.com.my)*
** Disclaimer : All dates are subject to change without notice. Please contact Materials Technology Education Sdn Bhd for the latest schedule and information.*

Compiled by Karen Cheng,Training Dept, Materials Technology Education Sdn Bhd

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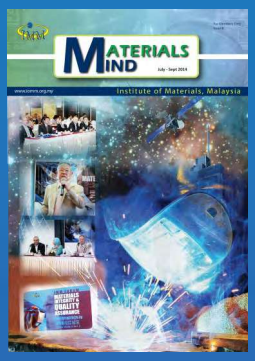

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The International Journal of the Institute of Materials Malaysia (IJIMM) is an initiative by the Institute of Materials, Malaysia (IMM) to provide a publication platform for sharing and disseminating of primary research findings in Materials Science and Engineering. The Editorial Board of IJIMM comprises international members who are recognized experts in the subject areas. Published twice a year, IJIMM comprises research papers that report primary or original scientific work that has not been published elsewhere.

Aims and Scope

IJIMM aims to provide a publication platform for new research findings in Materials Science and Engineering, and its extended application in major areas such as Energy, Sports, Biomedical Engineering and Built Environment including interdisciplinary research performed at the interface of these areas. This includes analysis of properties, processing, characterisation, behaviour and operating environment of engineering materials.

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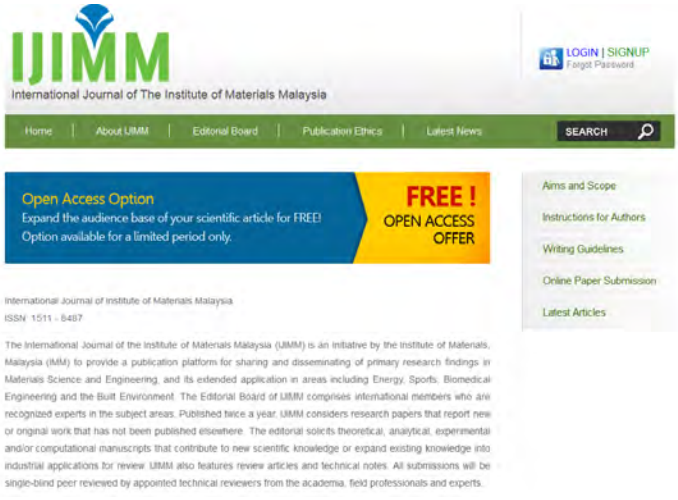
The editorial solicits theoretical, analytical, experimental and/or computational articles that contribute to scientific knowledge base or expand existing knowledge into industrial applications for review. Please visit **http://www.ijimm.org** for more information on manuscript preparation and online submission.



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IMM prides itself as the only professional society in Malaysia dedicated and committed to bringing the academics and industry professionals together to share technological knowledge, experience and expertise so that academic-industry collaborative research and development programs can be beneficial to the university lecturers and students while offering benefits to industries in Malaysia to be globally competitive.

THEME : Design, Research & Inventions

IMTCE2016

10th International Materials Technology Conference & Exhibition

16 -19 May 2016
Putra World Trade Centre (PWTC),
Kuala Lumpur, Malaysia

Organised by:

Institute of Materials, Malaysia

Synergising Industry & Academia

Design, Research & Inventions

10th International Materials Technology Conference and Exhibition (IMTCE2016)

INVITATION

The 10th International Materials Technology Conference & Exhibition (IMTCE2016) is scheduled to be held from 16 – 19 May 2016 at the Putra World Trade Centre (PWTC), Kuala Lumpur. IMTCE2016 will provide a platform to academicians and industrialists to showcase their knowledge and expertise in the area of "Design, Research & Inventions" in the following progressions of technology:-

Current Technologies - performance of materials, facilities & assets

New Technologies - trials & tribulations encountered

Future Evolution - research & inventions for the future

The collaboration of industrial practitioners and academic researchers have led to the development of new sustainable innovative products and services in the oil & gas, marine, power, petrochemical, chemical, water resources, transportation, construction, automotive, equipment manufacturing, electrical & electronics, agriculture, food & beverage processing, and furniture industries. IMTCE2016 covers both economic issues and technical aspects on materials science, engineering and technology, ultimately affecting all industries globally. It intends to highlight the requirements, challenges, and uncertainties in 2016 and beyond for the sustainability of facilities, equipment, and assets through design, research and inventions of better materials, better products and better services.

3 Technical Symposiums

ISAPM2016: International Symposium on Advanced Polymeric Materials

ISMAI2016: International Symposium on Materials & Asset Integrity

ISCC2016: International Symposium on Coatings & Corrosion

The Technical Conference focuses on the three symposiums above comprising topics of industry and academic interests. The Conference programme consists of plenary, keynote, invited, oral and poster presentations. **Ample time is provided for free discussion between industry and academia within each symposium.**

With the theme of "Synergising Industry & Academia: Design, Research & Inventions", IMTCE2016 invites academics, scientists, engineers, researchers, industrialists and service providers to present their latest research findings in technology and innovation, and current development in materials sciences which include metals and alloys, polymers and plastics, rubber and elastomers, ceramics, timber and wood, concrete, minerals, nanomaterials, advanced materials, electronic materials, and textiles. Papers are cordially invited from industry and academia.

CONFERENCE OBJECTIVES

- To provide a platform for the exchange of knowledge and expertise among industrial practitioners, industry's professionals and higher learning institutions.
- To provide a forum or discussion and exchange of views on the opportunities that arises in the challenging material processing and applications through collaborations between industry and academia.

"Coat & Corrosion Asia Exhibition" will be held from 17 – 19 May 2016 in conjunction with IMTCE2016. This first-of-its-kind 3-day exhibition on Specialized Products and Service relating to Coatings, Corrosion, Materials Degradation, Insulation, Fire Protection, Materials Testing, Failure Analysis, Welding and Inspection Service will be held in Malaysia for the first time in 2016!

Some 800 speakers, presenters, exhibitors and delegates are expected to participate in IMTCE2016. We welcome you to IMTCE2016!

Coat & Corrosion Asia
The Malaysia International Exhibition on Coating and Corrosion

Co-Organizers :

www.imtce2016.org
enquiries@imtce2016.org

IMTCE2016

10th International Materials Technology

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Plenary speakers of IMTCE2016

Confirmed : **Prof. Dr. Stuart Lyon**
(School of Materials, The University of Manchester, UK)
Title : Corrosion Research & Applications
- More to Come -

IMTCE2016 features 3 concurrent Symposiums

International Symposium on Advanced Polymeric Materials (ISAPM2016)

Theme: Polymers for Industry Applications

Aims of Symposium:

1. Disseminate and showcase advances in the understanding of polymeric material innovation technology and application in industry.
2. Gather stakeholders from academia and industry for sharing of innovative and sustainable ideas, collaboration and networking opportunities.

Scopes and Topics:

1. Polymer composites and nanocomposites
2. Advances in polymer synthesis, processing and characterisation
3. Application of polymer composites in industry
4. Biological, biomedical and environmental-friendly polymers
5. Polymeric materials for clean and sustainable energy
6. Multi-techniques of polymer characterisation
7. Failure and solution
8. Monitoring and inspection
9. Durability and performance

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International Symposium on Coatings & Corrosions (ISCC2016)

Theme: Sustaining Technical Integrity through Improved Coating Industry and Corrosion Protection Technologies.

