A quarterly magazine PP 18691/01/2018 (034114) / ISSN 2289-9030

MATERIALS MIND

Issue 26
October 2019

www.iomm.org.my
Institute of Materials, Malaysia

CORROSION

HIGHLIGHTS

- Cost of Corrosion: Roles of Education and Technology
- Silver Sulfide-Based Nanocomposite: Synthesis, Characterization and Its Red/Near-IR Light Driven Photodegradation Activity
- Big Wave - Mock Execution of Polymeric Coating Fingerprinting for IMM Standard and/or SIRIM Industry Standard
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INSTITUTE OF MATERIALS, MALAYSIA
Suite 515, Level 5, Block A, Kelana Centre Point (Lobby B), No. 3 Jalan SS 7/19, Kelana Jaya, 47301 Petaling Jaya, Selangor
Tel: +603-7880 1753

secretariat@iomm.org.my
www.iomm.org.my
+60 18-911 3480
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Cost of Corrosion: Roles of Education and Technology

Ir. Ong Hock Guan[1] and AP Ir. Dr Mokhtar Che Ismail[2]

[1]Delivery Manager (Technical Authority level 1), Materials, Corrosion and Inspection Engineering, Shell Malaysia Upstream. (IMM Corrosion Committee – Chairperson)
[2]Head, Centre for Corrosion Research, Universiti Teknologi PETRONAS (UTP). (IMM Corrosion Committee – Deputy Chairperson)

The economic impact of corrosion can be viewed in term of Capital expenditure (CAPEX), Operating expenditure (OPEX) and Health Safety and Environment (HSE) aspects. Quantifying the Cost of Corrosion (COC) in these categories is not an easy task. A general assessment of the global COC that implicates many industries boils down to issues relating to competency of workforce and successful implementation of technologies in corrosion mitigations and controls. It is also common to categorize corrosion costs in terms of "avoidable" and "unavoidable". Savings under cost avoidance may be realized by better use of existing or currently available technology together with greater corrosion awareness and education with life-cycle cost analysis. By contrast, there are other types of unavailable costs that must be incurred because of the realities in the world we live. Reduction of costs that are currently unavoidable or even potentially avoidable will depend on advancement in new technologies, and this creates challenges for research and development (R&D). While cost is an important consequence of poor corrosion control and awareness, of equal importance is the potential impact of corrosion on HSE. If left unchecked and poorly controlled, corrosion can seriously affect asset integrity as well as its serviceability. This often raises the risk of leaks and discharges of flammable fluids and gases that potentially cause serious health and safety hazards.

Figure 1: Metal corrosion that leads to material damage and component failure.

Therefore, in capital-intensive economic sector such as oil and gas industry, with assets ranging from wells, risers, offshore pipelines, drilling rigs, and offshore platforms in the upstream segment, to onshore pipelines, liquefied natural gas (LNG) terminals, Gas to Liquid (GTS) plants and refineries in the midstream and downstream segments, it is challenging for corrosion professionals to analyze and propose new approaches to maintain assets integrity costs effectively. Assets integrity can be compromised by corrosion that manifests in many different forms and requires comprehensive corrosion management program. It is reported that corrosion-related failure constitutes over 25% of the failures in the oil and gas industry. Therefore, in order to manage consequences of complex materials selection and to contain the corrosive fluid, two issues need to be resolved: human and technology. Thus, the critical step in reducing COC hinges not only on effective implementation of technical corrosion controls but also incorporating corrosion knowledge management both in education curriculum and industry experiences.

Figure 2: Corrosion in pipelines which results in economic loss and environmental pollution.

Trend in Cost of Corrosion (COC)

Since 1950, there had been eleven (11) different studies scrutinizing on COC. The recent study by NACE International entitled "International Measures of Prevention, Application and Economics of Corrosion Technology (2016 IMPACT)" states that the global COC at an astounding US$2.5 trillion, equating to 3.4% of a country's Gross Domestic Product (GDP) in 2013 for developed countries[1]. The most significant outcome of this study in postulating a possible reduction of COC is by upgrading corrosion knowledge that will be incorporated into corrosion management system. This is timely considering emerging technology for corrosion control, which requires new spectrum in terms of corrosion education curriculum and industrial experience.

Corrosion Education in Perspective

A study on effectiveness of corrosion education is reported in a 180-page Assessment of Corrosion Education (National Academy of Sciences, 2009)[2] and concluded that strengthening corrosion education is a major step toward improved corrosion control and management. In general, most of the available corrosion courses are either research-based or taught-course modules covering basic aspect of corrosion to address many degradations of a material's properties of functions a result of its interaction with operating and external factors. The main finding from the study is related to asset management/ corrosion management which usually is not covered in the curriculum and not systematically transferred from experienced corrosion professionals to their working environment.

Corrosion Technology Evolution

Corrosion control methods have been evolving since the last 200 years from antifouling coating (William Beale 1625), cathodic protection (Sir Humpry Davy 1824) to hot dip galvanizing. Emerging corrosion prevention methods such as development of exotic corrosion resistant alloys, advanced corrosion resistant coating such as self-healing technology, higher effectiveness chemicals for corrosion inhibition and treatment, and non-metallic materials can be useful to address these complex corrosion cases.

To this effect, Harvard Business School Prof. Clayton M. Christensen separates new technology into two categories: sustaining and disruptive[3]. Sustaining technology relies on incremental improvements to an already established technology. A disruptive technology is one that displaces an established technology and shakes up the industry or a ground-breaking product that creates a completely new approach in the industry.

Conclusions

In order to achieve safe and environmentally acceptable operations while reducing the high COC a systematic and responsive corrosion management strategy is required to be put in place.

Growing environmental awareness and imposed international legislation, corrosion issues are becoming more prominent, requiring intensive research and engineering activities.

COC can be reduced by improving corrosion education, mentoring system and by implementing effective technologies.

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IMM CORROSION CERTIFICATION SCHEMES

CERTIFIED CATHODIC PROTECTION ENGINEER

CERTIFIED CORROSION TECHNICIAN LEVEL 1 & LEVEL 2

CERTIFIED CATHODIC PROTECTION TECHNICIAN LEVEL 1 & LEVEL 2

For detailed information, please visit our website at https://www.iomm.org.my/imm-corrosion-certification-scheme/

CERTIFICATION SCHEME FOR CATHODIC PROTECTION TECHNICIAN LEVEL 1

CODE: CPT1

OBJECTIVES

To certify personnel who have been trained on the understanding of the key-point on:

- fundamentals of cathodic protection systems such as sacrificial anode and impressed current
- basis of cathodic protection for onshore & offshore pipeline, aboveground tank, underground tank, offshore jacket, jetty and steel rebar in concrete;
- supervision, installation, testing & commissioning of cathodic protection;
- sufficient troubleshooting skills;
- inspection & surveys and data interpretation; and
- cathodic protection interference.

PREREQUISITES

- Technician with working experience
- Attended Cathodic Protection Technician Level 1 Training Course

CERTIFICATION SCHEME FOR CATHODIC PROTECTION TECHNICIAN LEVEL 2

CODE: CPT2

OBJECTIVES

IMM Certification Scheme for Cathodic Protection Technician Level 2 is another level for the IMM Certification Scheme for Cathodic Protection Technician Level 1 certificate holder to upgrade their knowledge and competency. This scheme is to certify personnel who have been trained on the understanding of more detailed knowledge of:

- cathodic protection systems and electrical measurements;
- available pipeline survey techniques; and
- operation, maintenance and trouble shootings.

