For Members Only
Issue 4

MATERIALS MIND

April - September 2013

www.iomm.org.my

Institute of Materials, Malaysia

IMM COURSES

COATINGS COURSES	DURATION (DAYS)
▪ Diploma of Applied Science (Coatings Technology)	10
▪ Coatings Quality Control Technician (QC)	2
▪ Blasting & Painting Supervisor	2
▪ Corrosion Control by Protective Paint	2
▪ Marine Painting Inspection	3
▪ Coatings Inspection Certification Scheme	4
▪ Protective Coatings Technician Certification Scheme	1
▪ Thermal Spray Coatings Applicator	2
▪ Thermal Spray Coatings Inspector	4

WELDING COURSES	
▪ Welding Inspection Scheme	5
▪ Associate Welding Engineer (JWES) *	7
▪ Welding Engineer (JWES) *	7
▪ Senior Welding Engineer (JWES) *	8
▪ 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 Control By Cathodic Protection	2
▪ Cathodic Protection Technologist	4
▪ Corrosion Technician	4

VIBRATION SPECIALISTS
▪ Level 1 - 4

COURSES AVAILABLE UPON REQUEST	
▪ Blasting & Painting Course	5
▪ Welding – SMAW, GMAW, GTAW (1G - 6G)	5
▪ API-570 Piping Inspector	
▪ API-510 Pressure Vessel Inspector	
▪ API-653 Above Storage Tank Inspector	
▪ Microbiologically Influenced Corrosion (MIC)	2
▪ Management of MIC	1
▪ Welding and Joining Technology for Non Welding Personnel	1

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materials mind

contents

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Guideline for submission of articles (Academic papers as well as Industry technical papers) can be downloaded from www.iomm.org.my

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Message from the President

It is with great pleasure that we welcome Datuk Ir. (Dr) Abdul Rahim Hj. Hashim as the new Advisor to the Institute of Materials, Malaysia (IMM). His expertise, experience and knowledge will propel IMM to greater heights. At the same time, IMM thank the immediate past Advisor, Dato' Yeow Kian Chai, for his leadership and guidance over the last three years.

I am glad to note that the new IMM magazine, Materials Mind, is now in its third edition. The magazine was a changeover from the IMM Newsletter which was published on a half yearly basis for the past four years. News articles in the newsletter have served to keep IMM members informed of the many events and activities of the institute. As such, these will continue to be part of the new publication. Materials Mind will serve a wider spectrum of members, with information on product updates and new technological innovations.

Another project of IMM will be the International Journal of Institute of Materials, Malaysia (IJIMM). IJIMM will be a platform that will serve academically-inclined members, and prepare the institution for its ultimate mission to become the centre for materials information in Malaysia. We aim to project the journal to be amongst the elite international journals by being indexed by SCOPUS, in which a large number of peer-reviewed papers are stored in its database where researchers can refer to. A forerunner of the journal will be the 1st International Materials Symposium (IMS), from where papers will be selected and published in IJIMM.

IMM continues to provide technical skills certification and educational programmes in materials science, technology & engineering. For the first time, a 5-day Blaster & Painter training course was conducted last year. This course aimed to provide new or inexperienced workers with the basic skills before proceeding to be assessed and certified. The Blasting and Painting assessment was held at the Sabah Skills and Technology Centre, Kota Kinabalu for first time at the end of 2012. Since then more than 60 personnel have been certified. The Welding Engineer training course has gained tremendous popularity amongst the local welding community.

Fingerprinting of epoxy coatings has evoked controversies and contentions amongst manufacturers and users for many years. With advanced technology as well as modern measuring instruments and methods, this subject was broached, with IMM organising the forum on "Towards Fingerprinting of Polymeric Coatings" in late March. Due to overwhelming interest in this subject, IMM is acceding to calls to hold a similar forum in Johor in October.

Being an active and progressive society, IMM will hold several seminars and conferences to promote awareness and education of materials science, engineering and technology in the country. The Materials Lecture Competition (MLC2013) received blessings from PETRONAS, the sponsor for this event. The flagship of IMM, the 9th International Materials Technology Conference and Exhibition (IMTCE2014) will be held in May 2014 in Kuala Lumpur.

I am sure you will enjoy reading the rest of this magazine.

Happy reading!

Prof. Dr. Mohd. Kamal Harun
President
Institute of Materials, Malaysia

2012 - 2014
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Ir Pau Kiew Huai
Ir Tiong Huo Chiong
Ir Mohd Suradi Yasin

Datuk Rahim Initiated as IMM Advisor

Datuk Ir. (Dr.) Abdul Rahim Hj Hashim addressing the audience at the Inauguration ceremony

Kuala Lumpur 16th August 2013

Datuk Ir. (Dr.) Abdul Rahim Hj. Hashim, Vice Chancellor and Chief Executive Officer of Universiti Teknologi PETRONAS was installed as the Advisor to the Institute of Materials, Malaysia (IMM) during an inauguration ceremony at the Malaysian Petroleum Club, PETRONAS Twin Towers. Datuk Rahim has vast experience with Materials and education in materials science, engineering and technology. In his maiden speech, Datuk Rahim passionately said "There is a great need for engineers, technicians and workers to be knowledgeable and highly skilled in materials, especially those in the Oil and Gas industry. I would encourage IMM to collaborate with universities to provide training and education in materials". He added that student development in materials should include enhancement of soft skills in their curriculum. The recent Materials Lecture Competition, sponsored by PETRONAS, is a good opportunity for such purpose. He offered to play a bigger role to promote the institute's initiatives which included the controversial fingerprinting forum.

Thank you: Datuk Ir. Yeow Kian Chai (R) receiving a plaque in appreciation of his service from Prof. Dr. Mohd. Kamal Harun

At the same event, Datuk Ir. Yeow Kian Chai, the Head of Technical Centre of PETRONAS' Exploration and Production Technology Centre (EPTC), was honoured for his unwavering support to IMM since stepping in as Advisor in 2007. He enthused how IMM has been growing over the years, and appreciates the members' interest, dedication and passion for materials education in the country. The Asian Welding Federation's Common Welder Certification Scheme was initiated during his tenure.

Also in attendance was Ir. Pramod Kumar Karunakaran, Vice President, Infrastructure & Utilities Gas & Power Business.

IMTCE2014

9th International Materials Technology Conference & Exhibition

13th – 16th May 2014
Putra World Trade Centre
Kuala Lumpur, Malaysia

Synergising Industry & Academia: Innovations for Industrial Applications

Organised by

Conference Organiser

Co-organised by

Conference Overview

The 9th International Materials Technology Conference & Exhibition (IMTCE2014) is scheduled to be held in May 2014 at the Putra World Trade Centre (PWTC), Kuala Lumpur.

The objectives of the conference are to:

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

With the theme of "Synergising Industry & Academia: Innovations for Industrial Applications", IMTCE2014 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 & alloys, polymers & plastics, rubber & elastomers, ceramics, timber & wood, concrete, minerals, nanomaterials, advanced materials, electronic materials, and textiles.

We welcome you to IMTCE2014!

Please visit our website www.imtce2014.com for full details.

Guidelines for Submission of Synopsis

The official language of the Conference is English. The abstract and a brief biography must be submitted online in the specific format. The templates for abstract and biographical data are provided in the website at http://www.imtce2014.com/online_submission.php.

Submission of Paper to peer-reviewed and/or Scopus-Indexed Journals!

Submission of Paper to peer-reviewed and/or Scopus-Indexed Journals or conference proceedings will be coordinated by the Technical Publications Chairperson of IMTCE2014 [Dr. Karen Wong Mee Chu, Universiti Tunku Abdul Rahman] at imtce2014@gmail.com.

Papers that are intended for publication in journals must be submitted online within 2 weeks after the conference (i.e. before 31st May 2014).

Selected papers may be published in identified journals:

1. International Journal of the Institute of Materials Malaysia (IJIMM)
   (Publisher: Institute of Materials, Malaysia) (Full paper)
2. Journal of Science and Technology in the Tropics
   (Publisher: Academy of Sciences Malaysia, Malaysia) (Full paper) (Scopus-Indexed)
3. Jurnal Teknologi (Science and Engineering)
   (Publisher: Penerbit UTM Press) (Full paper) (Scopus-Indexed)
4. Polymers Research Journal
   (Publisher: Nova Publishers, USA.) (It is indexed in Chemical Abstracts, Elsevier, Genamics) (Full paper)*
5. Composite Interfaces
   (Publisher: Taylor & Francis Group) (Impact factor in 2011: 0.438) (Full paper)*
6. One book on "Advanced Polymeric Materials II: Macro to Nanoscales"*
   (Publisher: Apple Academic Press, Canada) (Book chapter)(The publication of the book chapter is free of charge. All chapter contributors will get a free soft copy of the book)*

**Note: Submission of paper (journals 4, 5 & book 6) is limited to the participants of ISAPM2014 only. Full papers are to be submitted to Dr. Lee Siang Yin (Head - Scientific & Publication Committee of ISAPM 2014) at isapm.publication@yahoo.com.*

Submission of Full Paper/Presentation (PDF or PPT) for CD by 14th Feb 2014.
Full papers submitted for CD for the Conference will not be reviewed, and will be added to the CD. Late submissions will be omitted from inclusion in the CD.

Submission of Full Paper for journal after the conference (within 2 weeks after the conference).
Only selected papers will be published in journals. Updated submission guidelines will be shown in the website www.imtce2014.com.

Plenary Speakers

Prof. Dr. Sabu Thomas
Mahatma Gandhi University, India and Universiti Teknologi MARA, Malaysia

Title: High Performance Epoxy Nanocomposites for Coating Applications

Dr. Liane Smith
Director of Woodgroup Intetech Ltd. UK

Title: Putting Theory into Practice - Lessons learnt from Oil & Gas Industry

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IMM Management Committee:

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III. Organising Chairperson – Awards
Prof. Dr. Esah Hamzah, (esah@fkm.utm.my)

Materials Lecture Competition (MLC)
- Dr. Nor Akmal Fadil

Green Materials Awards
- Prof. Dr. Saifollah Abdullah

Poster Awards
- Prof. Dr. Ahmad Fauzi Mohd Nor

5 Symposia

1. **International Symposium on Advanced Polymeric Materials (ISAPM 2014)**
   Theme
   Polymers and Composites as Replacement and Reinforcement for Metals

   List of Topics:
   - Synthesis and characterisation of high performance polymers.
   - Biological, biomedical and environment-friendly polymers.
   - Polymeric materials for clean and sustainable energy.
   - Multi-technique of polymer characterization.
   - Polymer composite and polymer nanocomposites.
   - Nanostructured polymeric materials.
   - Advances in polymer processing and characterizations.