Aims of Symposium:

1. Disseminate and showcase advances in the research, development and application of the new and/or greener technologies for paints & protective coatings

2. Disseminate and showcase advances in the understanding of Corrosion and corrosion protection techniques.

3. Gather researchers from academia and industry for the exchange of ideas, collaborations and networking opportunities.

Scopes and Topics

1. Smart and nano coatings
2. High temperature coatings
3. Biocoatings
4. Biobased composites
5. Nanocomposite coatings
6. Coating QA and QC standards
7. Coating inspection and maintenance program
8. Coating equipment
9. Green coatings
10. Rheology of coatings/ Complex fluid
11. Surface engineering
12. Organic coatings and Inhibitors for corrosion control
13. Polymer coatings
14. Thin film coatings for electronic packaging
15. Coating processes and techniques
16. Coating performance
17. Health concerns in coatings
18. New regulatory/standards and trends affecting the coating industry
19. Asset integrity in coatings
20. Material selection
21. Corrosion research
22. Accelerated corrosion testing
23. Corrosion of steel reinforced concrete
24. Corrosion inhibitors
25. Cathodic protection
26. Corrosion monitoring
27. Eternal corrosion direct assessment
28. Corrosion modeling
29. Microbiological induced corrosion
30. Pipeline corrosion
31. Marine corrosion
32. Stray current & interference

Academia Co-Chairperson I:	Dr. Yern Chee Ching (Universiti Malaya, Malaysia)
Academia Co-Chairperson II:	Dr. Denni Kurniawan (Universiti Teknologi Malaysia, Malaysia)
Industry Co-Chairperson I:	Ms. Nurul Asni Mohamed (PETRONAS GTS, Malaysia)
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International Symposium on Materials & Asset Integrity (ISMAI2016)

Theme: Advancements and Innovations in Materials & Asset Integrity Analysis and Management

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1. Disseminate and showcase findings in materials & asset integrity analysis and management in the areas of (but not limited to) energy, power generation, oil and gas, built environment and other engineering industries.

2. Provide academic-industry collaborative opportunities.

Scopes and Topics:

1. Materials for clean and sustainable energy devices
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3. Materials failure analysis
4. Structural characterization of materials
5. High strain rate behavior of materials
6. Advanced materialogical fundamental understanding
7. Monitoring and inspection
8. Durability and performance
9. Corrosion management
10. Asset integrity analysis
11. Asset life-cycle analysis
12. Integrity and reliability management
13. Infrastructure protective technologies
14. Structures under extreme loadings and environments

Academia Co-Chairperson I:	Prof. Dr. Abdul Kariem Arof (Universiti Malaya, Malaysia)
Academia Co-Chairperson I:	Dr. Sudharshan N. Raman (Universiti Kebangsaan Malaysia)
Industry Co-Chairperson I:	Dr. Hasnah Abdul Wahad (SIRIM, Malaysia)
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IMTCE2016

10th International Materials Technology

Interesting activities :

Friendly golf

Plant visit

Local tour

IMTCE2016 Conference Program

15th May 2016	IMTCE2016 Friendly golf game
16th May 2016	Registration and Conference
17th May 2016	Conference, CCA2016 Exhibition, Cocktail and banquet dinner
18th May 2016	Conference, CCA2016 Exhibition, and Conference Closing Ceremony
19th May 2016	Masterclasses, plant visit and local tours

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For further information please contact:

Mr. Keng Chuan Kirk: Mobile tel: 016-2222189
Email: mte5475@gmail.com or
Ms. Karen Cheng: Mobile tel: 012-2952668
Email: karen@mte.com.my

Important Dates and Deadlines

Submission of Abstract	1st Dec 2014 - 31st May 2015
Notification of Acceptance	1 month after submission
Submission of Full Paper/ Presentation (PDF or PPT) for CD/Pen-drive	1st Jan 2016 - 14th Feb 2016
Full paper Submission for Journal	16th - 31st May 2016
Registration of Masterclasses	14th Feb 2016
Registration of local tours	14th Feb 2016
Registration of plant visit	14th Feb 2016
Registration of IMM friendly golf	14th Feb 2016

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INTRODUCES

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10th International Materials Technology Conference & Exhibition (IMTCE2016) 1st Organizing Committee Meeting

Reported by:Anas Kamarundzaman, Materials Technology Education Sdn Bhd
Edited by:Ainil Fidrah Mohd Ghazali, Materials Technology Education Sdn Bhd

Date: **18th July 2014, Friday**
Time: 10 am to 12 noon
Venue: Ivory 8, Holiday Villa, Subang Jaya, Selangor

Following the success of the 9th International Materials Technology Conference & Exhibition (IMTCE2014), the Institute of Materials, Malaysia is already looking forward for the 10th International Materials Technology Conference & Exhibition (IMTCE2016).

On 18th July 2014, the 1st IMTCE2016 Organizing Committee Meeting took place at Holiday Villa, Subang Jaya Selangor. The objective of this meeting is to kick start the implementation of IMTCE2016 as well as a get to know session amongst the members of the committee. The meeting was chaired by Assoc. Prof. Dr. Melissa Chan Chin Han from Universiti Teknologi MARA, Shah Alam who is appointed as the Chairperson of the IMTCE2016 Organizing Committee. Assoc. Prof. Dr. Melissa Chan Chin Han gave a walk through on the general view of the implementation of IMTCE2016. The members of the committee were then introduced to their responsibilities in organizing IMTCE2016. She further elaborated on the importance of team work, mutual understanding and cooperation amongst all members to ensure smooth implementation of IMTCE2016.

Though the date of the conference is more than two years away, the members of committee are aware that there are a lot of matters to be addressed and tasks to be executed. The meeting ended with a positive note of which all members had agreed to give their full commitment as member of the organizing committee. The committee shall sit once a month to discuss the progress on planning IMTCE2016.

From Condom to Condominium

Reported by:Kirk Keng Chuan, Materials Technology Education Sdn Bhd

22nd August 2014
Universiti Tunku Abdul Rahman (UTAR), Kuala Lumpur.

The IMM Advanced Materials Committee and the **UTAR FES Department of Mechanical and Materials Engineering** hosted a Technical Talk on "Natural Rubber: the Elastic King of the Plant Kingdom - (From condom to condominium)". Dr. Chen Kah Pin (Chairman of the IMM Advanced Materials Committee) opened the talk which was held in Universiti Tunku Abdul Rahman (UTAR).

The featured speaker, Dato' Dr. Ong Eng Long, expounded on the background of the natural rubber and its applications. Dato' Dr. Ong, Immediate Past President of IMM and an authority in rubber research in Malaysia, discussed how the elastic properties of natural rubber have been exploited in the unique applications in various rubber products ranging from barrier protecting medical devices such as condoms to e ngineering rubber products such as seismic elastomeric bearings for the protection of condominium and its contents against earthquake.

Also present at the talk was Dr. Lai Soon Oon (FES Deputy Dean) who presented the token of appreciation.

The talk attracted much attention from the 70 students and guests who enthused about such activities from IMM.

Appreciation: Dato' Dr. Ong Eng Long (L) with Dr. Lai Soon Oon.

SERBA DINAMIK (SD) – INSTITUTE OF MATERIALS, MALAYSIA (IMM): ORGANISING THE FIRST VIBRATION SPECIALIST TRAINING PROGRAMME BASED ON ISO18436

Reported by:Dr. Zulkarnain Bin Kedah

Compiled by:Karen Cheng, IMM Secretariat, Materials Technology Education Sdn Bhd

Following success stories of expertise, passion and quality training programmes, the reputation of Serba Dinamik's Training Academy for excellence now makes local and international expansion inevitable.

With the vision to be a successful regional training provider for oil and gas and related industries, Serba Dinamik's Training Academy led by Dr. Ir. Haji Mohd. Abdul Karim Abdullah and managed by Dr. Zulkarnain Kedah, two qualified and experienced educators at SD organised its first SD-IMM Vibration Specialist Training Programme based on ISO18436 held at Serba Dinamik's Training Academy in Shah Alam between **7 and 10 October 2014** recently.

In order to ensure that this training programme is recognised by PETRONAS and other Production Sharing Contract (PSC) Contractors, SD has collaborated with **IMM**, an authorised certification body, to certify this Vibration Specialist Certification (VSC) programme starting from Level 1 until Level 4 to produce competent Vibration Specialists for the relevant industries which will be recognised Internationally across the globe.