PREREQUISITES

- Possesses 5 years working experience in related field; OR
- Certified as IMM Certified Cathodic Protection Technician Level 1 with 1 year of working experience; AND
- Attended Cathodic Protection Technician Level 2 Training Course

CERTIFICATION SCHEME FOR CATHODIC PROTECTION ENGINEER

CODE: CPE

OBJECTIVES

To certify personnel who have been trained on the understanding of the key-point on:

- cathodic protection fundamentals and field measurements;
- stray current identification;
- installation of cathodic protection components;
- troubleshooting of basic design of cathodic protection system;
- properties and application of sacrificial anodes & impressed current anode;
- cathodic protection instrumentation & their applications;
- soil rusticity measurements, pipe & cable locating;
- cathodic protection potential measurement i.e. close interval potential survey; and
- data logging, mapping with GPS & coating defect survey (DCVG/Pearson).

PREREQUISITES

- No working experience required
- Attended Cathodic Protection Engineer Training Course

CERTIFICATION SCHEME FOR CORROSION TECHNICIAN LEVEL 1 AND LEVEL 2

CODE: CT1 & CT2

OBJECTIVES

To certify personnel who have been trained on the understanding of the key-point on:

- corrosion monitoring and process corrosion monitoring;
- measurement and interpretation of corrosion rates;
- procedures to use retrieval tools, service valves, back-pressure pumps and surge tubes; and
- utilization of the corrosion inhibitor monitoring and protective coating surveys.

PREREQUISITES

Level 1:

- Technicians with working experience
- Attended Corrosion Technician Level 1 Training Course

Level 2:

- Certified as IMM Certified Corrosion Technician Level 1
- Technicians with 3 years of working experience
- Attended Corrosion Technician Level 2 Training Course

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Technical article 1

Silver Sulfide-Based Nanocomposite: Synthesis, Characterization and Its Red/Near-IR Light Driven Photodegradation Activity

Yoong Wei Chuen[1], Loke Chui Fung[1], Juan Joon Ching[2], Khatijah Mohamad Yusoff[3], Norhafizah Mohtarrudin[4], Tetsu Tatsuma[5], Lim Teck Hock[1*]

[1]Faculty of Applied Sciences, Tunku Abdul Rahman University College, 53300, Kuala Lumpur, Malaysia
E-mail: limth@tarc.edu.my ([*] corresponding author)
[2]Nanotechnology & Catalysis Research Centre, University of Malaya, 50603, Kuala Lumpur, Malaysia
[3]Faculty of Biotechnology & Biomolecular Sciences, Universiti Putra Malaysia, 43400, Serdang, Selangor, Malaysia
[4]Faculty of Medicine & Health Sciences, Universiti Putra Malaysia, 43400, Serdang, Selangor, Malaysia
[5]Institute of Industrial Science, The University of Tokyo, 4-6-1 Komaba, Meguro-ku, Tokyo 153-8505, Japan

Abstract

A simple, aqueous-based method was developed for the synthesis of silver sulfide/silver (Ag_2S/Ag) nanocomposite by simple ion exchange method in water under ambient conditions. The Ag_2S/Ag nanocomposite produced was in the form of segregated spherical particles with a bimodal distribution. One distribution centered at 59 nm and the other centered at 155 nm. The nanocomposite was characterized by Field-Emission Scanning Electron Microscopy (FESEM) and Powder X-ray Diffraction (PXRD). Aqueous dispersion of the nanocomposite was highly stable with a zeta potential of -40 mV across a range of pH values. At pH 6.1, the nanocomposite was able to degrade methylene blue (a dye with a cationic organic moiety) under red/near-infrared (NIR) irradiation up to 34% in 1 hour, 30% higher than the 3% observed for the control. Increasing pH value was found to enhance the photodegradation efficiency more effectively than increasing catalyst loading. The nanocomposite has potential in treating polluted water in rural areas where solar radiation or economical commercial NIR lamps could help drive the degradation of harmful dyes due to pollution, with other benefits including the established anti-microbial effects of Ag_2S and Ag nanoparticles well-documented in literature.

Introduction

Water pollution due to harmful organic dye effluents being accidentally or unlawfully discharged into the environment represents a serious environmental issue specifically when the dyes released are inherently hazardous and capable of causing adverse health effects and affecting the chemical oxygen demand (COD), biological oxygen demand (BOD) and the pH of the water bodies [1-3].

Methods developed by researchers worldwide to clean up dyes-polluted water include chemical oxidation, membrane filtration, fixation via chemical and physical absorption and photodegradation where lights in the UV and visible range are used to degrade organic dyes via electron-hole-pair-assisted generation of reactive oxygen species [4-7].

Nanoparticles make excellent photocatalysts due to their tunable band gaps and their size-and-shape-dependent chemical and physical properties. Nanoparticles often have relatively large surface area when compared to their bulk counterparts and this is beneficial for increasing photodegradation efficiency via enhancing light-nanoparticles and molecules-nanoparticles interactions. In the past decades, nanomaterials have attracted much attention of researchers due to their potential applications in many important fields including healthcare, optoelectronics, catalysis, photocatalysis and treatment of harmful wastes [8-9].

Most photocatalysts reported in the literature performed well under ultra-violet (UV) and visible light (Vis). The use of NIR irradiation is less studied despite circa 50% of the solar radiation's energy lies in the NIR range. In order to utilize the NIR spectrum, a photocatalyst must be able to absorb most of the solar radiation in order to maximize its photodegradation efficiency.

Silver sulfide (Ag_2S), a semiconductor with a bandgap of <1 eV, is expected to absorb most of the solar radiation. It is known to absorb red/NIR strongly as this range is close to its band gap and previous reports have shown that Ag_2S exhibits a size dependent bandgap when the particle size is smaller than the Bohr radius of 2.2 nm [10-11].

Despite being chemically stable, Ag_2S could be prone to sedimentation which is non-beneficial for photocatalysis application [12-13]. While silver thiosulfate is known to decompose to Ag_2S, it has not been previously employed to produce Ag_2S nanoparticles.

In this report, we investigated the feasibility of synthesizing segregated Ag_2S/Ag nanocomposite with excellent colloidal stability in water and its structural characterization. The nanocomposite's ability to degrade methylene blue under red and NIR (600-2000 nm) radiation emitted from a commercial lamp was studied together with the effects of pH and catalyst loading evaluated.

Results and discussion

Morphological, Structural Characterization and Dispersion Stability Study

The Ag_2S/Ag nanocomposite produced was found to comprise of highly crystalline acanthite (a mineral of Ag_2S) and face-centered cubic silver, with Ag_2S being the dominant species (Figure 1).