   Symposium Co-Chairperson:
   - Dr. Chia Chin Hua (Universiti Kebangsaan Malaysia, Malaysia)
   - Prof. Sabu Thomas (Mahatma Gandhi University, Kottayam, India/UiTM)
   - Ms. Siti Haslina Ramli (PETRONAS, Malaysia)

2. **International Symposium on Materials Characterisation and Testing 2014 (ISMCT 2014)**
   Theme
   Technologies & Innovation for Materials Asset Integrity

   List of Topics:
   - The application of characterisation and testing techniques to:
     - Forensic Materials Engineering
     - Materials Failure Analysis
     - Process Optimisation
     - Materials Development / Design
     - Advancing Fundamental Understanding
     - Assessing Materials Performance
     - Nanomaterials
   - The development of characterisation and testing methodologies
     - For Rheological properties
     - For Chemical Properties
     - For Physical Properties
     - For Mechanical Properties
     - For Microstructural / structural characteristics
   - Advances in instrumentation/equipment for characterisation and testing
     - Spectroscopy
     - Microscopy
     - Imaging
     - Thermal
     - Structural
     - Non-destructive
     - Destructive
     - Sample preparation
     - At the nanoscale

   Symposium Co-Chairperson:
   - Dr. Hasnah Abdul Wahab (SIRIM Berhad)
   - Eur-Ing. Nigel Brewitt (Norimax Sdn Bhd, Malaysia)
   - Dr. Andrew Spowage (Woodgroup Intetech, Malaysia)

3. **International Symposium on Coatings Technology (ISCT 2014)**
   Theme
   Assuring Integrity & Safety in Coatings Development

   List of Topics:
   - Synthesis and characterisation of high performance coatings.
   - Environment-friendly coatings .
   - Coating materials for clean and sustainable energy .
   - New technologies in coatings application.
   - High temperature and high pressure coatings.
   - Fireproofing coatings.
   - Developments in surface preparation.

   Symposium Co-Chairperson:
   - Mr. David Lim Chee Cheong (ExxonMobil E&P (M) Inc, Malaysia)
   - Dr. Rajkumar Durairaj (Universiti Tunku Abdul Rahman, Malaysia)
   - Nurul Asni Dato' Mohamed (PETRONAS GTS)

4. **International Symposium on Metallurgy and Welding Technology 2014 (ISMWT 2014)**
   Theme
   Facility Safety through Welding Integrity

   List of Topics:
   - Welding processes and welding equipment.
   - Welding metallurgy and materials behaviours during welding.
   - Welding design versus fabrication and construction.
   - Welding quality control and safety through both conventional and advanced NDT techniques.

   Symposium Co-Chairperson:
   - Ir. Dr. Edwin Jong Nyon Tchan (Jurutera Perunding Akal Sdn. Bhd., Malaysia
   - Prof. Dr. A. S. M. A. Haseeb (Universiti Malaya, Malaysia)
   - Encik Zamaluddin Ali (PETRONAS GTS)

5. **International Symposium on Corrosion & Material Degradation (ISCMD 2014)**
   Theme
   Sustaining Technical Integrity through Improved Corrosion Protection Technologies

   List of Topics:
   - Material selection
   - Degradation mechanisms
   - Corrosion research
   - Accelerated Corrosion Testing
   - Corrosion of Steel Reinforced Concrete
   - Corrosion Inhibitors
   - Cathodic Protection
   - Corrosion Monitoring
   - External Corrosion Direct Assessment
   - Corrosion Modelling
   - Microbiologically Induced Corrosion
   - Pipeline Corrosion
   - Marine Corrosion
   - Stray Current & Interference

   Symposium Co-Chairperson:
   - Ms. Halimah Pit (Shell (M) Sdn. Bhd., Malaysia)
   - Dr. Mahesh Kumar Talari (Universiti Teknologi MARA, Malaysia)

Important Date

Submission of Abstract	1 Jul 2013 – 15 Jan 2014
Notification of Acceptance	1 month after submission
Submission of Full Paper/Presentation (PDF or PPT) for CD	1 Jan - 14 Feb 2014
Full Paper Submission for Journal	16 – 31 May 2014

Online Registration

http://www.imtce2014.com/online_registration.php

Registration Fees

Category	IMM Members	Non Members	Students*2
Early Bird*1	MYR 1200 / USD 430	MYR 1300 / USD 470	MYR 800 / USD 290
Regular	MYR 1500 / USD 550	MYR 1600 / USD 580	
On-site	MYR 1875 / USD 688	MYR 2000 / USD 725	MYR 1000 / USD 363

1. Notes:
   *1 Early Bird – **Registration & full payment received on or before 1st January 2014.**
   *2 Students – **Please provide evidence of studentship**
2. Fee includes attendance to all Conference Sessions, Exhibition, Materials Lecture Competition Grand Final, Banquet Dinner and Farewell Cocktail. Tea & coffee breaks and lunches.
3. Sixth participant enjoys free admission when five (5) participants from the same organisation are registered in one registration form, (except for student participants.)

Payment Methods

Full payment must be made online at http://www.imtce2014.com or by other modes of payment on or before 13th April 2014. The organisers reserve the right to prohibit presenters who fail to do so, from presenting at the Conference. The information on other modes of payments is available at www.imtce2014.com.

Oral Presentation

Time allocated (inclusive of 5 minutes Q&A) :

Plenary lectures	: 60 minutes
Keynote Speakers	: 45 minutes
Invited Speakers	: 30 minutes
Oral presentations	: 20 minutes

Poster Presentation

- Dimension of poster boards: 2.5 m (height) × 1 m (width)
- Maximum size of poster: 1200 mm (height) × 900 mm (width) (in Portrait orientation)
- The poster boards will be numbered, and can be found in the final programme.
- Specific time will be allocated for poster presentations.
- Authors will be notified by IMTCE2014 Secretariat in advance on the time slots.
- All poster authors must be present at their post during the allocated time.

Awards

1. Best Poster Award
2. IMM Green Materials Awards
3. Materials Lecture Competition (MLC)

For more information, visit our website www.imtce2014.com

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Forum On Specialty Polymers for High Temperature and High Pressure Applications In The Oil and Gas Industry

Kuala Lumpur, 14th June 2013

A forum on specialty polymers for high temperature and high pressure applications in the Oil and Gas Industry was held by IMM at the Petronas Twin Towers. The event was organized by the IMM Polymer Committee and sponsored by Solvay.

It was a half-day event with full-house attendance. 3 prominent industry experts were the speakers for the session. These included Mr. Tony Bacon, Manager of Bredero Shaw , Mr. Xu Chun, Marketing Manager of Solvay , and Mr. William Lee, Technical Consultant of Research Instruments Sdn. Bhd.

Mr Bacon's topic, "3LPP for High Temperature Pipelines" focused on the current limits of standard pipeline coatings, as well as the history of projects where treatments were performed at over 120°C.

This was followed by an in-depth presentation by Mr Xu Chun, which was split into 2 parts. The first half of Mr Xu's presentation was called "Polyether Ether Ketone KetaSpire (PEEK) for High Temperature and High Pressure Applications in the Oil and Gas Industry", which gave a brief history of Solvay, followed by an introduction to Polymer families, as well as their key properties and benefits, discussing the choice of Polymers in various mechanical applications, Polymer liners, internal and external coatings, and composites. The first part of Mr Xu's session wound up with discussions on Fluoropolymers, Partially-Fluorinated Polymers, Fully-Fluorinated Polymers, as well as Ultra-Polymers. The second half of Mr Xu's session was titled "Fluorinated Polymers for High Temperature and High Pressure Applications in the Oil and Gas Industry." This session focused on the purpose of using liners, and gave a brief idea about various fluoro-polymers for pipe coatings, and the various lining technologies and materials used.

The final speaker of the day was Mr William Lee, who spoke on the "Characterization of High Temperature Polymers by the Dynamic Mechanical Analyzer". Mr Lee's presentation was on the topic of Dynamic Mechanical Analysis. He spoke at length about the DMA (Dynamic Mechanical Analyzer), which is an instrument that looks at the viscoelastic properties of materials.

After the three presentations, the floor was opened to a Q & A session. Various questions were posed by the attendees to the panel speakers pertaining to the topics at hand. The forum was a monumental success, and a fruitful and mutually beneficial exchange of information for all parties involved.

SOVLAY is the leading supplier of Specialty Polymer especially for the Oil & Gas industry. SOLVAY provides PVDF material for offshore flexible riser for decades. Its superiority technology has been proved by global industry. The development of High-Temperature/High-Pressure (HT/HP) projects in Oil & Gas industry requests better material to enable new technology. SOLVAY is focusing on development of new material to answer the calls from the industry. PFA is fully fluorinated polymer and can work under high temperature up to 260C°; it is a promising candidate for the HT/HP application. Besides PFA, PEEK/PAEK and PAI material also demonstrate the capability to perform under high temperature. Specialty polymer material can be applied to the Oil & Gas pipeline system through various approaches. Besides flexible pipes, lining and coating could also be an effective way to apply polymeric material for pipeline protection.

Coatings Birth Certificate

There has long been a widespread perception within the oil and gas industry that fingerprinting of polymer coatings was not possible. To address this issue, IMM organized the first forum titled "Towards Fingerprinting of Polymer Coating" on 22nd March 2013 which introduced the topic on coating fingerprinting to the audience. Due to the overwhelming response received during the Q & A session, the inception of Coatings Fingerprinting Task Force was officialised with a first meeting held on 31st May 2013.

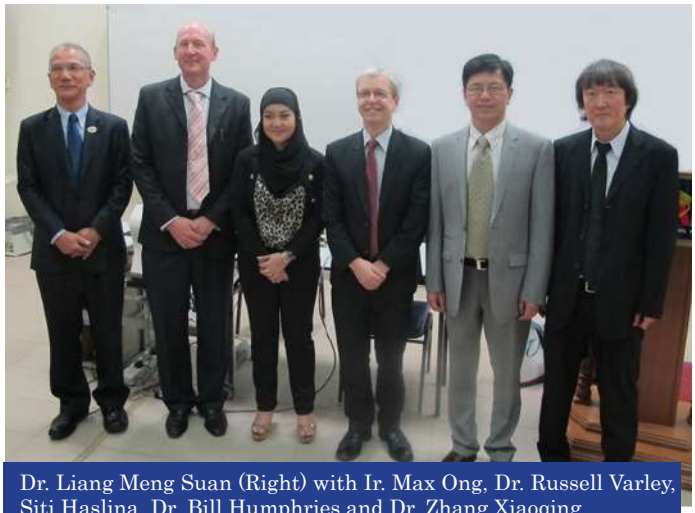
The Task Force on Coatings Fingerprinting is chaired by Ms Nurul Asni Mohamed from GTS PETRONAS and co-chaired by Ms Elizah Samat from Shell, with the IMM Polymer Committee as facilitator and advisor. Other members include representatives from Exxon Mobil, UiTM, UKM, SIRIM, Norimax, PLC Laboratory, Sigma Coatings, HEMPEL, International Paint, Kansai Paints and Research Instruments.

The task force objectives are:

1. To review the available standards and specifications requiring Fingerprinting of Polymeric Coatings in the Oil & Gas Industry.
2. To review quality control and quality assurance techniques practiced by the paint manufacturers during manufacture and storage.
3. To review QA and QC techniques practised by the blasters & painters in regards to the paints prior to application and during application
4. To review fingerprinting testing methods available in regards to the reliability, speed of testing and costs.
5. To establish a Fingerprinting Document Template acceptable to all parties involved in the manufacture, application and usage of Polymeric Coatings in the Oil & Gas Industry.