This training programme is the latest one certified by **IMM** and the official launching was made early January this year which aims to fill up the market gap by producing more competent manpower in this specialised skillset for oil and gas, chemical, energy, transportation, manufacturing and construction industries. It is also one of IMM's roles to help increase the number of skilled manpower for the country to achieve its vision 2020.

In addition, SD has recognised that vibration technology has become a proven tool to troubleshoot and analyse technical problems related to failures in machineries such as their rotating parts and structures. Apparently, it is essential for the relevant industry players to send their technical staff to participate in this vibration specialist training and be certified as soon as possible.

With regards to the key trainers of this certification programme, Dr. Ir. Haji Mohd. Abdul Karim Abdullah, Managing Consultant at SD with more than 27 years of hands-on experience in managing, supervising, lecturing and carrying out various tasks related to turbomachinery carried out this first training programme along with Dr. Rahizar Ramli, Senior Lecturer at University of Malaya with 25 years experience in vibration technology who also became the lead trainer and examiner for this programme. The latter said that, "I share my passion and experience to present the theoretical parts to the students and in order to apply them to the industry, my team combines the practical parts and data provided by experienced Vibration Specialists from Serba Dinamik, incorporated into the syllabus".

In terms of benefits, the VSC programme aims to offer participants a career advancement as Vibration Specialist starting from level 1 to 4 which emphasises on quality standard based on documented systems and best work practices. The target groups include engineers, supervisors, inspectors and technicians involved in operating and maintaining rotating machineries (e.g pumps, compressors, gas turbines, steam turbines etc) in technical oriented industries. For the first intake, there are 10 participants who have enrolled in the Vibration Specialist Certification Level 1 and if they pass the examination, they will become qualified Vibration Specialists Level 1 certified by **IMM.**

In addition, Encik Noor Hisham Abdul Hamid, the Chairman of Vibration Specialist Committee said that "I foresee that with the response received, marks a beginning for a bigger role for **IMM** together with SD to enhance asset integrity in operation via Vibration Technology monitoring system when the need to offer a managerial awareness program to industries like oil and gas, power generation, automotive etc."

Furthermore, if there is any party from the relevant industries interested to organise or collaborate in this VSC programme, please do not hesitate to contact Fadhilah at +603 5511 3213 (office's landline) or Dr. Zulkarnain Kedah at +6017 370 3644 (mobile phone) or his email at drzul@e-serbadk.com and we will always be happy to answer any questions or concerns that you may have in this matter.

Materials Integrity and Quality Assurance Forum

Reported by:Kirk Keng Chuan, Materials Technology Education Sdn. Bhd

Kuala Lumpur, 11th Sept 2014
Impiana Hotel, KLCC

Issues related to materials integrity is one of the major concerns amongst the Oil & Gas, Power & Marine industries. Pipeline and structural components need to be well managed to prevent potential disasters and loss of lives.

Matters such as inspection, coatings, welding, training of personnel and the implementation of a common system, such as the Asian Welding Federation (AWF) Common Welder Certification System (CWCS), to monitor performance of skilled workers were actively discussed during the forum. Speakers include **Mohd Azmi Mohd Noor**, the Head of Asset Integrity, Upstream HSE, PETRONAS, whose overview of integrity issues in the Oil & Gas industry set the tone for the lively discussions that follow.

Nurul Asni Mohamed (Principal Engineer of Corrosion, PETRONAS GTS) then presented the success of the fingerprinting of coatings initiated by IMM. With new technology available, it is now possible to create a "birth certificate" for every batch of coatings manufactured at minimum costs.

Ang Chee Pheng, Secretary General of AWF and Vice President of the International Institute of Welding (IIW), felt the CWCS will be a giant step forward in assuring quality work from welders. More so when a management system is in place where the welders' performance are constantly monitored and updated. According to Ang, the CWCS has been successfully implemented and utilised in other Asian countries.

After a dynamic panel Q&A session, several members of the participating companies present volunteered to serve in a task force that was set up to address issues related the materials integrity and quality assurance. This task force will be headed by Mohd Azmi Mohd Noor, who is also the Deputy President of IMM.

Kamarudin Zakaria, Vice President of PETRONAS Group HSE and OE, as guest of honour in attendance, in his opening speech stressed the urgent need for such forums and actions to address these issues.

The Materials Integrity and Quality Assurance (MIQA) forum was organised IMM. It was supported by Universiti Teknologi MARA (UiTM), and jointly organised by the IMM committees of Materials & Asset Integrity, Polymer and Welding.

Hello!: Kamarudin Zakaria (R) with Mohd Azmi Mohd Noor

Hope that answers your question: Azmi Noor (L), Nurul Asni & Ang Chee Pheng

SSPC Protective Coatings Inspector Program (Level 1 and Level 2)

Reported by:Muhd Sazlie Bin Ibrahim, Materials Technology Education Sdn Bhd
Edited by:Karen Cheng, Materials Technology Education Sdn Bhd

Conducted at Gading Institute, Kuala Lumpur,
24th – 27th Sept 2014

Practical test for level 2 examination.

The Institute of Materials, Malaysia (IMM) in collaboration with The Society for Protective Coatings of USA (SSPC) has organized SSPC Protective Coatings Inspector Program on 24th – 27th of August 2014 at **Gading Institute, Kuala Lumpur.** To note, this is the first SSPC training program being held together with IMM and it was successfully conducted. This first jointly program has managed to train 9 participants from various companies such as Kansai PLC Sdn. Bhd., KCC Paints Sdn. Bhd., as well as Buler Engineering Sdn Bhd

The Program started with refresher class on **Day 1** by Mr. Thomas A. Jones, from SSPC and followed by the Level 1 examination on **Day 2. Day 3** was reserved for those who failed Level 1 examination to re-sit the test and also a revision day for those passed. Those who passed the Level 1 examination may proceed for Level 2 theory & practical examination on the **Day 4**.

Special appreciation should be given to **Gading Institute** for hosting this program with equipped of excellent facilities. It is a hope that this program will continue in the future.

Participants of SSPC Protective Coatings Inspector.

Mr Thomas A. Jones with the participants during the test.

Report on IMM Task Force on Coatings Fingerprinting (Phase 1: 2013-2014)

Reported by:Ms. Nurul Asni Mohamed, PETRONAS GTS Dept.

Background of "Coating Fingerprint Certificate"

Each year, oil & gas companies worldwide spend billion dollars on polymeric coatings for corrosion protection of steel structures and pipelines for the transportation of crude oil and gas. The frequent failures of the polymeric coatings lead to the corrosion of steel structures and pipelines and thus, leakage of crude oil and gas to the environment. These pose a severe inventory loss to the companies and serious threat to the environment, and also cause many safety issues to plant, personnel and surrounding public. Since mid 90s, PETRONAS, Shell Malaysia, ExxonMobil Malaysia and other oil companies have called for a "mill certification" of the supply of polymeric coatings from local paint manufacturers for the quality assurance of the coatings supplied. However, there was widespread perception within the oil and gas industry that certification of polymeric coatings was not possible because the expertise on spectroscopic analyses and interpretation of results for such purpose were not available back then. Hence, the provision of **Coating Fingerprint Certificate** for polymeric coatings supplied to the oil and gas companies did not materialize.

The Malaysian oil & gas industry had been focusing on the paint quality control inspection, surface preparation (abrasive blasting) and paint spraying application techniques & skills since 1990 to improve coating performance. Despite efforts to improve quality in these 3 skill sets, coating failures continue to get worse. Thus, the oil & gas industry now realizes that the coating materials can be another factor causing the failures. Since materials testing technology, particularly on non-metallic materials, has improved significantly over the past decade, it is timely for the industry to focus on the testing of the coating materials in the same way as metals are tested and issued with a mill certificate.

Forum on "Towards Fingerprinting of Polymeric Coatings" I held on 22nd March 2013, highlighted the prime concerns of the local paint manufacturers, e.g. the protection of product formula, lack of expertise on spectroscopic analyses and interpretation of results. On the other hand, the users of the oil & gas companies suffer from high cost of repainting the steel structures and pipelines when the coatings fail.