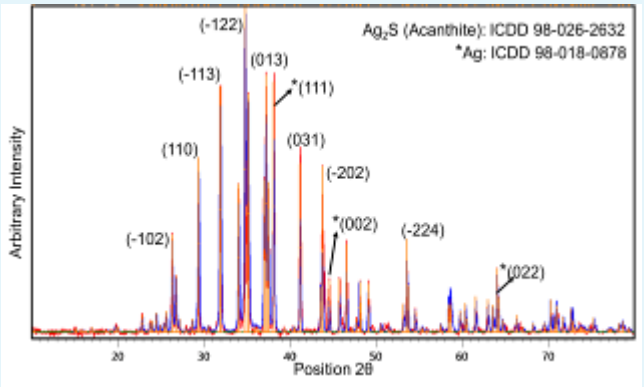

Figure 1 X-ray diffractogram obtained for Ag_2S/Ag nanocomposite

Figure 2 (a) and (b) showed two FESEM images (in secondary electron imaging mode) of the highly crystalline Ag_2S/Ag nanocomposite. Analyses of the images revealed two types of segregated spheroids. The small particles have a distribution with a mean of 59 nm in diameter. These particles are considered nanoparticles due to their sizes are lesser than 100 nm. The big particles displayed a distribution with a mean of 155 nm in diameter

As demonstrated in Figure 2(c), Ag_2S/Ag nanocomposite displayed a zeta potential value of -40 mV at both pH 3.9 and 6.1. This indicates that the colloidal stability of Ag_2S/Ag in water is not readily affected by a change in pH, which is beneficial for the application of photodegradation of dyes in real situations where the pH values of the polluted water body could fluctuate [14-15]. Methylene blue in water itself

has a pH of 3 which is highly acidic to note. Such insensitivity toward pH change means that the Ag_2S/Ag nanocomposite could be used directly for waste treatment without the need to adjust pH values. Ag_2S/Ag nanocomposite produced was tested as photocatalyst for the degradation of methylene blue under red-NIR radiation emitted by a commercial lamp with a broad emission range of 600-2000 nm. This range is close to the red-NIR portion of solar radiation.

Photodegradation of Methylene Blue under Red/NIR Radiation

Figure 3(a) and (b) are photos of the experimental setup taken under ambient light and red/NIR light respectively. The blue solution on the left (pH adjusted; 10 mg/L methylene blue in water) served as a control. Adding Ag_2S/Ag nanocomposite to 10 mg/L methylene blue produced a transparent dark brown/black solution. Methylene blue has an absorption maximum at 664 nm where the Ag_2S/Ag nanocomposite does not absorb. Since no interference was expected, the solution could be directly used to track the photodegradation of methylene blue catalyzed by the Ag_2S/Ag nanocomposite.

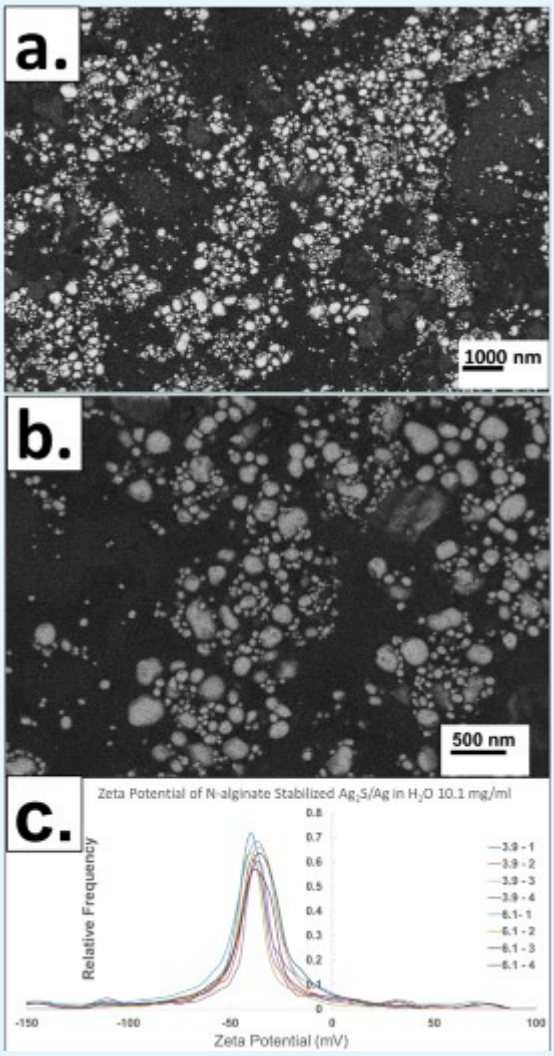

Figure 2 Images of Ag_2S/Ag nanocomposite (under Secondary Electron Imaging (SEI) mode) taken in a FESEM and zeta potential measurement. **(a)** Segregated spherical particles observed without signs of aggregation; **(b)** At higher magnification, two types of spherical particles were observed. One type has a mean centered at 59 nm and the other at 155 nm **(c)** Ag_2S/Ag nanocomposite dispersed in water was highly stable with a zeta potential value of -40 mV which remained unchanged when across the pH range of 3.9 to 6.1

A thermal camera was used to study the temperature profile of both the control and the sample. Heat and temperature differences may affect UV-Vis absorption readings therefore it is important to ensure that the temperature of both the control and sample are similar while trying to substantiate the photocatalytic effect of the Ag_2S/Ag nanocomposite

As shown in Figure 3(c), the control displayed a temperature of 45 °C while the Ag_2S/Ag sample displayed a temperature of 46 °C. Since there was no significant temperature difference, the photodegradation efficiency observed could be attributed to the photocatalytic effect of the Ag_2S/Ag nanocomposite.

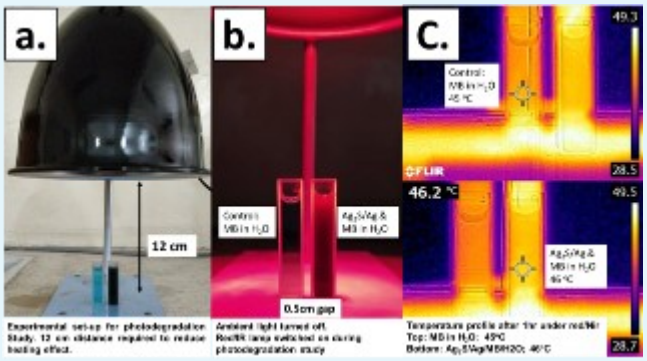

Figure 3 Photodegradation of methylene blue (MB). (a) A photo of the experimental setup under ambient lighting condition. A commercially available red/NIR lamp with a broad emission of 600-2000 nm was placed above a control (MB and water) and sample (Ag2S/Ag/MB/water) in an off-stage (b) An image of the tested system under red/NIR irradiation without ambient light; (c) Thermal images of the control and sample after 1-hour of exposure to red-NIR light. The temperature of the control was close to that of the sample (45 oC versus 46 oC). UV-Vis measurements were carried out within 30 seconds for both the control and sample to establish degradation efficiency

Effect of Photocatalyst Loading and pH

From Figure 4, both controls (0 mg/L catalyst at pH 3 .9 and 6.1) gave the lowest photodegradation efficiency of 3%. This indicated that the red/NIR light alone is not sufficient to degrade methylene blue efficiently, despite methylene absorbs strongly at 664 nm.

In the presence Ag_2S/Ag nanocomposite, a significant increase in photodegradation efficiency was observed. The best result was 34% when 10.1 mg/ml of Ag_2S/Ag nanocomposite loading was used at pH 6.1. When 5.3 mg/ml was used at pH 6.1, only 22% photodegradation efficiency was observed. This signifies that it is advantageous to increase photocatalyst loading. 10.1 mg/ml was the highest loading tested because over 10.1 mg/ml a faster sedimentation was observed.

The pH of the solution was found to have a strong effect on the photodegradation efficiency. An 8% increase in photodegradation efficiency was observed by raising the pH from 3.9 to 6.1, while the catalyst loading was fixed at 10.1 mg/ml. At lower pH, the absorption of positively charged proton on catalyst surface is expected to increase the chance of repelling the positively charged methylene blue, therefore leading to lower degradation efficiency. Similar effects have been observed and reported in literature [16].

