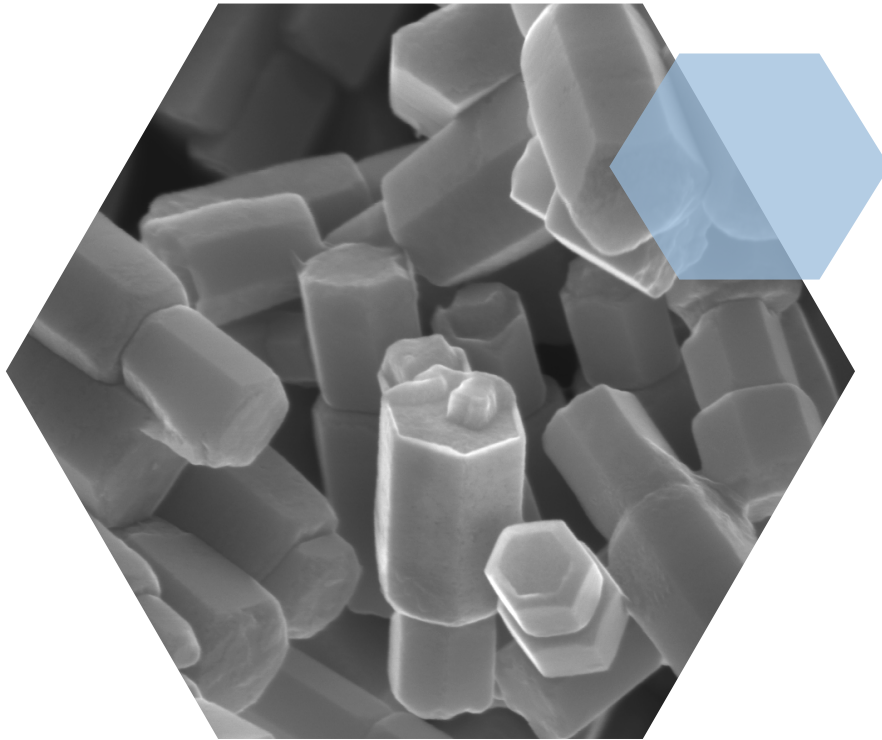


NanoScope

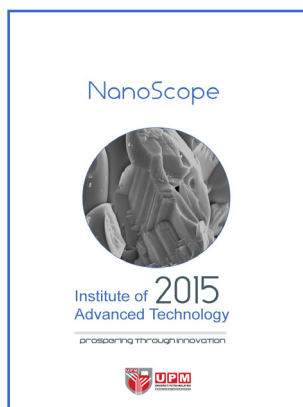


Institute of **2015**
Advanced Technology

prospering through innovation



UPM
UNIVERSITI PUTRA MALAYSIA
BERILMU BERBAKTI



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EDITOR'S PREFACE

Alhamdulillah, all praises to Allah SWT, with his blessings, Institute of Advanced Technology (ITMA) has successfully published our annual magazine, NanoScope, for the year 2015.

The main objective of the production of this magazine is to highlight the research activities that have been carried out by ITMA and our Research Associates.

Yet, despite impressive successes and growing interest in nanotechnology, ITMA will try to highlighting the expertise particularly through the writing of expertise to enhance the image and visibility of the ITMA especially in the field of nanotechnology research and to boost its research and development of products that can be commercialized later.

Finally, my special thanks to Assoc. Prof. Dr. Suraya Abdul Rashid for her advice and members of the Publication and Website Committee for their contribution in preparing NanoScope 2015 .



Warm Regards,

Marzieana Ab Rahman
Editor

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DIRECTOR'S FOREWORD

Alhamdulillah, all praises to Allah, the Almighty, ITMA has successfully published the NanoScope 2015. My thanks to the Publication and Publicity Committee for their contributions in preparing this report. Generally, this magazine is the medium to showcase the achievements of the researchers, staff, students and research laboratories in ITMA for the year 2015.

In 2015, ITMA's Research Associates are the recipient of several prestigious awards such as Malaysia's Rising Star Award and Top Research Scientist Malaysia 2015 (TRSM). They are Prof. Dr. Robiah Yunus (TRSM), Assoc. Prof. Dr. Abdul Halim Abdullah and Prof. Dr. CLugman Chuah Abdullah are Malaysia's Rising Star Award 2015 recipients.

Meanwhile, two postgraduate students from ITMA had won gold medals during the 39th Convocation of University Putra Malaysia. Tumirah binti Khadiran won a Gold Medal for her Doctor of Philosophy thesis and Nur Atiqah binti Mohammad Aziz won a Gold Medal for her Master thesis. I hope their achievements will inspire the future alumni or current student to excel in their study and future.

Being one of the institute in university of world repute, I hope ITMA will stand tall among local institute which are carrying out nanotechnology research in Malaysia and will have good relation with industries and communities.

Lastly, I want to emphasize that a successful research institute must be innovative, flexible, responsive, and adaptable. The key to success is innovation and always be competitive.