A Task Force on Coatings Fingerprinting was set up under IMM in April 2013 to look into the issues brought out by various parties. The end deliverable of this Task Force is to enhance the overall painting coating quality assurance with the aim of ensuring all protective coatings manufacturers supply products according to specifications.

On 11th October 2013, **Forum on "Towards Fingerprinting of Polymeric Coatings" II** was held. Presentation of the draft of the **Coating Fingerprint Certificate** by Chairperson of the Task Force, Ms. Nurul Asni Mohamed from PETRONAS GTS, was attempted. Refining on the **Coating Fingerprint Certificate** based on the feedbacks during Forum II and periodic meetings of the Task Force was persistently carried out. The objective of the final **Forum on "Towards Fingerprinting of Polymeric Coatings" III** was to present the **Coating Fingerprint Certificate** of polymeric coatings, which is acceptable to the oil and gas companies. The involvement of IMM through multi-lateral discussions and practical trials using the FTIR equipment jointly with the oil and gas operators, paint manufacturers, materials testing organizations and FTIR instrumental specialists over many months have resulted in a new step towards improved quality of paint supply and paint performance in the oil and gas industry.
This final forum had succeeded in create awareness for the practicality of the fingerprinting of the polymeric coatings. The well acceptance from the Malaysia oil & gas users for the Coating Fingerprint Certificate as one of the effective approaches for QA & QC tools for the enhancement of the overall painting coating quality assurance was noted.

Deliveries of 1st phase: 2013 – 2014

1. Tentative Coating Fingerprint Certificate for 2-component intermediate materials of epoxy coatings was presented.

2. Fourier-transform infrared (FTIR) is a simple and reliable tool for the study of reproducibility (i.e. to fingerprint) of the epoxies and hardeners as well as to differentiate different types of epoxies and hardeners without any intrusion of paint formulations.

3. Fingerprinting regions of FTIR for epoxy resin and hardener are proposed and the **confidence level of acceptance** for QA & QC control is proposed at **≥ 90.0%**.

Current situation

Currently, only 2-component epoxy coating (intermediate materials) was used in the evaluation of the practicality of the structural analysis by FTIR for complete **Coating Fingerprint Certificate.** We note here, this FTIR analysis shall not be limited to 2-component epoxy coating, but has to be extended to inorganic zinc coating, epoxy-zinc coating, polyurethane coating, acrylic coating, polyester coating etc.

Report on IMM Task Force on Coatings Fingerprinting (Phase 2: 2014-2016)

Reported by:Ms. Nurul Asni Mohamed, PETRONAS GTS Dept.

This Task Force is co-chaired by a PETRONAS and Shell representatives and Shell with IMM Polymer Committee as facilitator and advisor. The key element of Task Force shall focus on "finalising the elements listed inside *Tentative Coating Fingerprint Certificate for 2-component intermediate materials of epoxy coatings*" and extend this Coating Fingerpring Certificate to different types of polymeric coatings. The ultimate objective is to ensure that protective coatings manufacturers supply products according to specifications.

The **objectives** of this Task Force shall include but not limited to the following:-

1. To review the available standards and specifications requiring Fingerprinting of Polymeric Coatings in the Oil & Gas Industry.
2. To review and/or to propose quality control and quality assurance techniques practiced by the paint manufacturers during manufacture and during storage.
3. To review and/or to propose spectroscopic fingerprinting testing methods in regard to the reliability, speed of testing and costs.
4. To propose a Coating Fingerprint Certificate acceptable to all parties involved in the manufacture, application and usage of Polymeric Coatings in the oil & gas Industry.

150 Years of Heritage

Compiled by:Kirk Keng Chuan, Materials Technology Education Sdn. Bhd

Raza Amin, Managing Director, Oil and Gas Malaysia welcoming the guests.

DNV GL, the world's leading ship classification society and one of the world's leading risk and sustainability service providers, is celebrating a double milestone: The Foundation DNV's 150th anniversary and DNV GL's first year as a merged company.

A year ago, the Norwegian company Det Norske Veritas (DNV) merged with Germanischer Lloyd (GL) from Germany, forming a new company called DNV GL with 16,000 experts in 100 countries across the globe.

The anniversary was marked with several celebrations throughout the year to develop stronger networks with customers and stakeholders. The celebrations were also a platform to create dialogue with our stakeholders on the significant changes ahead.

DNV GL is looking ahead with a year long scientific initiative that explored six strategic themes for the future, taking a broader view of the relationship between technology, business and society – contributing to a safer, smarter and greener future.

The six 'Strategic themes for the future' are:

- A safe and sustainable future
- From technology to transformation
- The future of shipping
- Electrifying the future
- Arctic: the next risk frontier
- Adaptation to a changing climate

Focusing on Technology to Transformation, DNV GL Malaysia, during its 150th celebration for customers, held a dialogue with key industry players on the technologies that are transforming Malaysia's energy landscape.

With its vision for a sustainable future, DNV GL works with many partners and customers on a number of exciting ongoing projects which are helping the industries responsibly improve business performance. Efforts into research and innovation have resulted in projects such as supporting Joint Industry Projects (JIP). One such JIP planned is "Design of Concrete Coating for Offshore Submarine Pipelines". The main objective of the JIP is to develop a design guideline for concrete coatings for offshore submarine pipelines. The purpose of the design guideline is to ensure the integrity of pipeline concrete coatingsoutside the current range of applicability, reduce risk and cost of repair, and potentially relax various requirements on installation vessels. The JIP is currently inviting potential participants to join the project.
(Contact: Justin.nga@dnvgl.com)

Introducing the Crew at MTE

GENERAL MANAGER
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As the GM, **Mr. Kirk Keng Chuan** oversees the activities at MTE. Mr Kirk's task is mainly to plan and direct the activities for the company.

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CONFERENCE, FINANCE, ADMIN
& EDUCATION DEVELOPMENT
DIVISION
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Ms Ainil Fidrah Mohd Ghazali is tasked for overall coordination and administration of activities of the 10th International Materials Technology Conference & Exhibition (IMTCE2016). Besides, her portfolio includes finance, admin & education development.

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BUSINESS
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EXECUTIVE
TRAINING DIVISION
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MEMBERSHIP
DIVISION
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DIVISION
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Introducing **Ms Zalilawati Hassan**. She is the person responsible forcoordination and administration of activities of the 10th International Materials Technology Conference & Exhibition (IMTCE2016). Her main task is to ensure smooth planning, preparation and implementation of IMTCE2016 which is a major biennial event for IMM. IMTCE2016 targets to pull in as much as 800 participants.

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Conclusion of IMM Task Force on Coatings Fingerprinting PHASE 1 (2013 -2014)

Reported by:Ainil Fidrah Ghazali, Materials Technology Education Sdn Bhd
Edited by:Assoc. Prof. Dr. Melissa Chan Chin Han, Editor of Materials Mind

Date: 14th August 2014
Time: 10:00am – 12:00 noon
Venue: Seminar Room,
Kelab Golf Negara Subang(KGNS)

Chairperson: Nurul Asni Mohamed, Principal Engineer (Corrosion), Group Technical Solutions, Technical & Engineering Division, PETRONAS GTS, Malaysia. (Lady in red)

The IMM Task Force for Coatings Fingerprinting Phase 1 final meeting had taken place one day before the end of the festive month of Syawal. The meeting was well attended by the \committees of the task force from the industry as well as from the academia. The meeting was attended by the following members:

NAME	DESIGNATION/ ORGANIZATION	NAME	DESIGNATION/ ORGANIZATION
NURUL ASNI MOHAMED	CHAIRPERSON	KENETH WAY	COMMITTEE MEMBER
ASSOC. PROF. DR. MELISSA CHAN CHIN HAN	ADVISOR	LIM CHUAN GEE	COMMITTEE MEMBER
ASSOC. PROF. DR. CHIA CHIN HUA	ADVISOR	M SHAHRIL ATIQI	COMMITTEE MEMBER
DR. TAN WINIE	ADVISOR	KELLY HONG	COMMITTEE MEMBER
IR. MAX ONG CHONG HUP	ADVISOR	THENG SOO SIANG	COMMITTEE MEMBER
ZAMALUDIN ALI	ADVISOR	MOHD HAFIZ HIDZIR	UiTM
ABDUL AZIZ HARON	COMMITTEE MEMBER	AINIL FID-RAH GHAZ-ALI	MTE
AHMAD BADLI SHAH	COMMITTEE MEMBER	ANAS KAMARUN-DZAMAN	MTE
FRANKIE CHUA CHENG HUAT	COMMITTEE MEMBER	SUHAILA SUHAIMI	MTE

The Chairperson congratulated each and every one for their endless effort and commitment in materializing the objectives and target set for the task force. It was indeed a treasured experience for everyone. Valuable efforts had been contributed and input had been obtained throughout the implementation of the project.