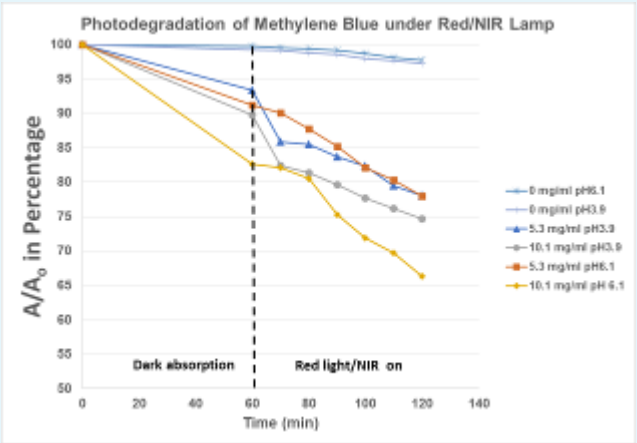

Figure 4 Photodegradation of methylene blue at two pH values and two catalyst loadings. A/A_o refers to the change in absorbance at 664 nm. In the presence of the catalysts at 5.3 mg/ml, 22% degradation was observed for both pH 3.9 and 6.1. At 10.1 mg/ml, a 34% and 25% degradation were observed for pH 6.1 and pH 3.9 respectively. A more acidic environment seemingly led to lower degradation efficiency, even when the catalyst loading was doubled. This may be attributed to the absorption of positively charged proton which would increase the likelihood of repelling positively charged methylene blue, in congruence with literature observations

Conclusion

In conclusion, a simple aqueous-based method was employed to synthesize Ag_2S/Ag nanocomposite. The surfactant played a critical role in controlling particle size and imparted colloidal stability and negative zeta potential to the Ag_2S/Ag nanocomposite. The Ag_2S/Ag nanocomposite was found to be an effective photocatalyst capable of degrading methylene blue under the red-NIR radiation (600-2000 nm), a range similar to the lower energy end of the solar spectrum. In the absence of the catalysts, a mere 3% degradation was observed. Both pH and catalyst loading were found to affect the degradation efficiency. A catalyst loading of 10.1 mg/ml at pH 6.1 gave the highest degradation efficiency of 34% in 1 hour. The effect of pH was more profound than that of catalyst loading when the environment highly acidic. The Ag_2S/Ag nanocomposite has potential to be used as a photocatalyst driven by solar radiation or commercial lamps to degrade dyes in rural areas with the additional antimicrobial properties known to be exhibited by Ag_2S and Ag.

Acknowledgement

The authors express their gratitude to the Ministry of Education Malaysia for funding part of this work through the Fundamental Research Grant Scheme (Grant Number: FRGS/1/2017/STG07/TARUC/02/1)

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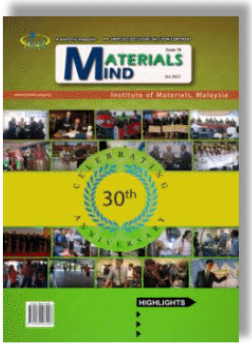

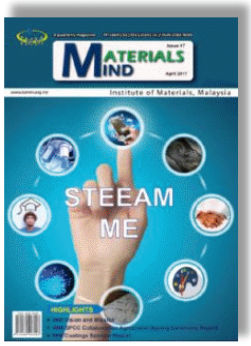

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Frequency: Quarterly Magazine
Format: Print & Online Editions
Reader: ~ 8000
ISSN: 2289-9030

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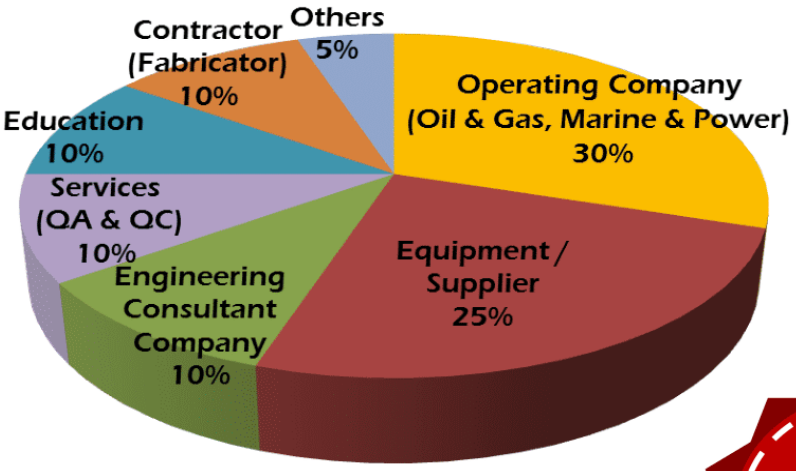

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Student Editorial Board from Universiti Tunku Abdul Rahman

Physical Examination of Metals (as-Reflowed Sn-Ag-Cu) Using the Characterization Techniques

Introduction

A Solar cell is an electronic device that traps sunlight and converts it directly into electricity. Light enters the device through an optical coating or an antireflection layer. This layer minimizes the loss of light via reflection by effectively trapping the light falling on the solar cell. In this article, Platinum (Pt)-reinforced Sn-Ag-Cu (SAC) solder was used as an interconnecting material in the solar cell. Platinum was expected to reduce the excessive growth of intermetallic compound (IMC) and in turn increase the conductivity. With samples having 0.0% Pt and 0.4% Pt under heat treated and non-treated conditions, microstructures were examined via the Scanning Electron Microscope (SEM). The Sn-36Pb-2Ag solder is the most suitable interconnection material because it is known for its low processing temperature, relatively cheap price and is usually coated on the copper (Cu) ribbon for the ease of processing. The benefits of SAC solder in terms of mechanical property are its relatively low melting temperature, superior mechanical properties and good solderability when compared to other Pb based solder. This article is about heating the solder paste until the reflow zone. The temperature of heating is adjusted beyond the melting point of the solder for about forty to sixty seconds. This is to ensure sufficient flux action in the solder and to obtain good wetting properties. Typically solder paste has the melting point from 215 ˚C to 225 ˚C. The peak temperature requirement for SAC alloys as for reflow soldering ranges from 235˚-245˚C (Yang, et al., 2014).

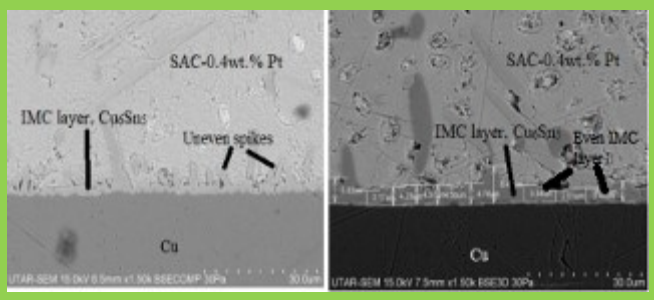

Figure 1 SEM micrograph for 0.4 wt.% Pt SAC with (a) Non-heat treated and (b) 240 hours heat treatment.

Discussion

As shown in Figure 1, when exposed to heat treatment, the thickness of the IMC layer increased. This is due to the increasing amount of Cu atoms diffusing to form the IMC layer, over a period of time under heat treatment. With longer period of heat treatment, the grain size of Cu_6Sn_5 increased. This is best explained by the Ostwald ripening mechanism, where with the continued aging at temperature high enough for diffusion to occur, the difference of the radius between neighbouring grains of the IMC will cause the smaller particles to dissolve and larger ones to grow. This is revealed in the SEM micrographs where there are lesser spikes, thicker IMC layer and flatter surfaces when the sample is heat treated with longer hours as shown in Figure 1(a) 0 -hour heat treatment and Figure 1(b) 240-hours heat treatment. Samples with Pt and without Pt showed a similar trend, as explained previously by the Ostwald ripening mechanism (Zhao et al., 2019).