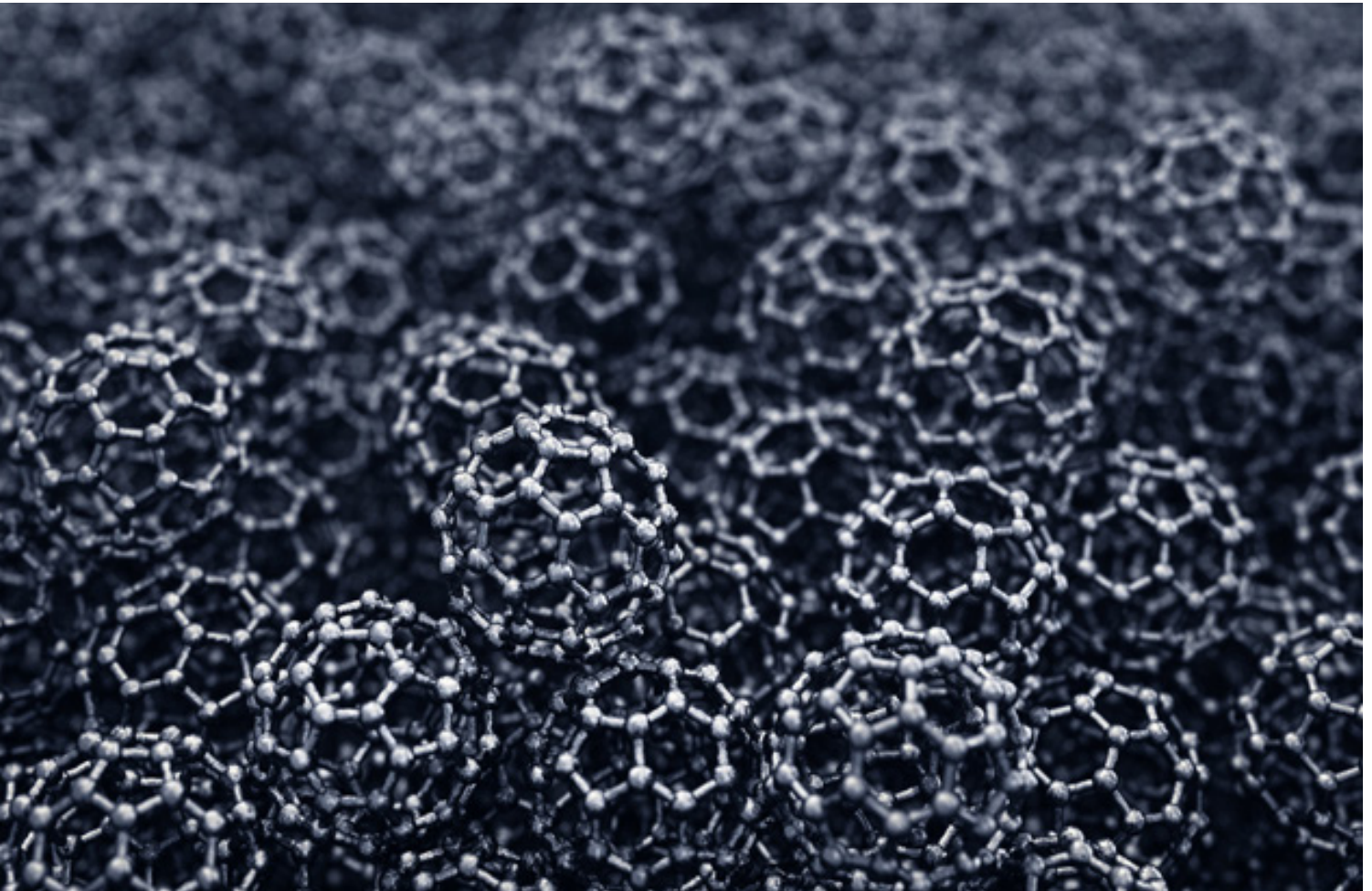
I would like to extend my gratitude to all staff in ITMA who have also contributed directly or indirectly towards the development and achievement of research in ITMA, and appeal for your support to help ITMA achieve greater heights.

Warm Regards,

Prof. Dr. Nor Azah Yusof
Director



Institute of Advanced Technology



Institute of Advanced Technology (ITMA), Universiti Putra Malaysia (UPM) was established in 1999 as an institute for advanced research in various fields. In line with the restructuring of university research in 2012, ITMA has restructured its areas of specialization to the Advanced Materials and Nanotechnology, which focuses on areas such as the synthesis and characterization of materials, processing and materials technology, and application of the sensing device and functional devices. ITMA's ecosystem structure is supported by three laboratories, namely Materials Synthesis and Characterization Laboratory, Materials Processing and Technology Laboratory, and Functional Devices Laboratory. ITMA develops world-class research laboratories, attracts renowned researchers and trains future research leaders in niche areas related to advanced materials and nanotechnology. ITMA shares its research findings, expertise and facilities with research communities and industries throughout the world. The Institute of Advanced Technology aims to be a leading institute in advanced materials and nanotechnology focusing on research, postgraduate studies and consultancy services. In addition, ITMA has also played a part in income-generating activities through laboratory services that had been recognised by International Standard ISO/IEC 17025:2005 for FESEM Testing Services.