Such collaborative initiative between industry and academia is fairly new in Malaysia and it has proven to be a success for IMM through this task force. This would definitely pave way towards bringing IMM to a higher level to become a well-recognised professional body in Malaysia as well as in the world in the future.

Having felt the success of this project, at the meeting, the members of the committee were eager and wanted to have 'a feel' on the cost implication of implementing the FTIR Fingerprinting Test. As a result, at this meeting they opened a final round of brainstorming session and were able to yield an 'Indicative costing' for FTIR Fingerprinting Test, i.e. roughly RM 0.02 testing cost per litre of paint at in-house laboratory of paint manufacturer or RM 0.10 testing cost per litre by third party laboratory.

With such high spirit and involvement of all members of the committee the Nurul Asni looks forward to the success of Coatings Fingerprinting Phase 2 of which she anticipates to complete within a year. She indicated that the task force for Coatings Fingerprinting Phase 2 will involve additional members.

The new born 'Coatings Fingerprint Certificate' of this project, is a well-accepted QA & QC tool for enhancement of the overall painting quality assurance by the Malaysia Oil & Gas Industry and has set new expectations for all involved in the industry. The success of this project is just the beginning of other foreseeable success of similar initiatives in the future. What most important is that, this project had enabled closer relationship and minimized the gap of knowledge and skill between the Industry and Academia. The convergence of ideas and experience from distinctive environment and back-ground, would ignite powerful and strong foundation of knowledge which is the fundamental of knowledge economy and knowledge society.

Compare functions of FTIR software for structural analysis of epoxy paints on steel structures for coating fingerprinting certificate

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Abstract

This progressive article on Fourier-transform infrared (FTIR) structural analysis showcases the practicality and simplicity of the provision of **Coating Fingerprint Certificate** for 2-component epoxy coatings for the supply of polymeric coatings from local paint manufacturers as quality assurance requirement of the coatings supplied. Fingerprinting regions of FTIR for epoxy resin and hardener are proposed and the confidence level of acceptance for quality assurance and quality control (QA & QC) is suggested at $\geqslant$ 90.0%. We conclude that, the structural analysis by FTIR for complete **Coating Fingerprint Certificate** for epoxy resin and hardener is reproducible when High Sensitivity Compare feature of the FTIR software is to be strictly followed. This algorithm depends on *x*- (wavenumber) and *y*- (absorbance) vectors. This function is able to discriminate minute difference of different components as well as the compositional change of the components among samples. Besides, rejection or acceptance of the samples can be easily done by setting the threshold value at 0.90 using High Sensitivity Compare feature of the FTIR software. Finally, we attempt to compare inorganic fillers for polymer coatings (*e.g.* Rutile or Anatase of TiO_2) using FTIR, which seems to be practical as well.

Introduction

Currently, only 2-component epoxy coating (intermediate materials) was used in the evaluation of the practicality of the structural analysis by Fourier-transform infrared (FTIR) for complete **Coating Fingerprint Certificate** [1] introduced by Institute of Materials, Malaysia (IMM) Task Force on Coatings Fingerprinting. Deliveries of 1st phase of the task force (2013 – 2014) are:

1. Tentative Coating Fingerprint Certificate for 2-component intermediate materials of epoxy coatings was presented.
2. FTIR is a simple and reliable tool for the study of reproducibility (*i.e.* to fingerprint) of the epoxies and hardeners as well as to differentiate differenttypes of epoxies and hardeners without any intrusion of paint formulations.
3. Fingerprinting regions of FTIR for epoxy resin and hardener are proposed and the confidence level of acceptance for quality assurance and quality control (QA& QC) is proposed at $\geqslant$ 90.0%.

We would like to recapitulate here, the complete **Coating Fingerprint Certificate** [1] for polymeric coatings consist of two parts, *i.e.* **(1)** physical analyses (e.g. viscosity, density, color code, non-volatile matter (by mass), weight solid of Zn metal/Total Zn *etc*; and **(2)** structural analysis by FTIR (which shall be carried out immediately after each batch of the production in the paint factory).

For this article, we are looking into the Compare functions of FTIR software for structural analysis of 2-component intermediate materials of epoxy coatings, which serve as an important tool for QA & QC for the batch-to-batch reproducibility of the epoxies and hardeners as well as for different epoxies and hardeners by estimation of correlation (*r*).

We shall emphasize here once more, this FTIR analysis coupled with the considerations needed using the Compare functions of FTIR software shall not be limited to 2-component epoxy coating, but has to be extended to inorganic zinc coating, epoxy-zinc coating, polyurethane coating, acrylic coating, polyester coating etc.

Experimental

FTIR sample collection

Sample collection was published in ref. [2] and is briefly sketched here. Polymeric coatings, *i.e.* epoxy resin (or base) and hardener (or curing agent) from local Paint Manufacturer A were analyzed. A total of 3 samples/batch or 3 samples/ mixing tank with minimal of 50 g of sample mass for epoxy resin as well as hardener were supplied. Sampling of samples at the end stage of production (before packing) was done from **T**op, **M**iddle and **B**ottom of the mixing tanks. Samples were sent for FTIR analysis within 4 days after sample collection. A total of 2 batches of samples were used for this study on the reproducibility of the results. These samples were analyzed as received.

Epoxy_**B***x***T**(or **M** or **B**)*y*-*z* denotes epoxy resin of x^{th} **B**atch for y^{th} sample at the location of **T**op (or **M**iddle or **B**ottom) and with the z^{th} FTIR scanning. Analogue sample coding was adopted for Hardener_ **B***x***T**(or **M** or **B**)*y*-*z*.

FTIR analysis

To fingerprint polymeric coatings, ASTM D7588-11 [3] standard is followed. As mentioned before [4], there is lack of guide in ASTM D7588-11 for the interpretation of FTIR

spectra, *i.e.* the practical approaches on estimation of the degree of similarity (or correlation) (*r*) between two FTIR spectra for the same or different polymeric coatings.

Spectroscopic studies were performed on the intermediate materials of polymeric coatings, *i.e.* epoxy resin and hardener independently. FTIR analysis was carried out using the Attenuated Total Reflection accessory (ATR) on Nicolet iS5 (Madison, UK). FTIR spectra were recorded in the transmittance mode over the range of 600 - 4000 cm^{-1} by averaging 32 scans at a maximum resolution of 4 cm^{-1}. Triplicate analysis for each sample was carried out, where a fresh sample was used for each analysis. The material of ATR crystal is Diamond coated with ZnSe germanium. The spectra of FTIR were analyzed by OMNIC Software Suite (Madison, UK).

Quality control of the intermediate materials

Absorbance spectra were baseline corrected. The "average" FTIR spectrum of sample from **T**op, **M**iddle and **B**ottom of the mixing tank was adopted as the reference spectrum (c.f. ref. [2].) The degree of similarity, which is termed as *correlation* (*r*), of a spectrum was generated by comparing the spectra of the samples to that of the reference using the *Normal Compare* OR *High Sensitivity Compare* features of the FTIR software. Degree of similarity is directly proportional to quantities of *r*, *i.e.* $r = 1$ represents complete matching of the sample spectrum to that of the reference spectrum.