The ultimate goal of this initiative is to enhance the overall painting coating quality assurance, with the aim of ensuring that all protective coatings manufacturers supply their products according to specifications.

Talk on Self Healing Materials



Dr. Liang Meng Suan (Right) with Ir. Max Ong, Dr. Russell Varley, Siti Haslina, Dr. Bill Humphries and Dr. Zhang Xiaoqing.

Kuala Lumpur, 12th June 2013

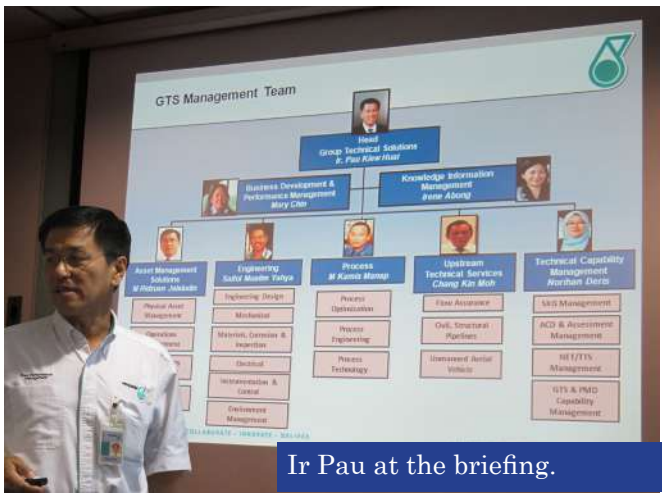
The Advanced Materials and Composite Committees of the Insitute of Materials, Malaysia (IMM), together with the IMM Student Chapter in Univeriti Tunku Abdul Rahman (UTAR) organised a Technical Talk on Advanced Materials - Self Healing Materials in the campus in Setapak, Kuala Lumpur.

Dr. Russell Varley, a Principal Research Scientist at Commonwealth Scientific Industrial Research Organsiation (CSIRO) Materials Science and Engineering, Australia, spoke on improved industrial polyolefin coatings modifacation for advanced applications, topcoat reactivation, self healing materials, and the challenges faced amongst other subjects.

Dr. Liang Meng Suan, Chairman of the IMM Advanced Materials Committee, said "I am glad that the students of UTAR have been given this opportunity to listen to a world-renowned scientist on Self Healing Materials. This has been made possible with the close working relationship between UTAR and IMM, which is in line with the vision of UTAR to become a world-class university that works closely with industry and professional bodies."

Distinguished guests at the event included Dr. Bill Humphries and Dr. Zhang Xiaoqing of CSIRO, Ir. Max Ong and Siti Haslina, Chairman of IMM Composites Committee.

IMM Council Meetings



Ir Pau at the briefing.

Council members of IMM were twice feted to warm receptions and kind hospitality when they met to discuss matters pertaining to the institute in the last quarter.

The first meeting, held in the office of the Group Technology Solutions (GTS) PETRONAS in Menara Dayabumi, Kuala Lumpur was at the kind invitation of Ir. Pau Kiew Huai, Head of GTS. Prior to the meeting proper, Pau briefed the attendees on the work and services of GTS, and the opportunities available to the public. Ir. Pau Kiew Huai is a first term council member.

Pn. Hjh. Maimunah Ismail, Asset Integrity Manager of Lloyds Register of Shipping (LR) was at hand to welcome the council, which met at the premises of LR. LR Managing Director En. Mohd Azhar Sulaiman provided an overview on the organization, its operations, and the challenges faced by the various groups within LR.

Materials Science, Engineering And Technology With Applications In The Oil & Gas Industry

Kuala Lumpur, 3rd April 2013

A one-day seminar was organized for the students of UTAR to instill the importance and advances of Materials Engineering, and expose them to the various applications and career opportunities within the oil and gas industry. This event also provided students with the opportunity to interact with industry experts from their respective fields of interest, and was chiefly attended by engineering students of UTAR ranging from first to final years, VIPs, as well as lecturers of UTAR.

The enthusiastic crowd received the opening speech by Mr Wong Yee Shiuan, President of UTAR Students Society, who welcomed the speakers, consisting of Dr Lee Chee Hong, NACE Founding Malaysia Section Chairman, Dr Lim Ching Liang, Head of METACOS Malaysia with over 30 years' experience in the field, Mr Kok Wai Chee, Corrosion Manager of Duplex, who has been involved in Corrosion Engineering for the past 24 years, and finally, Eur-Ing. Nigel Brewitt, Materials Consultant at Norimax Sdn. Bhd., who has over 30 years' experience in Metallurgy.

Dr. Lee set the ball rolling with his topic, "Corrosion Engineering". Dr Lee's topic covered the field of corrosion engineering and the effects of corrosion in certain industries, and talked about his rewarding career as a corrosion engineer. Following that, Dr Lim delivered his presentation, titled "Materials Testing and Failure Analysis". This topic focused on various types of materials failures, methods to evaluate materials failures, as well as analytical techniques. The third speaker, Mr Kok delivered his presentation, "Cathodic Protection and Coatings". In his presentation, Mr Kok provided a brief introduction to the various materials in the marine sector used for corrosion protection, rehabilitation, and maintenance of marine infrastructure. Last but not least, the stage was opened to Eur-Ing. Brewitt, whose topic covered the issue of Failure Investigation, which focused on vital information about materials failures, and how properties of materials affect their performance.

Following the presentation, a question and answer session was opened for all participants, in which the students asked questions relevant to the topics discussed.

The speakers and guests then adjourned for personal discussion and the exchange of ideas. Students took this opportunity to speak on a one-to-one basis with the industry experts, in order to gain further insight into their respective fields. The event was a success as it was a productive and stimulating experience for everyone involved.

CWCS Progresses

Historic Event: Members of AWF Governing Council with senior members of AWS posing for the camera.

Singapore, 11th & 12th July 2013

Following the successful meeting held in Bangkok last year, each of the 13 country members at the Asian Welding Federation (AWF) Task Force (TF) meeting in Singapore presented an update of the implementation of the Common Welder Certification Scheme (CWCS) in their respective countries. The Chairman of IMM Welding Committee, Ir. Dr. Edwin Jong, presented his satisfaction and the on-going implementation of the CWCS scheme is progressively gaining recognition in the Malaysian Oil & Gas Industry.

Ir. Dr. Edwin reported that the Malaysian Authorised Certification Body (MAS-ACB) has been formed in 2011 with 14 Council Members representing the key stakeholders in Malaysia ranging from clients, contractors, fabricators, suppliers/manufacturers, professionals, consultants, specialists and certification bodies. The MAS-ACB has appointed 8 Authorised Test Centres (ATC) and 2 Authorised Training Body (ATB) since. Road shows were conducted to promote to PETRONAS and several contractors/fabricators, culminating in the registration of more than 260 welders in the Manpower Optimisation System (MOS). PETRONAS has included the requirement in the Technical Procedure Specifications (PTS) since 28th October 2011. The TF also discussed and updated the CWCS Operating Procedures at the meeting.

The AWF furthermore welcomed 3 senior members of the American Welding Society (AWS), President Nancy Cole, Executive Director Ray Shook and the Corporate Director of International Sales Jeff Kamentz. Shook then addressed the assembly, and expressed the desire of AWS to establish a mutual understanding and a close relationship between the global certification schemes, co-operate and collaborate with AWF. A discourse on the differences of the rules and systems between the 2 organisations followed with proposals to bridge the variances. Both AWF and AWS have agreed to have further consultations with the planned inaugural AWF-AWS Collaboration Task Force meeting to be held in Kuala Lumpur in November 2013.

IMM took advantage of the meeting to promote the 9th International Materials Technology Conference and Exhibition (IMTCE2014). The Governing Council approved the AWF being a co-organiser of this event.

Participating country members of the AWF are Malaysia, Japan, Singapore, China, South Korea, Philippines, Mongolia, Indonesia, Thailand, Myanmar, Vietnam, Iran and India.
Philippines, Mongolia, Indonesia, Thailand, Myamar, Vietnam, Iran and India.

AWF-AWS WELDING FORUM

" Harmonizing Towards Welding Cost Efficiency & Technical Integrity "

Organized by the Institute of Materials, Malaysia
Friday 15th November 2013
Malaysian Petroleum Club, Petronas Twin Tower 2, KLCC.

The spiraling costs of welding activities in Asia, particularly in the oil & gas industry, will impact decisions in many project implementations. Materials engineers & scientists must corroborate & collaborate their minds together to improve welding quality, efficiency and safety while reducing the costs of welding activities. Welding is a major activity in the design & fabrication of oil rigs & petrochemical facilities, and therefore has a significant impact on the overall project costs.

The Asian Welding Federation (AWF) in collaboration with the American Welding Society (AWS) presents this Forum to highlight the various initiatives developed to address the issues of welding costs, efficiency, quality and safety.

Tentative Program:-

2:30pm : Registration.
3:00pm : Welcoming Remarks by Professor Dr. Mohd Kamal Harun, IMM President.
3:05pm : Opening Speech
3:15pm : Common Welder Certification Scheme & Manpower Optimization System by Mr. Ang Chee Pheng, Secretary - General, AWF.
3:45pm : Technical Integrity Initiatives in Welding by Representative from AWS.
4:15pm : Tea / coffee & refreshment.
4:30pm : Welding Cost Efficiency Initiatives in Malaysia by Ir. Dr. Edwin Jong, Chairman - IMM Welding Committee.
5:00pm : Welding Inspection & Quality Issues in Malaysian Industries by Dr. Hasnah Abdul Wahab - SIRIM.
5:30pm : Welding Qualification & Certification Current Practices by En. Zamaludin Ali - PETRONAS Group Technical Solutions.
6:00pm : Closing Speech & Acknowledgements by Y. Bhg. Datuk Ir. (Dr) Abdul Rahim Hashim, IMM Advisor
6:15pm : Tea & refreshments.
7:00pm : Adjourn.

Admission free of charge.
Advance registration required by contacting IMM at the email below.

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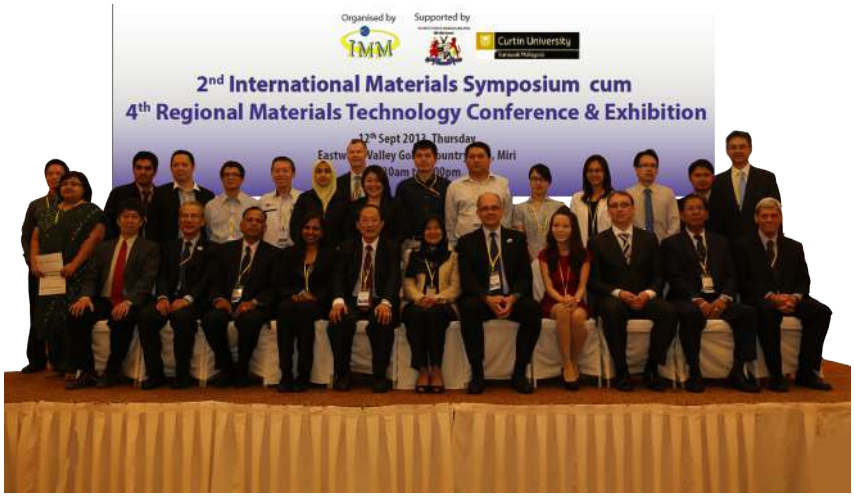
Materials Technologies for Asset Sustainability Conference in Miri

Miri, 12th September 2013



The IMM Miri Chapter and the International Materials Symposium (IMS) Committee jointly organized the 2nd International Materials Symposium cum 4th Regional Materials Technology Conference and Exhibition (2nd IMS cum 4th RMTCE) on 12th September 2013 at Miri. The event was supported by the Institution of Engineers, Malaysia (IEM-Miri Branch) and Curtin University Sarawak, Malaysia.