Based on the results obtained, the average thicknesses of IMC layer of solder with 0.4wt.% Pt reinforcements are thinner than the solder with no Pt reinforcement at all heat treated hours are shown in Figure 2. Pt has a lower dissolution rate compared to Cu. Presence of Pt in the solder paste would reduce solubility of Cu (Wang & Liu, 2007). Thus, the growth of Cu in molten solder is slowed down during the reflow soldering process, which results in the thinner, even and flatter IMC layer.

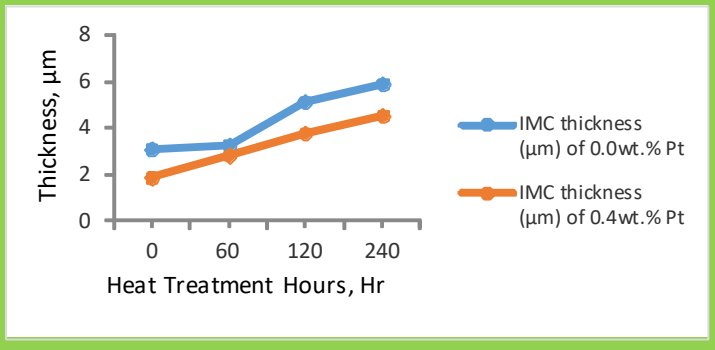

Figure 2 IMC layer thickness for SAC and SAC-0.40Pt solder solar cells at different heat treatment hours.

In contrast, sharp and uneven scalloped-shaped IMC layer structures are formed at the Cu ribbon/solder for samples without Pt reinforcement.

Conclusion

Formation of IMC layer can significantly reduce the efficiency of the solar panel. Therefore, the addition of the Pt will reduce the thickness of the IMC layer by reducing the growth of the Cu_6Sn_5. With longer heat treated hours, the thickness of the IMC layer will increase as well due to the Ostwald ripening mechanism. In short, the addition of Pt to the solder paste will increase the overall efficiency of the solar panel due to enhancement of microstructure.

References

Ku, A. et al., 2003. Lead-free solders: Issues of toxicity, availability and impacts of extraction. *Electronic Components and Technology Conference.*

Wang, S. and Liu, C., (2007). Coupling effect in Pt/Sn/Cu sandwich solder joint structures. Acta materialia, 55(10), pp.3327--3335.

Yang, L. et al., 2014. MD-2015-Microstructure, interfacial IMC and mechanical properties of Sn–0.7Cu–xAl (x = 0–0.075) lead-free solder alloy. *Materials and Design 67.*

Zhao, M., Zhang, L., Liu, Z., Xiong, M., Sun, L., Jiang, N. and Xu, K. (2019). Microstructures and properties of SnAgCu lead-free solders bearing CuZnAl particles. Journal of Materials Science: Materials in Electronics, 30(16), pp.15054-15063.

Reported by:

Liew Son Qian, IMM-UTAR Student Chapter Chairperson

Yuva Dharshini D/O Muraleekaran, IMM-UTAR Student Chapter Member

Memorandum of Understanding between Institute of Materials, Malaysia and Universiti Tun Hussein Onn Malaysia to Establish UTHM-IMM Materials Student Chapter

Reported by: Assoc. Prof. Ts. Dr. Hamimah Abd.Rahman, UTHM, IMM Working Committee Member of Southern Chapter

Date: 29th August 2019
Venue: Mudzaffar Hotel, Malacca

Universiti Tun Hussein Onn Malaysia (UTHM) has signed a Memorandum of Understanding (MoU) with the Institute of Materials, Malaysia (IMM) during the 10th International Conference on Mechanical and Manufacturing Engineering (ICME) 2019 on 29th August 2019 at Mudzaffar Hotel, Melaka. Deputy Vice Chancellor of Research and Innovation, Prof. Ts. Dr. Ruzairi Abdul Rahim represented UTHM while IMM was presented by its Honorary Treasurer, Ts. Dr. Zulkarnain Kedah. Also present at the event were IMM General Manager, Mr. N. Hithaya Jeevan and Dean of Faculty of Mechanical and Manufacturing Engineering, Assoc. Prof. Dr. Shahruddin Mahzan @ Mohd Zin.

The MoU was sealed to allow the establishment of IMM Materials Student Chapter in the UTHM campus and parked under Mechanical Postgraduate Association, Faculty of Mechanical and Manufacturing Engineering (FKMP). The MoU will strengthen the collaboration between IMM and UTHM through UTHM-IMM Student Chapter activities and leveraging of both parties' strengths and connections.

The networking and collaboration will allow both parties to co-organize activities or programmes relating to joint conferences, training courses, seminars and technical talks where IMM would bring in industry experts, researchers and government organizations to join the events. The MoU enables UTHM engineering students (undergraduates and postgraduates) to become members of the UTHM-IMM Materials Student Chapter without any membership fee. They will have opportunity to publish article in the IMM Newsletter. Students may also be offered free attendance to IMM conferences or workshops. Furthermore, IMM would also facilitate technical visits to materials technology-related industries and source for UTHM students.

UTHM, on the other hand, will be responsible in providing services of the academic staff and offering university facilities to carry out and support any collaboration activities. UTHM will also encourage its students to actively participate in any programmes organized by the IMM Materials Student Chapter. UTHM is truly honoured to be selected as the first Technical University in Malaysia to establish the student chapter.

Figure 1: Signing of UTHM-IMM MoU documents by Prof. Ts. Dr. Ruzairi Abdul Rahim (left), Deputy Vice Chancellor of (Research and Innovation), UTHM and Ts. Dr. Zulkarnain Kedah (right), IMM Honorary Treasurer

Figure 2: IMM and UTHM delegates with Secretariat of UTHM-IMM Materials Student Chapter at the MoU signing ceremony

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IMM Corrosion Committee Half-Day Seminar and Site Visit to Prasarana Centre of Excellence and Rapid Rail Depot



Reported by: Ir. Ong Hock Guan, Shell Malaysia Exploration & Production (IMM Corrosion Committee 2018-2020, Chairperson) & Leow Chun Ho, Shell Malaysia Exploration & Production (IMM Corrosion Committee 2018-2020, Treasurer)
Edited by: Karen Cheng Siew Hoon, Serba Dinamik Group Bhd. (IMM Corrosion Committee 2018-2020)

Date: 27th June 2019
Venue: Prasarana Centre of Excellence (PACE), Kompleks Rapid Rail Subang, Petaling Jaya, Selangor

Corrosion Committee of Institute of Materials, Malaysia (IMM) has succesfully organized a half-day seminar entitled "Corrosion Controls and Prevention in Rail Industry" and site tour to Rapid Depot at Prasarana Centre of Excellence (PACE), Kompleks Rapid Rail Subang, Petaling Jaya, Selangor on 27th June 2019. The Rapid Depot tour and Prasarana office visit were attended by a total of 17 participants which comprised of IMM Corrosion Committee members.

En. Zaki Mohamad (Head of Strategy and Capability Building Department) first welcomed the IMM delegates with his opening speech followed by Ir. Ong Hock Guan (IMM Corrosion Committee Chairperson) to thank PACE for organising a half-day seminar and site visit to Prasarana's Centre of Excellence department and Rapid Rail Depot.