The standard compare algorithms commonly used in infrared (IR) spectroscopy are well suited to identify unknown materials or to discriminate between materials that are significantly different, *i.e.* correlation compare algorithm of the FTIR software depends on *x*-vector (wavenumber / cm^{-1}) only. However, these standard algorithms often lack the sensitivity required when the materials being compared only exhibit very minute differences, *e.g.* for routine quality assurance and quality control of batch-to-batch production of the intermediate materials of the epoxy paints.

The Compare QCheck feature of the OMNIC Software (belongs to *Normal Compare* feature of the FTIR software), is a single scale *x*-correlation. This compare function depends mainly on the "structural analysis" of the component(s) of the intermediate materials of epoxy or hardener. This means, this compare function is not sensitive to compositional change of the similar structure(s) (or slight different structures) of epoxy or hardener. Very often, $r \rightarrow 1$ is observed even if there is significant variation of composition change of epoxy or hardener. This function is only useful for qualitative check to discriminate between obviously different materials.

On other hand, the high sensitivity function in OMNIC QCheck (belongs to *High Sensitivity Compare* feature of the FTIR software) effectively provides better sensitivity when the degree of similarity between samples is high. This algorithm depends on *x*- (wavenumber) and *y*- (absorbance) vectors. This function is able to discriminate minute difference of different components as well as the compositional change of the components among samples. For this study, quantities *r* (from 0 to 1) were estimated firstly for spectrum with wavenumbers from **(i)** 600 - 4000 cm^{-1}, and subsequently from **(ii)** 1000 – 1300 cm^{-1} (C-O-C) & **(iii)** 700 – 900 cm^{-1} (C-O-C) for epoxy resin; and **(iv)** 1000 – 1400 cm^{-1} (C-N) for hardener.

Results and discussion

Generation of reference FTIR spectrum from **T**op, **M**iddle and **B**ottom of the mixing tank were sketched in ref. [2]. After automatic baseline correction, the spectra in transmittance mode shall be converted to absorbance mode. The three spectra from **T**op, **M**iddle and **B**ottom were "averaged" using the commercial FTIR software for the generation of reference spectrum for Epoxy1 and Hardener1 (refer Figure 1).

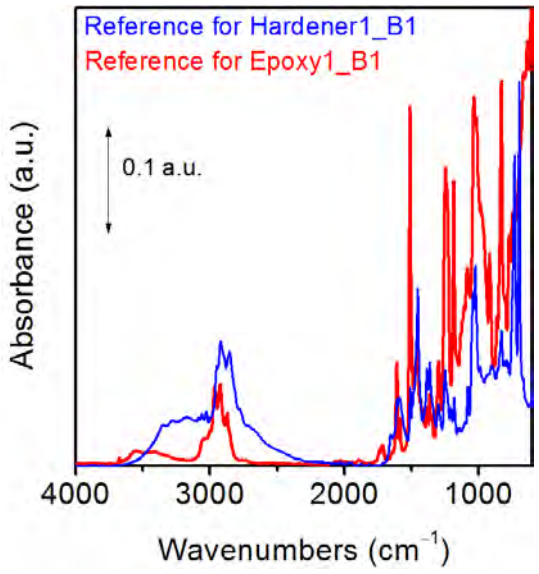

Figure 1 Reference spectra for Epoxy1 and Hardener1

Homogeneity of epoxies and hardeners at Top, Middle and Bottom of the mixing tanks and reproducibility of the epoxies (or hardeners) of Batch 2 as compared to Batch 1 by estimation of r

The degree of similarity (*r*) (in term of paint formulation), of Epoxy1_B1 (or Hardener1_B1) collected from **T**op, **M**iddle and **B**ottom of the mixing tank was generated by comparing the spectra of the sample to that of the reference spectrum (Epoxy1_B1 or Hardener1_B1) using the *Normal* and *High Sensitivity* features of the FTIR software. Quantities *r* for Epoxy1 and Hardner1 and are tabulated in Tables 1 and 2.

Table 1A Estimation of *r* for Reference Epoxy1_B1 to Epoxy1_B1**T**(or **M** or **B**) for 1st FTIR scanning with High Sensitivity Compare feature (reprint with permission from ref. [2])

Sample Code	*r* 600 – 4000 cm^{-1}	*r* 1000 – 1300 cm^{-1} (C-O-C)	*r* 700 – 900 cm^{-1} (C-O-C)	Reference Spectrum
Epoxy1_B1B1	0.9960	0.9996	0.9997	Reference for Epoxy1 _B1
Epoxy1 _B1M1	0.9910	0.9990	0.9996	
Epoxy1 _B1T1	0.9871	0.9990	0.9990	
Epoxy1 _B2B1	0.9970	0.9990	0.9990	
Epoxy1_B2M1	0.9940	0.9970	0.9990	
Epoxy1_B2T1	0.9930	0.9990	0.9970	

Table 1B Estimation of *r* for Reference Epoxy1_B1 to Epoxy1_B1**T**(or **M** or **B**) for 1st FTIR scanning with Normal Compare feature

Sample Code	*r* 600 – 4000 cm^{-1}	*r* 1000 – 1300 cm^{-1} (C-O-C)	*r* 700 – 900 cm^{-1} (C-O-C)	Reference Spectrum
Epoxy1_B1B1	0.9996	**1.0000**	**1.0000**	Reference for Epoxy1_B1
Epoxy1 _B1M1	0.9997	0.9999	0.9999	
Epoxy1 _B1T1	0.9995	0.9998	0.9999	
Epoxy1 _B2B1	0.9980	0.9992	0.9992	
Epoxy1_B2M1	0.9981	0.9992	0.9993	
Epoxy1_B2T1	0.9983	0.9993	0.9995	

The quantities *r* in this study are correlated to the paint formulation. It is relatively common to set $r \geq 0.90$ as the acceptable tolerance in order to suggest the similarity of different samples or different batches of similar samples. All epoxies and hardener are homogenous in the mixing for Epoxies or Hardenner 1, 2 and 3 for Batches 1 and 2 at different locations of **T**op, **M**iddle and **B**ottom of the mixing tanks. Besides, quantities $r \geq 0.90$ are recorded for Epoxies (or Hardeners) 1, 2 and 3 when Batch 1 was compared to Batch 2 at different locations of **T**op, **M**iddle and **B**ottom of the mixing tanks.

In all cases, $r_{High\_Sensivity} < r_{Normal\_Sensitivity}$ are noted. In some cases, $r_{Normal\_Sensitivity} = \mathbf{1.0000}$ are recorded, which are rather unrealistic, *i.e.* 100% matching between the Reference spectrum and the sample. Hence, we propose here, $r_{High\_Sensivity}$ is more suitable to be used for checking the homogeneity of epoxies and hardeners at Top, Middle and Bottom of the mixing tanks and the batch-to-batch reproducibility of the epoxies and hardeners

Table 2A Estimation of *r* for Reference Hardener1_B1 to Hardener1_B1**T**(or **M** or **B**) for 1st FTIR scanning with High Sensitivity Compare feature (reprint with permission from ref. [2])

Sample Code	*r* 600 – 4000 cm^{-1}	*r* 1000 – 1400 cm^{-1} (C-N)	Reference Spectrum
Hardener1_B1B1	0.995	0.9998	Reference for Hardener1_B1
Hardener1_B1M1	0.993	0.999	
Hardener1_B1T1	0.993	0.999	
Hardener1_B2B1	0.998	0.9997	
Hardener1_B2M1	0.994	0.9995	
Hardener1_B2T1	0.994	0.9996	

Table 2B Estimation of *r* for Reference Hardener1_B1 to Hardener1_B1**T**(or **M** or **B**) for 1st FTIR scanning with Normal Compare feature

Sample Code	*r* 600 – 4000 cm^{-1}	*r* 1000 – 1400 cm^{-1} (C-N)	Reference Spectrum
Hardener1_B1B1	0.9996	**1.0000**	Reference for Hardener1_B1
Hardener1_B1M1	0.9998	**1.0000**	
Hardener1_B1T1	0.9997	**1.0000**	
Hardener1_B2B1	0.9994	0.9997	
Hardener1_B2M1	0.9989	0.9997	
Hardener1_B2T1	0.9977	0.9993	

To estimate the r for Epoxy1 as compared to Epoxy2, Epoxy3 and PU; and Hardener1 as compared to Hardener2, Hardener3 and NCO

Epoxy1, Epoxy2, Epoxy3 and poly(urethane) (PU) are with different paint formulations. Analogues to epoxy, Hardener1, Hardener2, Hardener3 and isocyanate (NCO) are with different paint formulations. Tables 3 and 4 clearly demonstrate that FTIR analysis is a simple tool to differentiate different types of epoxies, between epoxy & PU, different types of hardeners; and between hardener & NCO with $r < 0.90$ when High Sensitivity Compare feature is used.