The 2nd IMS cum 4th RMTCE with its theme "Materials Technologies for Asset Sustainability", served as a platform for industrialists, academics and researchers to share their findings and discuss the latest developments in Materials technologies. 16 presenters, amongst them from PETRONAS Carigali, TNB Research, AgensiNuklearMalaysia and Curtin University Sarawak, covered topics on materials &corrosion engineering, welding technology and inspection techniques.

The Chairman of the IMM Miri Chapter, Ir. Dr. Edwin Jong Nyon Tchan, stressed the importance of the event as it will create awareness in Materials Technology and Development in the city Miri and Sarawak. He stated "IMM organizes such events regularly to create awareness and promote education on materials, materials technology and selection as it has huge impact onthe business, the environment and society". He urged participants to participate in the upcoming "Towards Fingerprinting of Polymeric Coatings II" Forum to be held in Pasir Gudang, Johor, on 11th October 2013. Such occasions introducesThis forum will introduce information on new and advanced technology,y and demonstratinges the capability and possibility to of ensuringensure consistent quality of paints.

The 2nd IMS cum 4th RMTCE concluded on a successful note with dinner and networking among the delegates, presenters and committee members.

New Initiatives on Materials, Corrosion and Inspection

Kerteh, 4th September 2013

The East Coast chapters of the Institute of Materials, Malaysia (IMM) and Malaysian Oil and Gas Service Council (MOGSC) jointly organised a seminar on The New Initiatives on Materials, Corrosion and Inspection in Kerteh, Terengganu.

The event reflected the positive and productive association between IMM and MOGSC. The President of IMM, Prof. Dr. Mohd Kamal Harun, in his opening remarks said "it is an opportune time for organisations such as IMM and MOGSC to work in partnership with one another so that industries, especially in Oil and Gas, can benefit from the many topics discussed."

En. Sofiyan Yahya, the President of MOGSC, expressly "thanked IMM for its support, and wish that there would be more such mutually beneficial collaborations between the two organisations in future."

5 distinguished speakers, consisting Prof. Dr. Mohd. Kamal Harun, Junaidy Abdullah, Eur-Ing Nigel Brewitt, Nor Fazri Nordin, and Dr. Ahmad Syahrizan Sulaiman spoke on subjects ranging from fingerprinting of polymeric coatings, flame spray coatings for Corrosion Under Insulation (CUI), materials failure analysis, new applications of Risk Based Inspection (RBI) and mechanical integrity assurance which are pertinent to current issues related to the oil and gas industry.

L-R: Ir.Ahmad Nazari Ashari, Sofiyan Yahya and Prof. Dr. Mohd Kamal Harun

A good number of participants benefitted from the presentations, many of whom are engineers from affiliated companies, as well as PETRONAS plants located in the area and Malaysian Investment Development Authority (MIDA). The speakers were a palpable hit, as reflected by the crowd's attentive and enthusiastic demeanor, and the numerous questions posed during the Q & A sessions.

Lunch was a celebratory occasion when the speakers and guests adjourned to the dining hall to enjoy a Hari Raya Open House buffet spread, at the courtesy of MOGSC.

Materials Lecture Competition

Kuala Lumpur 30th May 2013

The Materials Lecture Competition (MLC) was developed as an avenue for young and blooming members of the Malaysian scientific community (Malaysian students under the age of 28) to apply their training and expertise in the spirit of friendly competition to raise awareness and spread information on materials science, and to develop the individuals in question both personally and professionally, with particular emphasis on their communication skills.

In the MLC contest, participants must deliver a 15-minute presentation to a layman audience on a topic related to Materials, Minerals or Mining Science and Engineering. Participants must not only apply their scientific knowledge, but also their communication abilities. The 2nd MLC took place on 30th May 2012 at Seri Pacific Hotel in Kuala Lumpur, and was held in conjunction with the 1st International Materials Symposium. The event was sponsored by PETRONAS and jointly organized with the Institute of Materials, Minerals & Mining-Malaysia Branch.

The 3 judges consisted of Ir. Max Ong Chong Hup from IMM, Dr. Ng Wing Kong from IOM3 Malaysia Branch, and Professor Dr. Ahmad Faizal Mohd Zain from University Putra Malaysia. The First Prize winner was Farahani Irna Nazari of Universiti Teknikal Malaysia, who walked away with RM3000 in cash, and the honor of representing Malaysia at the annual Young Persons' Lecture Competition (YPLC) which will will be held in Hong Kong in October 2013. She gave an excellent presentation on Cals for Green Urea Fertilizer and Greener Earth. The Second Prize winner, Yap Meng Wei of University Malaya, and Third Prize winner Muhammad Idham Mohamad Ibrahim walked away with RM2000 and RM1000 in cash respectively.

The event was a dynamic and stimulating experience for both participants and guests, and this has paved the way for a 3rd MLC, which will take place in 2014.

For more information on the MLC or all other IMM events, please visit www.iomm.org.my or e-mail Mr. Azman Murad at iomm@po.jaring.my/Prof. Esah Hamzah at esah@mail.fkm.utm.my

International Materials Symposium

Kuala Lumpur 30th May 2013

The International Materials Symposium (IMS) is a new initiative by the IMM Technical Publications Committee, which was introduced in order for academicians and industry experts to showcase their technical research and development works, which will be published as full papers in the International Journal of the Institute of Materials, Malaysia.

This one-day symposium will be held at IMM chapters throughout Malaysia, and will take place twice a year. Besides serving as an avenue of intellectual expression, the IMS also functions as a networking opportunity for various members of the Malaysian Materials Science fraternity, in order for them to conduct constructive technological discussions on their respective fields of interest.

The 1st IMS was held at Seri Pacific Hotel in Kuala Lumpur on 30th May 2013, and was attended by 100 participants. There were a total of 10 distinguished speakers from industry, academia and research organizations, such as Lincoln Chemicals Sdn. Bhd., Universiti Teknologi PETRONAS, Universiti Tunku Abdul Rahman, Universiti Teknikal Malaysia Melaka, Universiti Kuala Lumpur Lumut, Malaysian Nuclear Agency, Universiti Kebangsaan Malaysia, Universiti Malaysia PerlisUniversiti Putra Malaysia.

The 1st IMS was a resounding success, and participants expressed satisfaction at the pace and timing of the event.

For more information, contact the Chairperson, IMM Technical Publication Committee, Dr. Karen Wong mcwong@utar.edu.my

IMM Golf Invitational Tournament 2013

Kuala Lumpur 18th May 2013

Golfers are a happy lot! IMM organised a tournament where 80 golfers rose up early morning to test their skills with one another at the Kelab Rahman Putra Malaysia in Sungai Buloh. The tournament gave them an opportunity to drive and putt the balls as best as they could to win some handsome prizes in store. Shahrul Anuar is the champion this year with a score of 38. Those who did not win any prizes also went home smiling holding lovely souvenir electrical items.

Netek Collaboration with GSE

To provide a more value added turnkey industrial solution, Netek IR System A/S has established a cooperation agreement with General System Engineering Sdn. Bhd. (GSE).

GSE's vision is to design and developing an optimal industrial machines and integrated industrial system and to go for Global Synergy to converse the Environment.

GSE was established in 1992 as a project base engineering company, specializes in turnkey projects related to Surface Finishing System, Industrial Oven and Specific Industrial Process, include Integration of Industrial System.

Over the past 20 years of continuous commitment and effort in serving the industries at large & synergized collaboration with other engineering companies, GSE had successful implemented many projects in a diverse industries throughout the world. In return of the journey, GSE had earned much trust and recognition.

GSE's design principle is to focus on energy saving, CO2 reduction, clean environment, high yield, reliable & durable machine quality & design, smaller foot print, easy maintenance & inspection, flexible production method, expansion plan, last but not least to provide excellent after sales service.

Netek IR System A/S is a specialized company within CIR (Catalytic Infrared Radiation) technology. The need for drying and curing of coating systems in general has existed, ever since coatings started to be applied. Through the development of numerous kinds of multi layer coating systems, for all sorts of purposes, whether it is solvent- , water- or chemically based, the need for drying and curing has grown. Drying and curing concepts, by means of CIR technology, has been developed by Netek IR System A/S with great success, during the past 12 years, and our reference list has grown considerably over the years.
The key words for the Netek IR System concepts are:

- Faster drying and curing
- Energy savings
- Reduced emissions of CO2
- Reduced emissions of VOC
- Greatly improved coating quality
- Reduced process space requirement

The technology:
The IR emitter is based on a catalytic oxidation process, where the fuel gas (natural gas or LPG) is oxidized. The result of the oxidation process being CO2, water vapors (to the same extent as an ordinary combustion) and most important Infrared Radiation, having a wave length between 2 – 10 µm. Most paint systems, varnishes, lacquers and plastic products got emissivity figures between 6 – 8 µm, meaning that receiving IR beams from an IR emitter, emitting within this wave length becomes very efficient.

Netek IR System A/S is confident that the partnership with GSE, in expanded yet specialized scopes, brings the Netek CIR technology into forming an integral part of the GSE Turn Key solutions. As a team we will be able to strive technology and our service to next height, hence bring optimal values to our customer.

FT-IR FINGERPRINTING OF ORGANIC COATINGS: POSSIBILITIES AND PRACTICALITIES IN INDUSTRY

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ABSTRACT
Fourier Transform Infrared Spectroscopy (FT-IR) can be used as a quality control tool to fingerprint paint and coatings. The fingerprinting of the final cured coating or the uncured liquid paint are both possible; in each case it is possible to achieve good batch to batch correlation. However the effectiveness of fingerprinting in detecting formulation changes remains to be seen. The implementation of any fingerprinting program should take into consideration the constraints and standard practices of paint formulators, as well as other factors that may affect the performance of the final coating.

1. Introduction

The characterisation of organic coatings in industry has commonly involved the testing of a number of properties, some of which include hardness, flexibility and impact resistance. The appearance, such as gloss and colour, can also be measured. For protective coatings, outdoor durability and corrosion protection performance are critical; both can be tested for in accelerated weathering machines such as the QUV (A and B) and salt fog or cyclic corrosion chambers, even though the correlation with natural weathering data can be found wanting.