Figure 1: En. Zaki Mohamad delivered his Opening Speech and presented a Prasarana's plaque to IMM representative, Ir. Ong

Figure 2: Group Photo with PACE's staff outside their Prasarana office in Petaling Jaya, Selangor

The participants from the Prasarana office are mostly from their PACE department. After a round of introduction, En. Zaki gave a presentation on the overview of the PACE department. En. Abdul Rahim Musa (Chief of PACE), Ir. Arnizan Ariffin (Head of Rail Engineering) and Puan Norhaslita Ramli also gave presentations on PACE contributions in providing training locally and oversea and its rail lines facilities and activities. Ir. Arnizan also shared on how his team had dealt with corrosion related issues such as stray current affecting the rail tracks. In addition, they also showed how to rectify the issue via improved design in the newer rail lines construction.
Presentations were made to generate awareness on the role of Prasarana in the rail industry, the development of human capital, the mitigation of corrosion threats in the rail facilities and IMM role in helping the industries to provide relevant training in general.

Agenda:

10:00 am: Welcome Speech by Prasarana Head of Strategy and Capability Building Department, En. Zaki Mohamad

10:10 am: Presentation on "IMM Vision, Mission and Organization" by IMM Honorary Secretary, Prof. Ts. Dr. Melissa Chan

10:15 am: Presentation on "New Technologies Solution to Combat Corrosion" by IMM Corrosion Committee Chairperson, Ir. Ong Hock Guan

10:30 am: Corrosion Issues in the railway industry by Prasarana Head of Rail Engineering, Ir. Arnizan Ariffin

11:15 am: Training & Competency requirements in railway industry by Prasarana by Pn. Norhaslita Ramli

1:30 pm: A tour of the Rapid depot was conducted by Ir. Arnizan Ariffin and he enlightened the delegates on the activities at the Rapid Depot and the functions of his department. The tour was completed slightly over two hours. After the tour, participants had a good working lunch with the host before the event ended at 2:30 pm.

IMM Corrosion Committee chairman would like to express appreciation to our host En. Zaki, En. Abdul Rahim Musa and Ir. Arnizan Ariffin for giving IMM the opportunity to visit the Rapid Depot. The half-day seminar and the site tour at the Rapid Depot have provided the participants with better understanding on how Prasarana and Rapid Rail operate. We also would like to record our appreciation to all participants of the Prasarana PACE and Rapid Depot site visit. Lastly, we would like to say a big thank you to Pn. Noraishah Mohamad Noor and her team from the Strategic Education & Capability Building Department for a well-organized visit.

Sabah Oil & Gas Conference & Exhibition 2019 Parallel Session – Youth Forum on Technical and Vocational Education and Training

Reported by: Ms. Devyne Koh, Secretary of IMM Sabah Chapter

Date: 10th July 2019
Venue: Meeting Room 3, Level 1, Magellan Sutera Resort, Kota Kinabalu, Sabah

In conjunction with the Sabah Oil & Gas Conference & Exhibition 2019 (SOGCE 2019) that was held on 10th & 11th July 2019, a parallel session on Youth Forum on Technical and Vocational Education and Training (TVET) was successfully organized by the Institute of Materials, Malaysia's (IMM) Young Professionals Committee and IMM Sabah Chapter.

This forum introduced the youths on the diverse and specific job roles within oil and gas industries, dispel the many myths that young people associate with the oil and gas; as well as sharing of programs available for youths in IMM. This forum also provided an excellent platform for students to explore career opportunities and gain knowledge on the industry of oil and gas and at the same time learn the best practices from the experienced speakers.

The attendance was encouraging where about 80 students from seven institutions and TVET schools accompanied by their lecturers attended this forum. The institutions were Sabah Skills & Technology Centre, TAS Institute of Oil & Gas, Polytechnic Kota Kinabalu, Institut Latihan Perindustrian, Kolej Teknikal Yayasan Sabah, Jabatan Pembangunan Sumber Manusia and University Malaysia Sabah which had oil & gas diploma students in attendance. Opening remarks of the forum was made by IMM Young Professionals Committee Chair, Mr. Mohd Fairuz Mohd. Salleh, followed by a welcoming speech by CEO of Handal Resources Berhad, Mr. M. Zaini M. Yunus.

Figure 1: Opening remarks by IMM Young Professionals Committee Chair, Mr. Mohd. Fairuz Mohd Salleh (left) & welcoming speech by CEO of Handal Resources Berhad, Mr. M. Zaini M. Yunus (right)

The forum was thoroughly inspiring and beneficial for the students. The speakers shared a lot of information regarding the latest development and areas of working interest in the oil and gas industries, a wide range of IMM programs related to oil and gas that were available and potential routes of professional development that were relevant not only to the engineering students but technically related students who wish to develop their career in this industry. In conclusion, the Youth Forum during the SOGCE 2019 was a great event for students to pick up more knowledge and start planning the pathway of success in the real working world.

Figure 2: Closing remarks by Chairman of IMM Sabah Chapter, En. Zubaidi Abang Zamhari (Petronas Carigali Sdn. Bhd., Sabah Operations)

The organizers also would like to express appreciation to all speakers who took time off to share their experiences and knowledge on oil and gas to our young youths.

Speaker 1	Malaysia Oil & Gas – Upstream, Midstream and Downstream *Mohamed Iskandar Zulkarnain bin Mohamed Ibrahim – Young Professionals Committee*
Speaker 2	Mechanical Joint Integrity Competency and Certification *Dr. Dasline Sinta – Asset Integrity Committee*
Speaker 3	Pipeline Maintenance – A Sabah Experience *Mr. Ronnie Simon – Project Manager, Borneo Seaoffshore Engineering Sdn. Bhd.*
Speaker 4	Vibration Practitioner and Specialist *Commander Arman bin Ariffin – Vibration Committee*
Speaker 5	Preparing Yourself for the Working World *Dr. Alex Ong Zhi Chao – Young Professionals Committee*
Speaker 6	Welding and Inspection *Dr. Mohamed Ackiel Mohamed – Welding Committee*
Speaker 7	Painting and Blasting Competency and Certification *Mr. Haji Ibrahim Bin Ahjar – Coatings Committee*
Speaker 8	Malaysia Oil & Gas – Career Opportunities and Progression *Mr. Choo Siang Wen – IMM Sabah Chapter*

Figure 3: A group photo of the Youth Forum participants with the speakers


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Initiative from IMM

Big Wave

Mock Execution of Polymeric Coating Fingerprinting for IMM Standard and/or SIRIM Industry Standard

IMM Task Force on Coating Fingerprinting

Prepared by:

Prof. Ts. Dr. Melissa Chan Chin Han
Universiti Teknologi MARA & Co-chairperson

Prof. Ts. Dr. Mohamad Kamal Harun
Universiti Teknologi MARA & Co-chairperson

Ms. Hairunnisa Ramli
Universiti Teknologi MARA & Committee member

An industry-academia collaboration was initiated in 2013 by the Institute of Materials, Malaysia (IMM) where the academic Council Members of IMM from various Malaysian universities in collaboration with oil & gas companies, paint manufacturers, Fourier-transform infrared (FTIR) instrument vendors and Coating Consultants came together to solve an industrial challenge on fingerprinting of polymeric coatings. A Task Force on Coating Fingerprinting comprising representatives from oil & gas companies (PETRONAS, SHELL, ExxonMobil), universities (Universiti Teknologi MARA, UCSI University, Curtin University and Tunku Abdul Rahman University College), paint manufacturers (Jotun, International Paints, PPG Coatings, Hempel Paints, Kansai Paints, and KCC Coatings), FTIR instrument vendors (Agilent Technologies, Perkin-Elmer, Bruker, Nicolet) and Coating Consultants (Norimax and SIRIM); was established to execute this initiative.