Again, In all cases, $r_{High\_Sensivity} < r_{Normal\_Sensitivity}$ are noted. When Epoxy1 is compared to Epoxy2 and Epoxy3, $r_{Normal\_Sensitivity} \geq \mathbf{0.90}$ are recorded, which are unacceptable because Epoxy1, Epoxy2 and Epoxy3 are having structural and compositional differences. Hence, we emphasize here, $r_{High\_Sensivity}$ is more suitable to be used for the comparison of different types of epoxies and hardeners.

Table 3A Estimation of *r* for Reference Epoxy1_B1 to Epoxy2, Epoxy 3 and PU with High Sensitivity Compare feature (reprint with permission from ref. [2])

Sample Code	*r* 600 – 4000 cm^{-1}	*r* 1000 – 1300 cm^{-1} (C-O-C)	*r* 700 – 900 cm^{-1} (C-O-C)	Reference Spectrum
Epoxy2 _B1	0.5	0.5	0.5	Reference for Epoxy1_B1
Epoxy3_ B1	0.6	0.8	0.6	
PU_B1	0.05	0.07	0.06	

Table 3B Estimation of *r* for Reference Epoxy1_B1 to Epoxy2, Epoxy 3 and PU with Normal Compare feature

Sample Code	*r* 600 – 4000 cm^{-1}	*r* 1000 – 1300 cm^{-1} (C-O-C)	*r* 700 – 900 cm^{-1} (C-O-C)	Reference Spectrum
Epoxy2 _B1	**0.90**	**0.93**	**0.90**	Reference for Epoxy1_B1
Epoxy3_B1	**0.96**	**0.98**	**0.94**	
PU_B1	0.11	0.14	0.12	

Table 4A Estimation of *r* for Reference Hardner1_B1 to Hardener2, Hardener3 and NCO with High Sensitivity Compare feature (reprint with permission from ref. [2])

Sample Code	*r* 600 – 4000 cm^{-1}	*r* 1000 – 1400 cm^{-1} (C-N)	Reference Spectrum
Hard-ener2_B1	0.3	0.2	Reference for Hard-ener1_B1
Hard-ener3_B1	0.3	0.1	
NCO_B1	0.04	0.002	

Table 4B Estimation of *r* for Reference Hardner1_B1 to Hardener2, Hardener3 and NCO with Normal Compare feature

Sample Code	*r* 600 – 4000 cm^{-1}	*r* 1000 – 1400 cm^{-1} (C-N)	Reference Spectrum
Hardener2_B1	0.5	0.4	Reference for Hard-ener1_B1
Hardener3_B1	0.6	0.2	
NCO_B1	0.08	0.004	

Setting the threshold to reject or to accept one sample using High Sensitivity Compare feature

For routine QA & QC check of FTIR, which shall be carried out immediately after each batch of the production in the paint factory, can be done easily with the assistance from the commercial FTIR software. As in this case, when the High Sensitivity Compare feature is opted and the threshold can be set at 0.90 (equivalent to $r \geq 0.90$) (c.f. Figure 2), we can immediately REJECT Epoxy2, Epoxy3 and PU when these samples are compared to Epoxy1 (c.f. Figure 3) by simply referring to the PASS or FAIL results displayed.

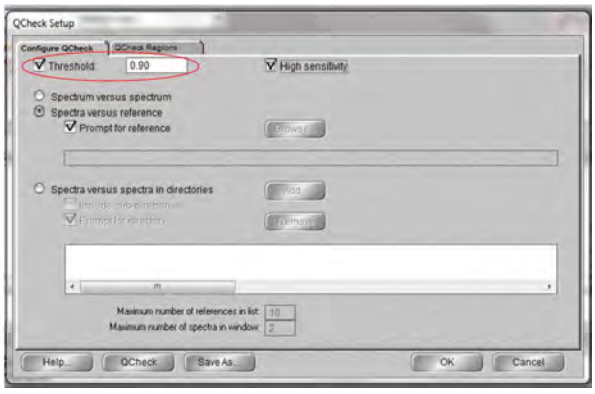

Figure 2 Setting the **threshold** to reject or to accept one sample using High Sensitivity Compare feature

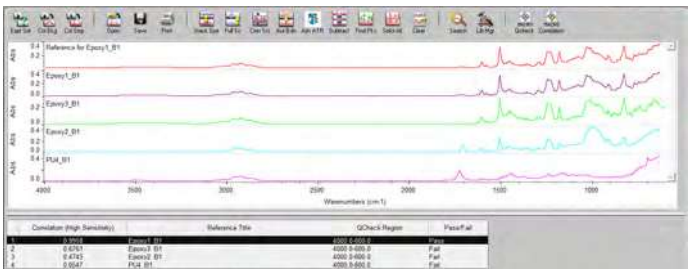

Figure 3 PASS or FAIL results displayed using High Sensitivity Compare feature by setting the **threshold** at 0.90

Comparing the inorganic fillers for polymer coatings

Titanium dioxide (TiO_2), the inorganic pigment, is commonly added into protective polymeric coatings. TiO_2 is commercially available in two crystal forms - Anatase and Rutile. The Rutile pigments are preferred over Anatase pigments for protective coatings, because they scatter light more efficiently, are more stable, and are less likely to catalyze photodegradation. Rutile is more expensive than Anatese. Hence, it may happen that the Rutile may be subsituted by Anatase if refomulation of paints is attempted. Identification of Anatase or Rutile or the mixtures of both is often made by X-ray analysis (Test Method: ASTM D 3720 [5]), where the testing cost is rather high.

By using commercial FTIR software, we are able to compare Rutile and Anatase TiO_2 spectra as depicted in Figure 4. The quantity $r_{High\_Sensivity} = 0.3$ (or $r_{Normal\_Sensitivity} = 0.6$) when Rutile is compared to Anatase.

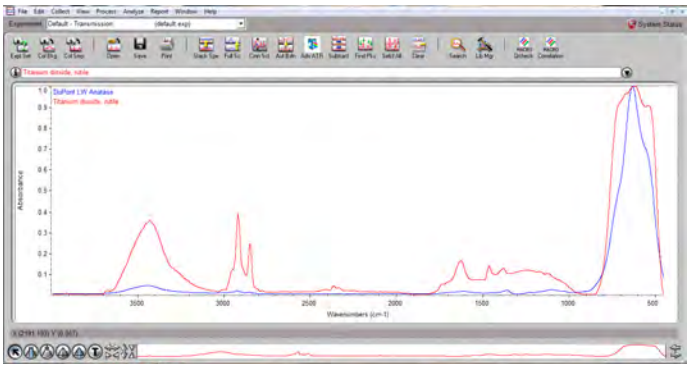

Figure 4 FTIR spectra extracted from the Polymer Library of OMNIC software for Rutile and Anatase TiO_2

Conclusion

We conclude here:

1. The structural analysis by FTIR for complete **Coating Fingerprint Certificate** for epoxy resin and hardener is simple and reproducible when High Sensitivity Compare feature of the FTIR software is to be strictly followed.