The application of analytical techniques in the characterisation of organic coatings has, however, been relatively slow to be accepted as standard practice among formulators and end users of the paints, particularly in developing countries where cost concerns are high and competition is intense. Apart from concerns about the high investment costs of the instruments, there are also issues in finding suitable personnel to use them since they require a certain amount of knowledge and expertise in order to be able to correctly analyse and interpret the data generated by these machines.

In the analysis of organic materials, FT-IR is one of the most versatile and useful tools available. It's applications in the analysis of organic coatings are routinely reported in scientific journals. While it has also been reportedly used as a quality control (QC) tool in the coatings industry, both in analysing in-coming raw materials and in analysing the final product to be shipped to the customer, this does not appear to be a standard industrial practice.

This article takes a look at the possibility of using FT-IR fingerprinting as a QC tool, and whether this is practical with regard to the paint industry.

2. Related Standards For FT-IR Fingerprinting of Organic Coatings

Two related ASTM standards on FT-IR are currently available [1, 2]. The first and older standard, ASTM D2621-87 (2011), involves the separation of the different components of paint (solvents, binders, pigments) via high-speed centrifuging. The separated components are then analysed individually. The analysis requires the careful and consistent application of a uniform thin film of the separated component onto a NaCl window. As the IR transmittance depends on the thickness of the film, it is therefore possible that different operators may generate spectra of varying quality. This method is intended more as a paint solids identification tool rather than as a fingerprinting technique.

The second and relatively recent standard, ASTM D7588-11, does not require the separation of the paint components. However, it requires the availability of a multiple or single bounce horizontal Attenuated Total Reflectance (ATR) trough plate to hold the liquid sample. The complete paint formulation is analysed, including the solvent. Sample preparation is convenient and the collection of spectrum requires minimal time and operator skill. However, solvent evaporation from the paint may occur during spectrum collection especially if the solvents are highly volatile. It is also noted in the standard that some paints may be unsuitable for this method as they may show many peak saturations (100% absorptions) which make the spectra inaccurate. This method appears to be similar to one reported much earlier [3].

3. FT-IR Fingerprinting of Liquid Paint

Despite the availability of related standards, a common method to fingerprint paints without separating the different components is by simply applying a thin film of the paint on a NaCl or KBr window, and proceeding with the scanning [4]. This is basically similar to the method of ASTM D2621-87 (2011) except without the centrifuging step. It does not require the ATR trough plate accessory as specified in ASTM D7588-11.

Figure 1 shows the spectra of seven batches of a single-pack epoxy primer for coil coating analysed as liquid samples. The samples were prepared by applying a small drop of paint onto a KBr disc. Another disc was then immediately put on top of the paint, effectively spreading it into a thin film and sandwiching it between the two discs. Scanning was then carried out and automatic baseline correction was applied on the resultant spectra.

c	Correlation
Batch 1 (Reference)	1.00
Batch 2	0.99
Batch 3	0.99
Batch 4	0.99
Batch 5	0.99
Batch 6	0.99
Batch 7	0.99

Table 1.Correlation forseven batches of uncured liquid epoxy primer on KBr disc

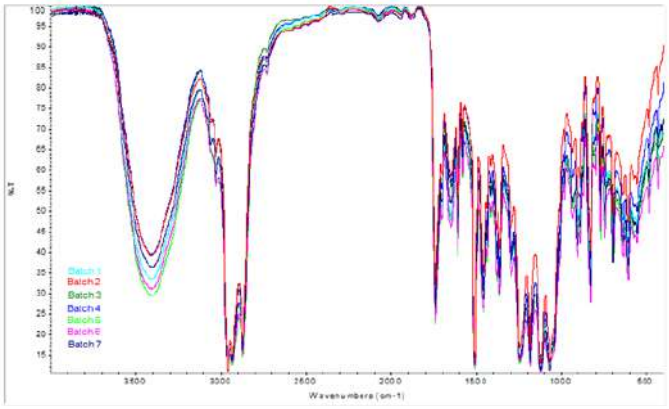

Figure 1. Transmittance spectra of seven batches of a single-pack epoxy primer for coil coating, analysed as liquid samples on KBr windows.

It can be observed in Figure 1 that the spectra are relatively consistent with each other even with the presence of solvents, which in this case were diacetone alcohol, xylene and some ester solvents. The consistency is reflected Table 1, which lists the correlations (degree of similarity) calculated by the FT-IR software. The correlations are very good at 0.99 in all cases.

The results show that it is possible to obtain good correlation by fingerprinting liquid paint. However, caution is strongly advised since the reproducibility of the method will depend on several conditions such as paint viscosity, which determines the ease of obtaining a suitable film thickness, and the operator performing the analysis. It is important that whatever method is developed must be evaluated carefully to ensure its repeatability and reproducibility before being implemented.

It is advisable to keep the maximum peak intensity in the transmittance spectrum at approximately 10% or above, or as specified by the instrument supplier. This is to ensure that there are no peak saturations which will affect the reliability of the measurement. A critical factor determining the transmittance is the film thickness of the paint applied onto the KBr discs. This is therefore a major difficulty with this method, especially if the paint has a high viscosity and is difficult to be applied into a thin film. The consistency of sample preparation could then become an issue. The alternative would be to use the ATR trough plate accessory but that is also no guarantee of eliminating peak saturations completely [2].

It should be pointed out that the most important component of a paint is the binder system because it determines the property and performance of the final coating. The solvents are there to ensure processability of the paint and that it has the right rheology to make its application as easy as possible, as well as to aid the proper film formation of the final coating. The solvents will also be eventually removed.

In practice, it is very common in the coatings industry to adjust paint rheology using solvents, thus the amount used from batch to batch may differ. Sometimes other solvents may also be added, even on site prior to applying the paint. More importantly and if done appropriately this practice does not negatively impact the quality of the final coating. Therefore the fingerprinting of a complete paint including solvents has to take this into account in order to avoid the unreasonable rejection of a batch of paint.

4. FT-IR fingerprinting of cured coating

Figure 2 shows the spectra of seven batches of the same single-pack epoxy primer, fully cured on galvanised steel substrate. The spectra were recorded on an ATR plate with ZnSe crystal. Again, it can be seen that the spectra are consistent among the seven batches, also with good correlation calculated from the FT-IR software (Table 2) at 0.98 and higher. Visually, the spectra also appear simpler compared to those of uncured liquid samples. This is because the solvents are no longer present, in addition to the lower sensitivity of the ATR technique.

While there do not appear to be any advantages of fingerprinting cured coatings over liquid paints in terms of correlation, there are good arguments to fingerprint the cured coating instead of the liquid paint.

A two-pack thermosetting paint such as an epoxy-amine system has to be mixed in the correct ratio specified by the paint supplier. The mixture is then allowed to cure and solidify into the final coating.

If fingerprinting is carried out on each component of the system separately, i.e. the epoxy and the amine, it may not ensure that the final coating is of the expected quality, since the final coating requires that the two components are added in the correct amounts and would probably need to be mixed in a certain way, for a certain duration, and to be used within a limited amount of time due to a short pot-life. In this situation, fingerprinting of the liquid paint may become almost meaningless apart from ensuring that they are consistent from batch to batch.

Sample	Correlation
Batch 1 (Reference)	1.00
Batch 2	0.99
Batch 3	0.99
Batch 4	0.98
Batch 5	0.98
Batch 6	0.99
Batch 7	0.99

Table 2.Correlation for seven batches of cured epoxy primer, scanned on an ATR plate with ZnSe crystal.

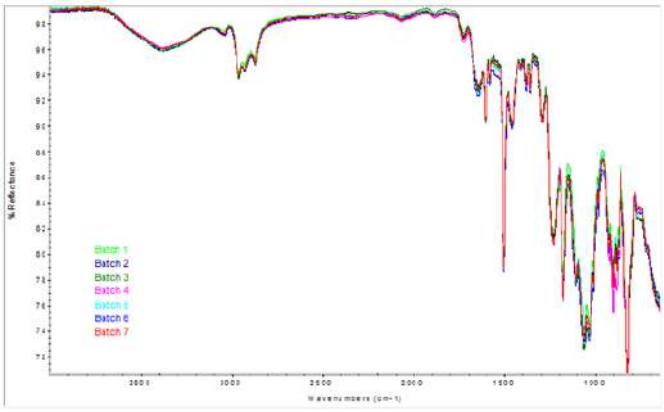

Figure 2. Reflectance spectra of seven batches of cured epoxy primer, scanned on an ATR plate with ZnSe crystal.

It is therefore desirable to complement the fingerprinting of liquid paint by also fingerprinting the final coating. If each batch of paint is mixed and cured properly, it is possible to obtain consistent spectra and any paint significantly out of specification can be detected. This is also applicable to single-pack systems since in certain cases it is possible to ascertain the degree of curing of the coating, which significantly determines the final coating performance.

A second argument in favour of fingerprinting cured coatings is that changes in formulation (not solvents) may be detected more easily, as discussed in the following section.

5. Reliability of fingerprinting in detecting changes in formulation.

The data in the previous sections shows that good correlation can be obtained between different batches of the same paint. However, if there are some changes in the formulation, could this be detected by looking at how the correlation is affected?

Figure 3 shows the spectra of one batch of the liquid epoxy primer on KBr window, and three other samples of this primer deliberately mixed with different amounts of a polyester resin. The spectra do not show obvious trending differences apart from the carbonyl region at ~1730 cm^{-1} and the band at ~1300 cm^{-1}. The correlations are listed in Table 3.

From Table 3, it appears that the correlations are good, even with a significant 10% addition of polyester resin at 0.97. Without looking closely at the differences in the spectra themselves, one could have quite easily assumed that the paints with 2% and 5% polyester resin are acceptable and the issue would have gone undetected until a failure occurs. This obviously raises doubts about the effectiveness of fingerprinting in detecting changes in formulations.

Sample	Correlation (400-4000 cm-1)
Epoxy primer (Reference)	1.00

Epoxy primer with 2% polyester resin	0.99
Epoxy primer with 5% polyester resin	0.99
Epoxy primer with 10% polyester resin	0.97

Table 3. Full range correlationfor liquidepoxy primer and three samples added with different amounts of polyester resin

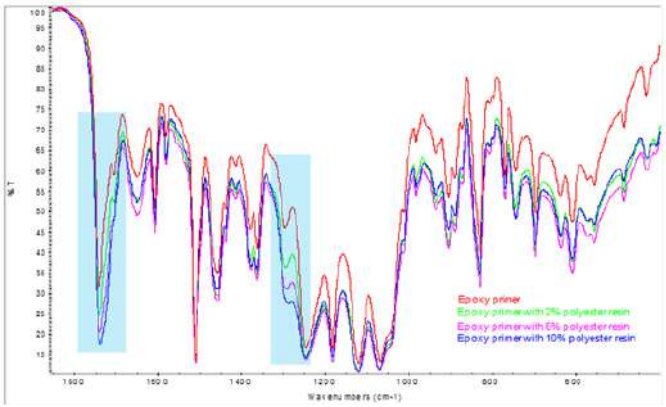

Figure 3.Transmittance spectra of liquid samples of epoxy primer and three samples mixed with different amounts of polyester resin. Regions highlighted in light blue indicate the bands most clearly affected by the addition of polyester resin. Only the wavenumber range 400-1850 cm^{-1} is shown.