Five public Forums were organized by the IMM between 2013 and 2019 to create awareness for the practicality of the fingerprinting of polymeric coatings. The IMM Task Force on Coating Fingerprinting completed Phase 1: The application of FTIR spectroscopy as a simple and reliable tool for the study of reproducibility (*i.e.* to fingerprint) of the epoxy coatings (resin and hardener). The fingerprinting regions of FTIR for epoxy resin and hardener were identified and the **confidence level of acceptance** for quality assurance and quality control (QA & QC) control was proposed at degree of similarity ≥ **0.900** under **Phase 1 (2013-2014).**

Phase 2 (2015-2016) involved the appreciation of the root causes of coating failures throughout the world and the adoption of the Coating Fingerprinting initiative by the Malaysian oil & gas operators as one useful QA/QC tool for ensuring coating quality. It also led to the establishment of the 1-day Foundation Course on Coating Fingerprinting and the 2-day Certification Course for Coating Fingerprint Quality Controller. The study concluded that coating failure is a combination of a number of factors which include:

- Surface Preparation of the substrates (blaster skills & techniques)
- Application of the coatings (applicator skills and techniques)
- Environmental factors (weather, temperature, humidity *etc* during blasting & painting)
- Quality of paint materials including paints, thinners and additives
- Project production schedules and management (rush jobs can lead to failures)
- Owner Specifications and Standards for paint systems and applications
- Mechanical damage during installation and erection
- Impractical design of structures and equipment for good painting
- Blasting & Painting Contractors' KPI on area of work completion

All the above contribute in one way or another towards coating failures throughout the world. This Task Force is tackling only one of the above contributors.

Phase 3 (2018 – 2020)
Mock execution using bench-top, mobile and handheld FTIR spectrophotometers is in progress for off-shore coating systems as follows:

- 3-coat system: IOZ/Epoxy/PU (for new construction & 2-pack system) (for IOZ - service up to 400 ^{o}C)
- 3-coat system: EPZ/Epoxy/PU (for maintenance & 2-pack system)

- Glass flake polyester/epoxy (for splash zone & 2-pack system)
- Silicone-aluminium (for high temperature & 1-pack system) (service > 450 °C up to 650 °C)

Figure 1: In-house paint samples

Figure 2: In–house FTIR lab testing

Figure 3: On-site paint samples

In addition to the mock-execution, the task force committee has released

1) IMM Standard (IMM FP01:2019) - Coating fingerprinting overall procedures for paints using FTIR and other related methods.
2) General requirement for recommendation of 3rd-party testing laboratory in relation to fingerprint coating certificate for retained paint sample.

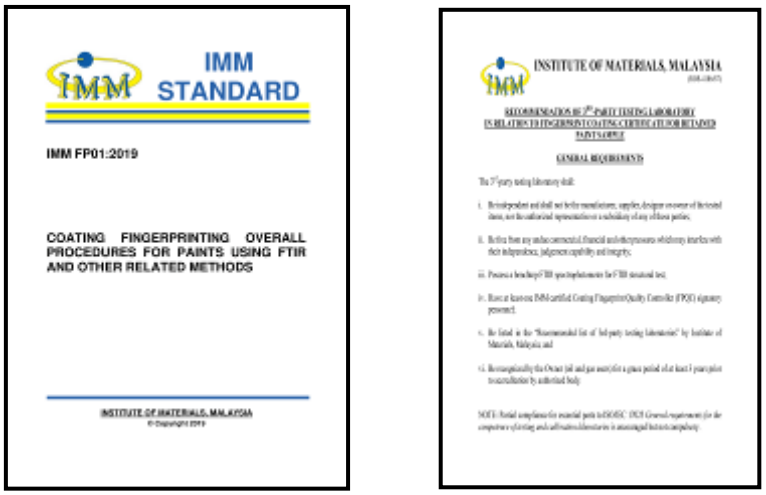

Figure 4: IMM Standard (left) and general requirement for recommendation of 3rd-party testing laboratory (right)

The Task Force committee had also initiated and completed the signing of an MOU between IMM and SIRIM STS Sdn Bhd to collaborate on the development and promotion of the IMM standard as a SIRIM Industry Standard.

Stay tuned with us for the latest information on the development of Coating Fingerprinting.

For more information on Coating Fingerprinting, please visit to
https://www.iomm.org.my/background-of-imm-task-force-on-coatings-fingerprinting/

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IMM Task Force on Coating Fingerprinting

Prof. Ts. Dr. Melissa Chan Chin Han - Universiti Teknologi MARA & Co-chairperson

Prof. Ts. Dr. Mohamad Kamal Harun - Universiti Teknologi MARA & Co-chairperson

Institute of Materials, Malaysia (IMM) project on polymeric coating fingerprinting, which is custom-tailored for oil & gas industry since 2013. This project has been led by UiTM research team and supported by other universities, oil & gas users, paint manufacturers, FTIR instrument vendors and testing laboratories. Serba Dinamik Holdings Bhd. is the research fund provider for the mock-execution of the coating fingerprinting for Phase 3 (2018-2020).

Prof. Ts. Dr. Mohamad Kamal Harun (UiTM - leader), Prof. Ts. Dr. Melissa Chan Chin Han (UiTM - leader), Nurul Fatahah Asyqin (UiTM – member), Hairunnisa Ramli (UiTM – member), Suhaila Idayu Abdul Halim (UiTM – PhD candidate) and Norsyazlin Abd Rashid (UiTM – Master candidate) participated in a few product/service innovation competitions.

Recently, the UiTM research team participated in the Selangor Research & Development and Innovation Expo 2019 at Malaysia International Trade & Exhibition Centre (MITEC), Kuala Lumpur. The Expo, with 120 exhibitors occupying 328 booths, was hosted by the Selangor State Government from 10th – 13th October 2019. In the competition held in conjunction with the Expo, the UiTM team's exhibit titled "A quick way to fingerprint your products!" won the **3rd prize with a cash reward of RM3,000** along with a trophy and certificate under the machinery/ equipment cluster for University/College.

Figure 1: UiTM research team at Selangor Research & Development and Innovation Expo 2019

Furthermore, after a gruelling but exciting 1-day Mini Business Accelerator Workshop organized by Malaysian Technology Development Corporation at the TM Convention Centre on 30th September 2019, 3 university teams and 3 SMEs shortlisted from each of the regional Road 2 Growth pitching competitions (Northern, Central, Southern, East Coast, Sarawak and Sabah) had pitched their products and services at the **Grand Final Pitching Competition** on 1st October 2019. This Grand Final Pitching, held the following day i.e on 1st October 2019, placed special emphasis on commercialisation of the product/service. Presenting the same project, the UiTM team was the **1st runner-up with RM10,000 Cash Prize** under the Institutes of Higher Learning category.

Prior to this Grand Final Pitching Competition, the team qualified by being the **2nd runner-up, winning a cash prize of RM1,000** at the **Pitching Competition** held on 2nd July 2019 at the TM Convention Centre where altogether 21 universities and 30 SMEs pitched their products and services.

Figure 2: From left Nurul Fatahah Asyqin, Norsyazlin Abd Rashid, Suhaila Idayu Abdul Halim, Prof. Ts. Dr. Melissa Chan Chin Han, Prof. Ts. Dr. Mohamad Kamal Harun and Hairunnisa Ramli

Besides, the team walked away with the following prizes at Invention, Innovation & Design Exposition (**IIDEX2019**) which was held at Dewan Agong Tuanku Canselor, UiTM, Shah Alam on 10th – 15th September 2019:

1) **Elevator Pitch – Silver Award with RM750 Cash Prize**
2) **Innovation Competition – Silver Medal**

Figure 3: At IIDEX2019 – FTIR fingerprinting is applicable for plastic, health care products etc.