2. Rejection or acceptance of the samples can be easily done by setting the threshold value at 0.90 using High Sensitivity Compare feature of the FTIR software.

3. Comparing the inorganic fillers for polymer coatings (e.g. Rutile or Anatase of TiO_2) is also practical by using FTIR.

We note here again, this FTIR analysis shall not be limited to 2-component epoxy coating, but has to be extended to inorganic zinc coating, epoxy-zinc coating, polyurethane coating, acrylic coating, polyester coating etc. FTIR can be used to fingerprint all these types of coatings. Progressive reports of the FTIR fingerprinting studies on these types of coatings will be published in the forthcoming issues of Materials Mind.

Acknowledgement

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fingerprint regions for epoxy and hardener.

References

Note: all the documents related to the background of "Coating Fingerprint Certificate" can be viewed at http://www.iomm.org.my/v1/index.php/fingerprint

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Biodata

CHAN Chin Han is an associate professor at Universiti Teknologi MARA, Malaysia. Her research interest is devoted to physical properties of macromolecules. She was appointed as Visiting Scientist at China University of Petroleum, Beijing, China (2011 – 2012), as Chair Professor on Advances in Hybrid Materials at Mahatma Gandhi University, Kottayam, India (2014), National Representative (Malaysia) of International Union of Pure and Applied Chemistry (IUPAC) for Polymer Division (2014-2015) etc. She has been one of the editors of Malaysian Journal of Chemistry, Materials Mind of Institute of Materials, Malaysia and books published by Royal Society of Chemistry (2013) and Apple Academic Press (2014) (distributed by CRC Press).

Ir. Max ONG Chong Hup graduated from Queen Mary University of London in 1977 with B.Sc.(Hons) in Materials Engineering. He has over 30 years experience in Corrosion Control covering Protective Coatings, Decorative Paints, Cathodic Protection, Corrosion Monitoring & Inspection, Fire Proofing Coatings, Thermal Spray Coatings, and Materials Selection - as a manufacturer, service contractor, and technical consultant. He was involved in paint manufacturing in Dimet/Ameron Protective Coatings (1982-1989) and Leighs Paints (2006-2009). He is currently the Chairman of the Education Committee of the Institute of Materials, Malaysia.

TAN Winie is a senior lecturer at School of Physics and Material Science, Universiti Teknologi MARA, Malaysia. Solid State Ionics are her main research areas. She is an Associate Fellow of the Malaysian Scientific Association (2012–present), Council Member of Institute of Materials, Malaysia (2014-2016) and member of Malaysian Solid State Science and Technology Society (2009-present). She is appointed as one of the editors in International Journal of Institute of Materials, Malaysia (IJIMM), Science Letters, Materials Research Innovation (2009) and American Institute of Physics (2009). Her contribution is also in the form of written chapter in books and over 40 International journal publications. Her research outcomes won her several medals and awards in international and national events.

Prof. Dr. Mohamad Kamal HARUN is currently the Deputy Vice Chancellor (Research, Innovation and Entrepreneurship) and head the Global Entrepreneurship Research and Innovation Centre at University Malaysia Kelantan. He was the Deputy Vice Chancellor (Industrial and Community Networking at University Teknologi MARA from 2007 – 2010. He is also the President and Fellow of the Institute of Materials Malaysia, Fellow of the International Institute of Plantation Management, Chairman of the Malaysian Accredited Certification Body for the Asian Welding Federation, Member of the Industrial Consultative Council, Malaysian Petroleum Resource Cooperation under Pemandu and currently is also the Cluster Head for Industry and Innovation, National Council of Professors. His areas of research are in corrosion protection by paints and inhibitors including the study of polymeric barrier coating degradation under atmospheric conditions.

LEE Jia Yin has worked in commercial testing lab as a Technical Chemist. She is experienced in handling various analytical instruments such as HPLC, LCMS, FTIR and UV spectrometer. Currently, she works as an Application Chemist in Research Instruments, and specializes in Thermo Fisher Scientific FTIR. She is responsible for installation, application training and troubleshooting.

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ABOUT IMM

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 4000.

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 12 materials committees, and 7 regional chapters, and supported by a secretariat with full time staff.

Membership of IMM is categorised into 7 different grades and open to anyone above the age of 17 years old - 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, corrosion and welding in support of the oil and gas industry in Malaysia. Over 600 Coating Inspectors have been trained and certified as well as 2,500 Blasters & Painters, supervisors and Corrosion technicians. Its certification programmes are recognized by PETRONAS and all oil & gas operators. Since January 2011, 42 Associate Welding Engineers, 33 Welding Engineers and 8 Senior Welding Engineers were trained and certified.

IMM has also organised 9 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 Materials Technology Education Sdn Bhd (MTE), a joint-venture between IMM and InterMerger Group.

Collaborations with the Asian Welding Federation, Steel Structure Painting Council (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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Company Member - Ordinary Member - Student Member

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MATERIALS LECTURE COMPETITION

Putrajaya
2 MARCH
2015

INTRODUCTION

The Materials Lecture Competition is intended to enhance awareness among young Material Scientists and Engineers in Malaysia, on the importance of Materials Engineering, Innovations in Materials and sustainability in the advancement of Technology and humankind.

AIM OF COMPETITION

The objective of the MLC is to select a competitor from Malaysian universities who can demonstrate excellent presentation & communication skills with the unique ability to express and explain his or her materials research work to an audience of academics as well as industrialists who may or may not have any educational background in Materials Science & Engineering. This competitor shall pit his or her skills against other international competitors from USA, UK, Brazil, Singapore, Hong Kong, etc. The command of English is of utmost importance in this competition.

SUBMISSION PROCEDURE

To take part in the MLC2015 competition, please send an e-mail with your name, a copy of IC (Malaysian Student) or Passport (International Student), phone number and e-mail details as well as an abstract of a maximum of 150 words, to your university's representative.

Name of University Representative:
Email Address :
H/P Number :

Each university will organise their own internal competition to select a winner who will represent the university in MLC2015 semi-final. The top five winners of the semi-final will compete in the MLC2015 finals. Cash prizes of RM 3000, RM 2000 and RM 1000 will be awarded to the first, second and third winners of the MLC2015 final competition (National Level). Additionally, the 4th and 5th finalists will receive cash prizes of RM 500 each. Lastly, the first prize winner of the MLC2015 (National Level) will represent Malaysia at the IOM3-UK Annual Young Persons Lecture Competition (YPLC) in London on 22 April 2015.

IMPORTANT DATES

- **15 DECEMBER 2014**
  Submission of names to participate in MLC 2015 (University level)
- **20 MARCH 2015**
  MLC 2015 Semi-final (UKM, Bangi)
- **28 FEBRUARY 2015**
  Submission of the name of the University winner to MLC 2015 committee
- **14 MAY 2015**
  MLC 2015 Final (Putrajaya)

JUDGING CRITERIA

Presentation will be judged against the following criteria:

- Structure of the presentation and clarity of explanation and argument
- Standard of presentation
- Personal enthusiasm for the subject
- Ability to deliver presentation spontaneously
- Technical content of the presentation
- Clarity and relevance of any visual aids used
- Ability to deliver a concise and meaningful summary at the end of presentation
- Ability to present within the specified time allocated
- Ability to handle judges questions

The decision of the judges is final, and is not subject to negotiation or appeal.

If you require additional information, please contact the MLC 2015 committee:

1. Assoc. Prof. Dr. Mariyam Jameelah Ghazali : mariyam@eng.ukm.my
2. Professor Dr. Esah Hamzah : esah@fkm.utm.my
3. Ir. Max Ong : maxong54@gmail.com
4. Ir. Abd Razak Abu Hurairah : razak@morecap.com.my

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