Figure 4 shows the spectra (ATR plate, ZnSe crystal) of one batch of the cured epoxy primer, similarly mixed with different amounts of the same polyester resin. The spectral differences are now clearer especially at the carbonyl region at ~1730 cm^{-1} which is significantly affected by the polyester resin. In the previous example with liquid paints, ester solvents and those with carbonyl groups such as diacetone alcohol have a significant absorption at the carbonyl region. These were no longer present in the cured coating, making the differences in this region more visually obvious. However, the full range correlations listed in Table 4 again do not show significant differences except for the sample with 10% polyester resin at 0.95.

Sample	Correlation (650-4000 cm^{-1})	Correlation (1690-1780 cm-^{1})
Epoxy primer (Reference)	1.00	1.00
Epoxy primer with 2% polyester resin	0.99	0.81
Epoxy primer with 5% polyester resin	0.98	0.71
Epoxy primer with 10% polyes-ter resin	0.95	0.63

Table 4. Correlation for cured epoxy primer and three samples added with different amounts of polyester resin

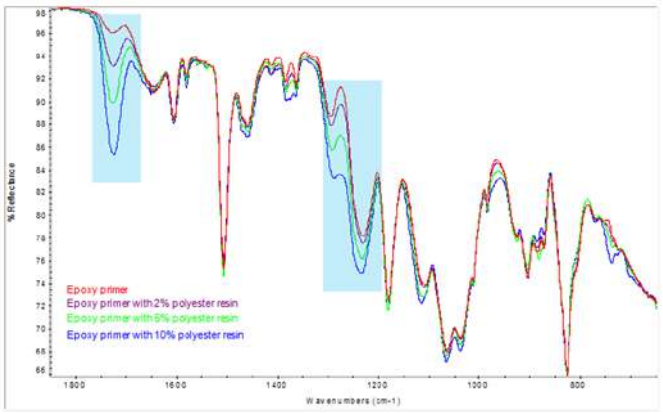

Figure 4. Reflectance spectra of cured samples of epoxy primer and three samples mixed with different amounts of polyester resin. Regions highlighted in light blue indicate the bands most clearly affected by the addition of polyester resin. Only the wavenumber range 650-1850 cm^{-1} is shown.

One way to overcome this difficulty is to calculate the correlation only at certain regions, in this case at the carbonyl region which shows up the differences in correlation much more tellingly (Table 4). However, this requires that the analyst is very familiar with the paint spectrum in order to pick up unusual and sometimes tiny differences and then proceed to carry out further analysis and comparisons. A certain level of skill in FT-IR interpretation and knowledge of paint formulations are needed in order to do this effectively.

Another alternative is to carry out high sensitivity correlation comparison over the full spectrum range, if this option is available in the FT-IR software. When using this, one has to be extremely careful in determining the acceptable threshold since very similar materials may show large differences in correlation. There is a danger that perfectly good batches may be unnecessarily rejected.

There are techniques which allow the detection of small changes by analysing and comparing specific bands in the FT-IR spectrum. However, this again requires skilled personnel and would not be a simple and routine QC procedure.

6. Practicalities in Industry

A thorough discussion about the practicality of introducing an FT-IR fingerprinting program in the paint industry is difficult, since many manufacturing and application practices need to be considered, and these may differ considerably among formulators and end users. Some of these practices have been pointed out in the previous sections. Very importantly, different types of paint may require different preparation techniques for analysis, and some knowledge of the paint formulation needs to be available in order to obtain a meaningful interpretation. Furthermore, as can be seen in section 5, a certain level of skill is required to compare spectra visually and effectively instead of relying completely on the software to calculate correlations which may not clearly reveal that changes have been made to the formulation.

Before implementing a fingerprinting program, it is important to understand how to use this tool appropriately in accordance with the situation and also to understand its limitations with regard to reducing the problems observed in the field.

In the industry, it is always very easy and natural for the coating to be blamed if it fails since it is the most obvious thing on the surface of a substrate. However, things are not always what they seem and it is usually necessary to look beyond the surface in order to find out the root cause of a failure.

Apart from ensuring that the paint supplied is of the expected quality and consistency, there are several important factors that must be

to be contd at page 26

Metallic Nanoparticles and Its Primary Future.

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'We know accurately when we know little, with knowledge doubts increases'
Johann Wolfgang von Goethe

When scientist pushes their boundaries by going nanosize, a whole new world of opportunities unveils. Indeed the nanosizeworld has increases the doubts of every possible mind with their uniqueness and possibilities.Nanomaterials by definition arematerial either a natural occurring, incidental or manufactured that contains particles where more than half of its distribution is in the size between 1-100nm [1]. To get the picture of how small nanosize is, the width of human hair is approximately 80 000 nanometres. Therefore, nanomaterials in general exhibits properties differ from it bulk counterpart due to their size difference. Up to date there are several inventions that have seized the world's attention. Hydrophobic coatings that able liquid to slide easily on their surface, carbon nanotubes that have the highest tensile strength recorded and development of gold nanoparticle as a cancer marker are some of the pronounced examples.

Metals as beneficial as it is in their bulk form, Nanometallic materials also possess similar charms.The development of microelectronics industry and manufacturing development of electronics nowadays is moving rapidly; metals generally and nanometallic materials specifically are the most outstanding ingredients that make the industry wider. Nanomaterials itself that have the special structure on their atoms and molecules in doing helpful assistances in industry base on their designed properties.When come into nanometallic materials, the specific metal with the specific characteristics will have the ability to control or manipulate on the system atomic scale hence creating devices that have novel properties and functions because of their small size. Among metals, silver is one of the precious metal that might as well has the highest thermal and electrical conductivity and one of the highest optical reflectivities.Silver is the best conductor of heat and electricity of any metal on the periodic table. Silver also has the lowest contact resistance of any metal. Silver is stable in pure air and water, but tarnishes when it is exposed to air or water containing ozone or hydrogen sulfide, the latter forming a black layer of silver sulfide which can be cleaned off with dilute hydrochloric acid.
In the area of nanotechnology, nanosilver, one of the nanometallicmaterial has famously giving impact in healthcare product. It is known as its antibacterial and antifungal properties, also hasbeen used for treatment of medical ailments for almost century back. The core technology of Nanosilver is the ability to produce particle as small as possible and to distribute these particle very uniformly. When the nanoparticles are coated on the surface of any material, the surface area is increasing several million times than the normal silver foil. With its maximized surface area, nanosilver will unite with the cell walls of pathogenic bacteria, will then directly get inside the bacteria and improve the bactericidal and fungicidal effectiveness. It quickly combines with sulphydryl (-SH) of oxygenic metabolic enzyme to deactivate them, to block inhalation and metabolism and suffocate the bacteria. The nanosilver suppresses respiration, which is the basal metabolism of electron transfer system, and transport of substrate in the microbial cell membrane. The nanosilver inhibits multiplication and growth of those bacteria and fungi which later cause infection, odour, itchiness and sores. Besides, this beautiful property of nanosilver also has been applied to other healthcare as well as female hygiene products. Many researchers are focusing on the possibility to be used in conquering the "super bacteria" which is threatening human life in the future. In addition, nanosilver will not expire. Light, heat and radiations will now affects its healing qualities. Nowadays, nanosilver technology is used in coating the surface of electronics such as washing machine; carbons or carbon blocks, textiles, metals, woods, ceramics, glass, papers, mixing to the plastics resin, using in fiber and many others.
At Advanced Materials Research Laboratory, University of Malaya, extensive research is currently taking place regarding nanosilver. One of such is synthesis of nanosilver composite which predicted to have metamaterialproperties.Metamaterials are defined as aspecial materials engineered to have properties that is extraordinary or may not be found in nature. Metamaterials gain their desired properties not from their composition, but from their exactingly-designed structures. Their precise shape, geometry, size, orientation and arrangement can affect the waves of light or sound in an unconventional manner, creating material properties which are unachievable with conventional materials. These metamaterials achieve desired effects by incorporating structural elements of sub-wavelength sizes, i.e. features that are actually smaller than the wavelength of the waves they affect.[2][3][4]

The greatest potential of metamaterials is the possibility to create a structure with a negative refractive index, since this property is usually not found in any natural materials. Almost all materials encountered in optics, such as glass or water, have positive values for both permittivityε and permeabilityμ. However, many metals such as silver, have negative permittivity at shorter wavelengths. A material having either ε or μ negative is often opaque to electromagnetic radiation. However, materials with only negative permittivity can produce negative refraction due toconditions of a non-superimposable mirror.

In attempt to this requirement, a special artificial nanocomposite silver-based with negative refractive index is one of the on-goingresearches in our centre. Nanosilver as the metal elements that has the highest electrical conductivity among all metals.Nanosilver can be obtained from bottom-up approach bysynthesizing silver from silver nitrate and using polyethylene glycol as the reductant. Based on the U-V Visible

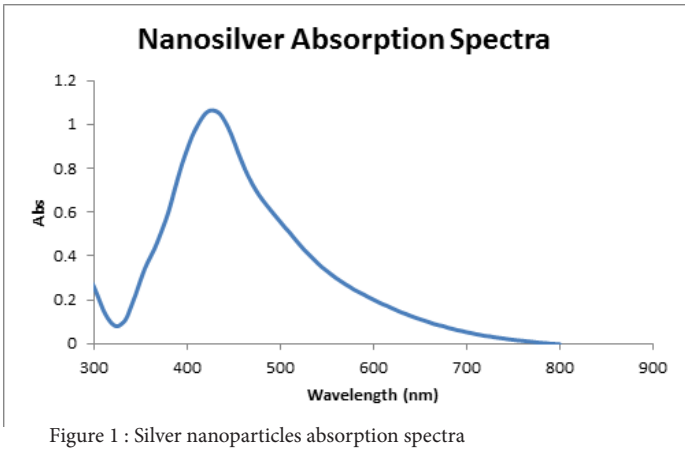

Figure 1 : Silver nanoparticles absorption spectra

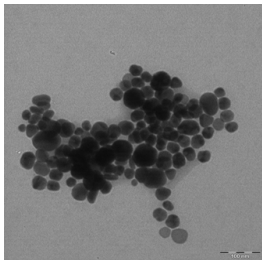

Figure 2 : TEM image of silver nanoparticles.

Spectra (figure 1), the absorption will be in the range of 420-430nm which indicates that nano size of silver particles exist.
Nanosilvers, that have been abstracted as shown in figure 2, will be coated with silica and functionalized with aminopropyltriethoxysilane on the surface, later. Other compounds are then could be coupled to the newly added amino groups directly prior to the desired properties. This addition of amines, which will be act as a crosslinker and immobilizer of other molecules.This simple and easy methodology by combination of nanochemistry and self-assembly techniques, further objective to gain materials based on silver composites exhibits with metamaterials properties can be fabricated.