Figure 4: At IIDEX2019 – Promoting IMM and distributing Materials Mind to the visitors

The UiTM research team wishes to share the achievements and the prizes with all the committee members of IMM Task Force on Coating Fingerprinting for Phase 1, Phase 2 and Phase 3. The honour is yours.

INSTITUTE OF MATERIALS, MALAYSIA

Updated on 30th December 2018

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

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

IMM is administered by a council of 30 members, with volunteers leading 18 materials committees, and 5 regional chapters, and supported by a secretariat with full time staffs.

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

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

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

Over the years, IMM have conducted courses on coatings, coatings fingerprinting, corrosion, welding, vibration etc in support of the oil and gas industry in Malaysia. Over 600 Coatings Inspectors have been trained and certified as well as 2500 Blasters & Painters, Supervisors, Corrosion Technician and Vibration Practitioners. Its certification programmes are recognized by PETRONAS and all oil & gas operators. Since January 2011, 72 Associate Welding Engineers, 80 Welding Engineers, 20 Senior Welding Engineers and 24 Coating Fingerprint Quality Controllers were trained and certified.

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

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

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

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

GENERAL INFORMATION ON MEMBERSHIP

The IMM Membership is opened to all individuals and companies in developing the contribution of Materials science, technology and engineering towards industrial growth in Malaysia. The technology of materials is advancing day-to-day throughout the world. Membership to the IMM will enable networking and exchange of knowledge from a very wide variety of specialised areas of expertise. Please feel free to download or print a copy of the application form together with the IMM regulations. If you have any doubt, please do not hesitate to contact our secretariat through the phone; +603-4256-2286 or email to secretariat@iomm.org.my

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

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

Kindly fill the form and email to secretariat@iomm.org.my or fax it to: +603-7880 1753 or send it to :

IMM SECRETARIAT

Suite 515, Level 5, Block A, Kelana Centre Point (Lobby B),
No. 3 Jalan SS 7/19, Kelana Jaya,
47301 Petaling Jaya, Selangor

IMM MEMBERSHIP BENEFITS

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

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

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

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

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

IMM MEMBERSHIP FEES SCHEDULE AS PER BELOW:

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

INSTITUTE OF MATERIALS, MALAYSIA

Updated on 30th December 2018

REGULATIONS GOVERNING ADMISSION AND TRANSFER OF MEMBER GRADES

The Council shall establish a Memberships Committee which will be responsible for review of applications for transfer of membership grades. The Memberships Committee shall recommend transfers for Council approval at Council Meetings. All grades of memberships are awarded at the discretion of the Council and may be withheld or withdrawn in the event of conduct likely to prejudice the standing of the Institute. Every member shall receive a membership certificate.

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

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

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

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

MEMBERSHIP GRADE & REQUIREMENT

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

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

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

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

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

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

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

Coating Fingerprinting Workshop

IMM Vibration Conference 2018

MOGSEC 2018

MLC 2018

FREE Ordinary Membership for Affiliates:

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

Members of following institutions and societies are welcome to apply.

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

FREE Company Membership for Affiliates:

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

List of Free Company Memberships for Trade Associations:-

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

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

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28	April 2020	IMM Courses & Certification Scheme
29	July 2020	Education

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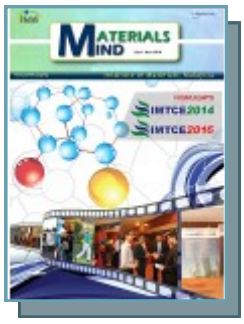

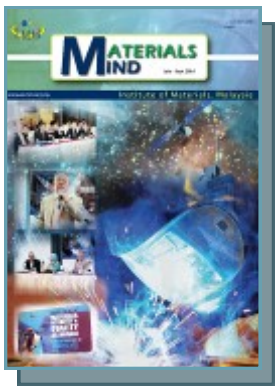

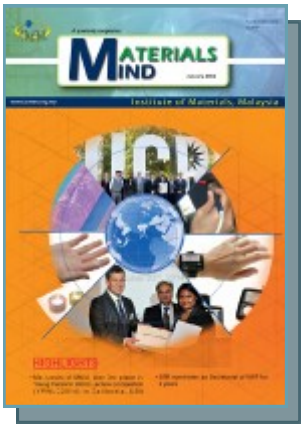


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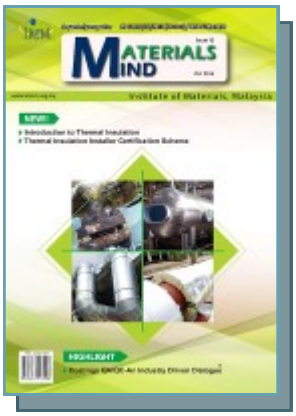
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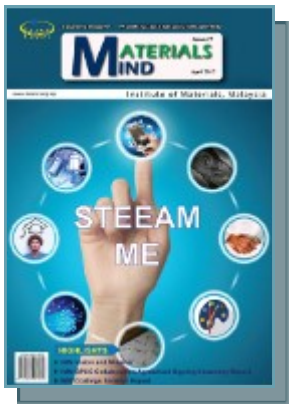
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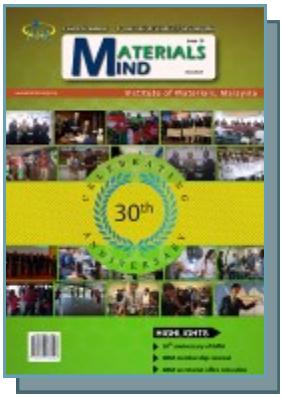
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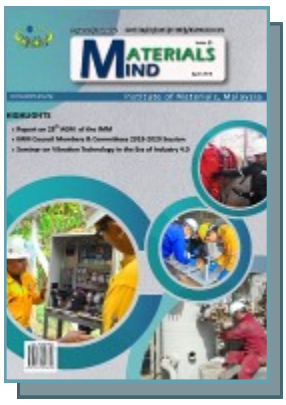
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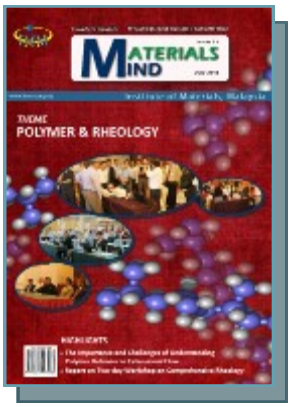
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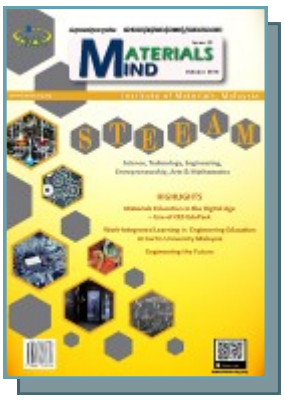
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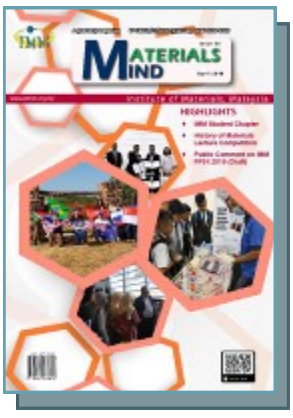
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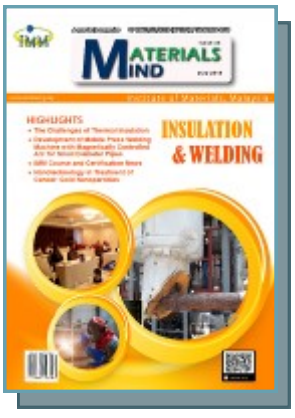
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