Other material that also captures our researcher's attention is nanogold. Although it does not look shiny and expensive as it is in the bulk form, gold if its small enough it would turn yellow, blue, red and several other colours based on their respective size. Absorption spectra of nanogold usually lies within the range of 520-540nm as shown in figure 3. Normal gold is gold in colour, inert and conducts electricity in comparison with nanogold which is a very good catalyst and turn into semiconductor instead. There are several other interesting properties of nanogold that enable it to be useful in different area. Properties of this element can be tailored by varying the size and elemental composition of the particles. Gold-based catalysts can effectively prevent the release of highly toxic forms of mercury in the atmosphere, reduction of chemicals from green feedstock and developed to meet the challenge of constructing an effective fuel-cell. According to scientists in Japan, gold displays excellent catalytic abilities when it is shrunk to 3nm to 5nm however nanogold that has sizes outside this range will remain it inertness [5]. Having unique bio-compatibility, the future of nanogold in biomedical area is rather bright. Cancer targeting drug delivery gold nanoparticle is being developed to target cancerous cell and once it sticks to the cell it has the ability to hindrance the growth of the cell. This is rather useful in detecting early stage of cancer. The application is not restricted with these two prime areas but the compability is way beyond. In advance technology area, nanogold has shown to offer benefits for visual display technology besides than the possibility to develop a new kind optical chip based on the principle that the gold shine in different way in nanosize. The applications have clearly demonstrated the flexibility and compability of nanogold. Figure 4 shows the TEM image of gold nanoparticles synthesized in the Advanced Materials Research Laboratory, University of Malaya.

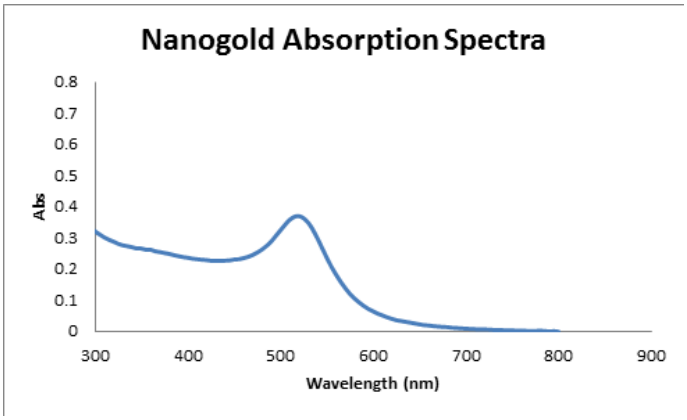

Figure 3: Gold nanoparticles absorption spectra showing a peak at 520nm

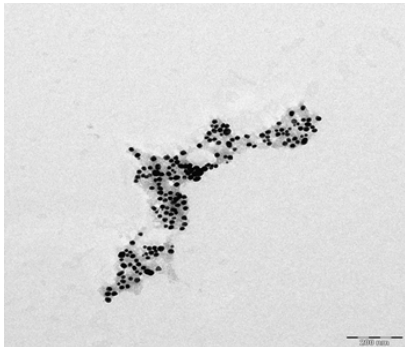

Figure 3 : TEM image of gold nanoparticles

In area of sensor development, nanoplasmonic structure is usually used as substrate for trace analyte detection using surface enhance Raman spectroscopy (SERS). However, this sophisticated structure is complicated to fabricate. Researchers from London proposed that self-assembly nanoparticles in close-packed structure offer more straight forward and cost effective solution to this problem. Gold nanoparticles were assembled at the liquid/liquid or liquid/air interfaces where the density of the arrays can be easily controlled by modifying the nanoparticles functionality, pH of the solution and salt concentration. The nanoparticle substrates can be used for detection of multi-analytes from different phases such as aqueous, organic or air. The array of the nanoparticles at liquid/liquid interface (LLI) can be achieved by simply vigorously shaking 2ml polypropylene tube containing 1,2-dichlororethance (DCE) and aqueous solution for approximately 10 s. The aqueous solution consists of NaCl and Au nanoparticle.The resulting emulsion will quickly separate into two distinct phases with the formation of a thin layer of self-assembled nanoparticle. To perform SERS for detection, the sample was then transferred onto a coverslip which resulted in the nanoparticle forming a thin film. [6]

The idea was further developed for sensor application, where individual analytes were dissolved in either aqueous or organic phase using the same concept as before. Thedesign has unique ability to simultaneously dress nanoparticle with analytes with different solubilities across multiple phases. This allows for direct control of the analyte type and relative concentrations of different analytes on the nanoparticle surface. The flexibility and ease of assembly as well as rapid detection makes this platform ideal for in-field sample testing of toxins, explosives narcotics or other hazardous chemical which if fully developed could reduce operation as well maintenance cost [6].

With demand of industry and based on the special characteristics of silver and gold, further research and investigation will be conducted to achieve greatest properties. However, development on the application of gold is a non-cost effective as we know it is the first luxurious and precious element in earth. Friends of the Earth also, has criticized silver nanoparticles, claiming that considerable of silver could have a toxic effect on different kinds of living cells and also might enter sewage plants and seriously trouble the biological purification process of water waste. We can encounter this only by accumulating a very small amount of nanogramsgold and silver per products, while the released silver-ions quickly bind to non-nano-sized structures in the water.

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INVERSE IDENTIFICATION OF CONSTITUTIVE PROPERTIES

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ABSTRACT

Most of us are familiar with performing forward analysis where we use known properties and existing equations or numerical simulations as input to calculate or predict the outcome or responses of our systems. With the advancement in computer technologies, inverse (or reverse) analysis becomes more tractable and thus widely used. In inverse analysis, the observed outputs or responses are used to determine the input, which is the opposite of forward problems. Inverse analysis has been utilised in a wide range of applications, including the identification of constitutive (stress-strain) properties from tests which is the focus of this article. Conventionally, constitutive properties are determined using homogeneous tests such as the uniaxial tensile or compressive test where simple equations exist to convert force-displacement data into stress-strain properties. On the other hand, the use of inverse analysis allows for parameter identification from experimental tests that may not normally be considered as conventional.

Introduction

A simple example of an inverse analysis is in finding a line fit to a set of experimental data. For example, assume that we have a set of experimental data that we would like to fit a line of equation

$$y=mx+c$$

where y is the response that we measure as a function of the variable x, with m and c being the unknown constants to be determined. The first step of the inverse analysis is to define an objective function, Φ, which describes the difference between the measured experimental observations and the predicted response. A commonly used objective function is the sum of squared residuals, i.e. the least squares method

$$\Phi = \sum_{i}^{N} (y_i - y^*_i)^2$$

where y_i and y^*_i are the predicted and measured response corresponding to the ith data point respectively. The purpose of the inverse analysis is to adjust the values of m and c so that the objective function becomes as small as possible. Effectively the objective function describes the difference between the line and the experimental data, and its value becomes minimum (or zero in the case of perfect fit) when the line best matches the experimental data.

To adjust the values of m and c, optimisation algorithms are used. These algorithms may be based on gradient methods or other metaheuristic methods such as simulated annealing, neural network or nature-inspired algorithms such as ant colony optimization. The gradient based methods minimize the objective function via iterative processes which are guided by the first and possibly second order partial derivatives of the objective function[1]; in other words, the search for the values of m and c in our example depends on perturbing the guess values of m and c by a small amount and selecting the direction of search which reduces the objective function. On the other hand, metaheuristic methods attempt to explore as many solutions as possible through trial-and-error and adaptation processes and as such tend to be more computationally expensive than gradient based methods[1]. Due to its efficiency, the Levenberg-Marquardt method, which is gradient based, is a popular algorithm used in parameter identification from experimental data.

The concept of the inverse analysis may be summarised in Figure 1. Initial guesses are first made for the unknown parameters. These guesses are used as input to calculate the response of the system. For this step, the use of numerical simulations such as finite element models is necessary to calculate the responses of complex problems. The calculations are compared with the experimental observations, and if they do not match, the guesses are changed and the calculations are repeated. These steps are done in an iteratively manner within the optimization algorithm until the objective function reaches its lowest magnitude and the guesses become the solution that we attempt to determine.

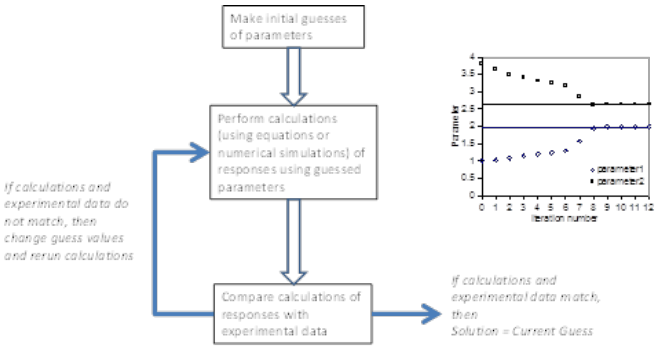

Figure 1: Schematic of flow of an inverse identification of parameters. The inset diagram shows how the guess values (represented by markers) may vary with subsequent iterations until they finally match the solutions (represented by lines).

It is possible to run an inverse analysis of the line fit example using an Excel spreadsheet. A number of columns may be set up to contain the values of y_i and y^*_i corresponding to different data points. The sum of the squares of the difference between y_i and y^*_i can be calculated in a cell and the Solver function can be run to minimize the error between y_i and y^*_i. Note that the Solver function in Excel uses the generalized reduced gradient method to perform the optimisation process.

Application to Engineering Problems

Although line fitting is a commonly performed task in engineering, the nature of the exercise is relatively trivial compared to other engineering problems where analytical equations are not feasible and where numerical simulations such as finite element analysis become important. Early examples where inverse analysis was used linking experimental data with numerical simulations include the estimation of current density and galvanic corrosion rate (see Mackerle and Tanaka for a review[2]).

The motivation in applying inverse analysis in identifying constitutive properties arises for a combination of two reasons - (1) tests involve inhomogeneous deformation and may be influenced by other factors such as sample geometry and friction; (2) the material is complex e.g. it exhibits non-linearity and time dependency or it is non-uniform. These reasons make it difficult if not impossible for force-displacement data to be converted into stress-strain properties and thus require the use of numerical simulations to incorporate the non-linearity, time dependency, non-uniformity as well as geometrical and surface effects.

The role of inverse analysis in expanding the field of constitutive identification can be clearly seen in the indentation test. Whilst indentation tests are traditionally used to provide single point measurements of hardness, the desire to characterise the flow curve from the test as well as the need to characterise more complicated materials and at the nano-level (via nanoindentation tests) has seen inverse analysis being used widely in current characterisation techniques. Thus, inverse analysis has been applied on the indentation testing of a range of materials and at different scales (macro-, micro- and nano-) [e.g.3-6]. The benefit of extracting constitutive properties from such tests is that in addition to the conventional hardness measurement which is an index useful for quality control or sample comparison, the availability of the constitutive properties provides a more detailed knowledge of the material behaviour and allows for more accurate prediction of the material behaviour during performance.

Example

The following is a simple example where inverse analysis is applied to determine constitutive properties from a test that traditionally is not

used for such a purpose. The example is based on the puncture test which is commonly used to determine puncture resistance of materials. Here, we will attempt to determine the elastic-plastic constitutive constants using the force-displacement data from the test. The material is assumed to be characterised by a bilinear stress-strain relationship which is commonly used in characterising the substrate behaviour in adhesive peel tests[b]. For the bilinear elastic plastic relationship (Figure 2), the parameters that can be obtained are the Young's modulus E, the initial yield stress σy and the bilinear hardening stiffness E'. Preliminary data suggested that the puncture force-displacement response was not significantly sensitive to the Poisson's ratio. Hence, the Poisson's ratio was assumed to have the value of 0.499.

A schematic of the puncture test is shown in Figure 3. The test was simulated using the finite element code ABAQUS. The probe was assumed to be frictionless, but the sample was assumed to stick to the bottom plate and the clamping surface. The probe and the clamp were modelled using rigid analytical surfaces while the sample was modelled using 2-D axisymmetric elements. The inverse problem was defined as determining E, σy and E' by matching the predicted forces P to the measured forces P^*. Ten points were extracted from the force-displacement data for the analysis.

The inverse analysis was tested using numerical data for five cases based on fictitious constitutive parameters as shown in Table 1. The numerically computed force-displacement data for these cases were used as the 'measured' force-displacement values. The inverse analysis was performed using initial guess values $\sigma y/E$=0.01 and E'/E=0.5 each time.

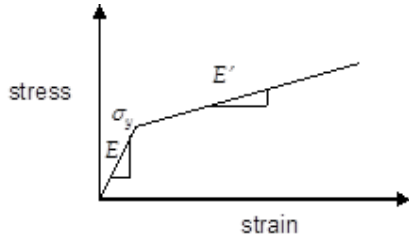

Figure 2 Stress-strain curve of a bilinear elastic-plastic material.

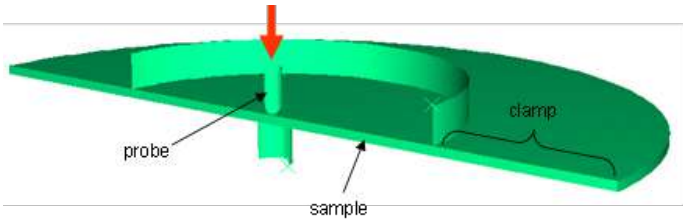

Figure 3 Schematic of finite element model (not to scale).

The results of the inverse analysis are summarised in Table 1 and the predicted stress-strain curves are shown in Figure 4. In general, the predictions of σ_y and E' are in close agreement with the solutions, with slightly higher errors found for cases with higher values of E'. These results show that inverse analysis can be used to extract constitutive properties from tests that are not conventionally used for such purposes.

	Input			Predicted		
	E	σ_y	E'	E	σ_y	E'
case 1	1.00	0.0825	0.334	0.996	0.0832	0.336
case 2	1.00	0.00423	0.777	1.04	0.00514	0.742
case 3	0.500	0.00120	0.450	0.497	0.000965	0.448
case 4	2.00	0.110	0.222	2.01	0.110	0.222
case 5	1.00	0.0505	0.101	1.00	0.0505	0.101

Table 1 Comparison between the input constitutive parameters and the predicted values from the inverse analysis (in MPa).

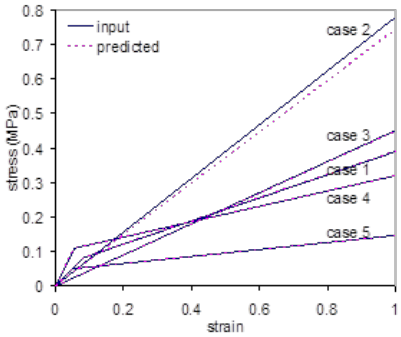

Figure 4 Comparison between the input stress-strain curves and the predicted curves from the inverse analysis.

Challenges

Two main challenges are typically associated with inverse identification of constitutive parameters :

Uniqueness, i.e. there is more than one set of constitutive parameters that can give rise to the same observed response. A way to overcome this problem is by using as many sets of data as possible in the inverse analysis. For example, for the indentation test, the force-displacement data corresponding to a number of geometries may be used simultaneously, or in the case of time dependent materials, data pertaining to different rates of deformation may be used. However, additional data sets require an increase in computational effort thus there is a practical limit as to how many sets of data should be used to increase the reliability of the analysis.

Convergence, i.e. the inverse analysis may not converge to the best possible set of parameters. This problem is well known for the Levenberg-Marquardt algorithm due to its convergence to a local minimum rather than the global minimum. The occurrence of local and global minima may be seen in Figure 5, where varying the material parameters may lead the objective function into a 'valley' which may not correspond to the lowest value (i.e. the global minimum) in the system. Selecting other optimization methods, such as simulated annealing, may overcome this problem. However these methods are typically heavily resource intensive and thus are not practical. Another simpler solution would be to attempt the inverse analysis using different initial guesses and select the results which give the lowest magnitude of the objective function.

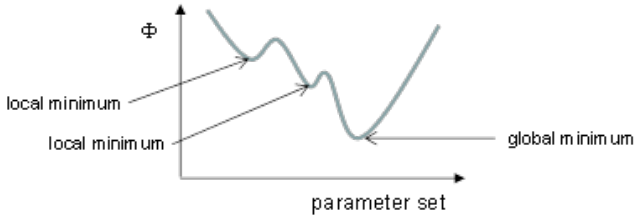

Figure 5 Illustration of the objective function having two local minima and one global minimum as a function of the parameter set.

Summary

Inverse identification of constitutive properties offers the possibility to characterise materials via unconventional test methods. This opens up a range of opportunities, for example, material properties may be measured in-situ during processing or during actual application without resorting to mechanical testing done separately. A requisite for successful inverse identification is that the process or usage or test conditions can be reasonably modeled using either analytical equations or for more complex systems, numerical simulations such as finite element analysis. With the advancement in numerical simulations as well as computer technologies, it is likely that inverse analysis will become more common

to be contd at page 26

in the future, not just for the identification of constitutive properties, but also for other properties as well.

Announcement

Curtin Sarawak Research Institute (CSRI) and Curtin University Sarawak, along with co-organisers Universiti Utara Malaysia and Universiti Putra Malaysia, will be organising the inaugural International Conference on Analysis and Mathematical Applications in Engineering and Science on 19th-24th January 2014. The conference will cover a spectrum of mathematical analysis and applications in engineering and science including optimization techniques and applications, control theory and applications, dynamic systems, modeling and numerical methods and inverse analysis. You are welcome to participate in the conference and to refer to http://csri.curtin.edu.my/?page_id=31 for more information.

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considered when analysing a coating failure. These include substrate quality, substrate preparation, paint application procedure, paint curing process and coating thickness, just to name a few. These are factors that cannot be prevented by any FT-IR fingerprinting program, no matter how good it is.

7. Conclusion

In order to set up an effective FT-IR fingerprinting program, the right method must be carefully developed according to the type of paint and application. While the fingerprinting of liquid paint is desirable, it may be more practical to fingerprint the cured coating instead. It is also critical to have personnel with the right skills in spectral interpretation in addition to having some knowledge of paint formulations.

Finally, FT-IR fingerprinting should not be used as the main QC tool for paints. It should only be used to complement the existing tests that are being performed. Other analytical techniques are available and can be employed to increase the assurance that the paints meet the specification intended for a particular application.

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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 committee, 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 - 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 8 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, American corrosion society 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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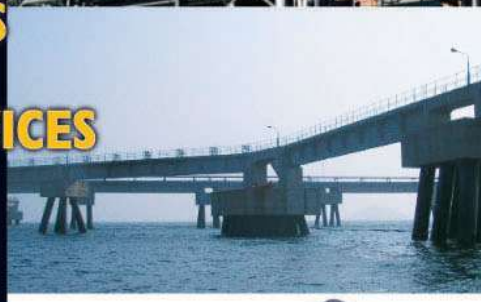

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Towards Fingerprinting of Polymeric Coatings II

Date : *11th October 2013*
Time : *1.30pm - 6.00 pm*
Venue : *Tanjung Puteri Golf Resort in Pasir Gudang, Johor*
Jointly Organised by: *IMM Polymer Committee & IMM Coatings Committee*
Co-organized by : *Malaysian Offshore Contractors Association (MOCA) & IMM Southern Chapter*
Co-sponsored by : *Hempel (M) Sdn. Bhd, Kansai Coatings Malaysia Sdn. Bhd., Research Instruments Sdn. Bhd.*

Introduction

Many years ago, the Oil & Gas industry discussed the idea of establishing a QA/QC system to check on the quality of paints supplied to the oil & gas industry. There were concerns regarding the cost reduction initiatives - that paint manufacturers may supply "cheapened formula" products labelled as the actual high quality products approved by the oil companies. Scientific testing technologies were not available then for the protective coatings to be "fingerprinted" like metals & alloys, which can be checked against its mill certificates obtained via spectrometers and in-house laboratory QC tests. The idea naturally died off. It is believed that the oil & gas industry continues to be plagued with supply of non-conforming protective coatings due to fierce price competition. Materials testing technologies have advanced exponentially over recent years that it may be possible for polymers to be "fingerprinted" in the near future.

This will be the second of a series of such forums, as the initiative towards "Fingerprinting" technology for polymeric coatings will require many rounds of discussion amongst interested parties.

Objective

The forum is aimed at dispelling the notion that there is no way to fingerprint the polymer coatings on the pipelines for oil and gas industry. Forum of "Towards Fingerprinting of Polymer Coatings" I held on 22th March 2013 by Institute of Materials, Malaysia had sent out the clear message that, there are ISO standards for of fingerprinting the polymer coatings and most importantly, the users are urging the paint manufacturers to provide "Mill Certificates & QC test reports" for the products supplied in order to ensure conformation of the approved specifications.

First draft of the Fingerprinting "Mill Certificates & QC test reports" will be presented during the forum which is proposed by the "Task Force on Coatings Fingerprinting". This Task Force is chaired by a PETRONAS representative with IMM Polymer Committee as facilitator and advisor. The key element of forum shall focus on "what are the proposed elements to be listed inside this "Mill Certificates & QC test reports". The ultimate objective is to ensure that protective coatings manufacturers supply products according to specifications.

We plan to have 4 presentations of 20 minutes each covering:-

a) Chemical Analysis Approaches in Polymeric Coating Identification.
   (Speaker: Prof. Dr. Mohamad Kamal Harun, Universiti Malaysia Kelantan and Universiti Teknologi MARA).
b) Production and Quality Control of Paint.
   (Speaker: Mr. Frankie Chua Cheng Huat , PLC Laboratory Sdn. Bhd)
c) FTIR Application in Coating Industry.
   (Speaker: Ms. Renee Teo Yong Yin, Research Instruments Sdn Bhd)
d) Qualification for New Maintenance Painting System and Products for Offshore Application.
   (Speaker: En. Muhd Hawari Hassan, PETRONAS GTS Dept)

Besides, a demonstration of fingerprinting of primers and hardeners as well as finished goods of epoxy coatings by FTIR will be provided after the four presentations. A 30-min floor discussion will be carried out after the FTIR demonstration.

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