VISION

To become a research institute of international repute in the field of nanotechnology and advanced materials.

MISSION

To contribute significantly towards wealth creation, nation building and universal human development through high impact research in nanotechnology and advanced materials.

MISSION&STRATEGIES

1. Conduct interdisciplinary research and development in advanced materials and nanotechnology:
 - Establish world-class laboratories and acquire state-of-the art facilities.
 - Pool highly trained research personnel.
 - Create national and international linkages
2. Offer international postgraduate programs in niche areas:
 - Determine and develop niche areas
 - Facilitate entry of outstanding students through attractive scholarships
 - Establish good research culture
3. Disseminate knowledge and innovative technologies:
 - Publish in reputed journals
 - Maintain a global network
 - Involve in consultancy services

MAIN OBJECTIVES

1. To undertake, coordinate and lead interdisciplinary research and development in cutting-edge areas of advanced technology.
2. To offer postgraduate training programmes at the M.Sc. and Ph.D levels to local and international students.
3. To develop a center for dissemination of knowledge and innovative technology and network with universities, laboratories and industry globally.

TOP MANAGEMENT



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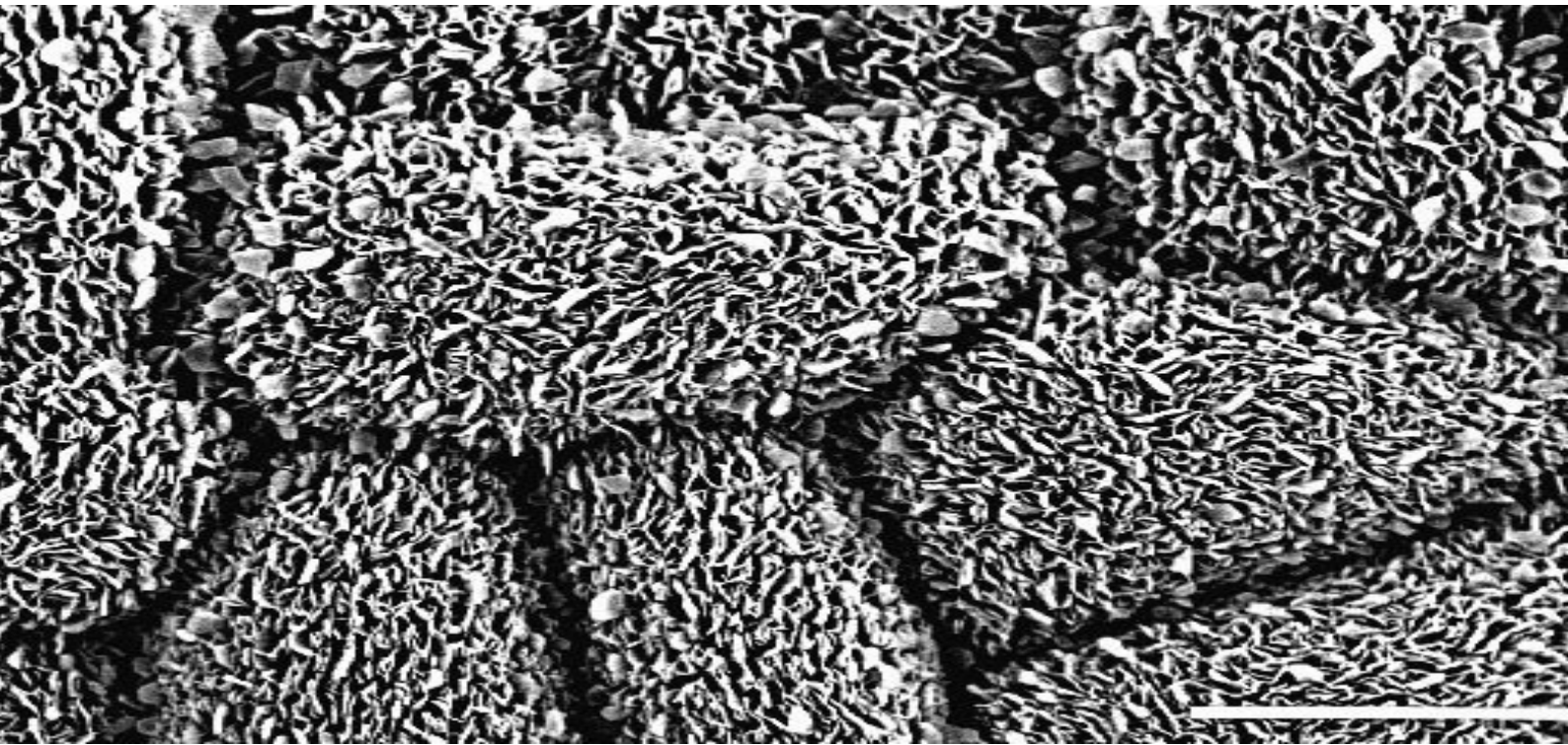
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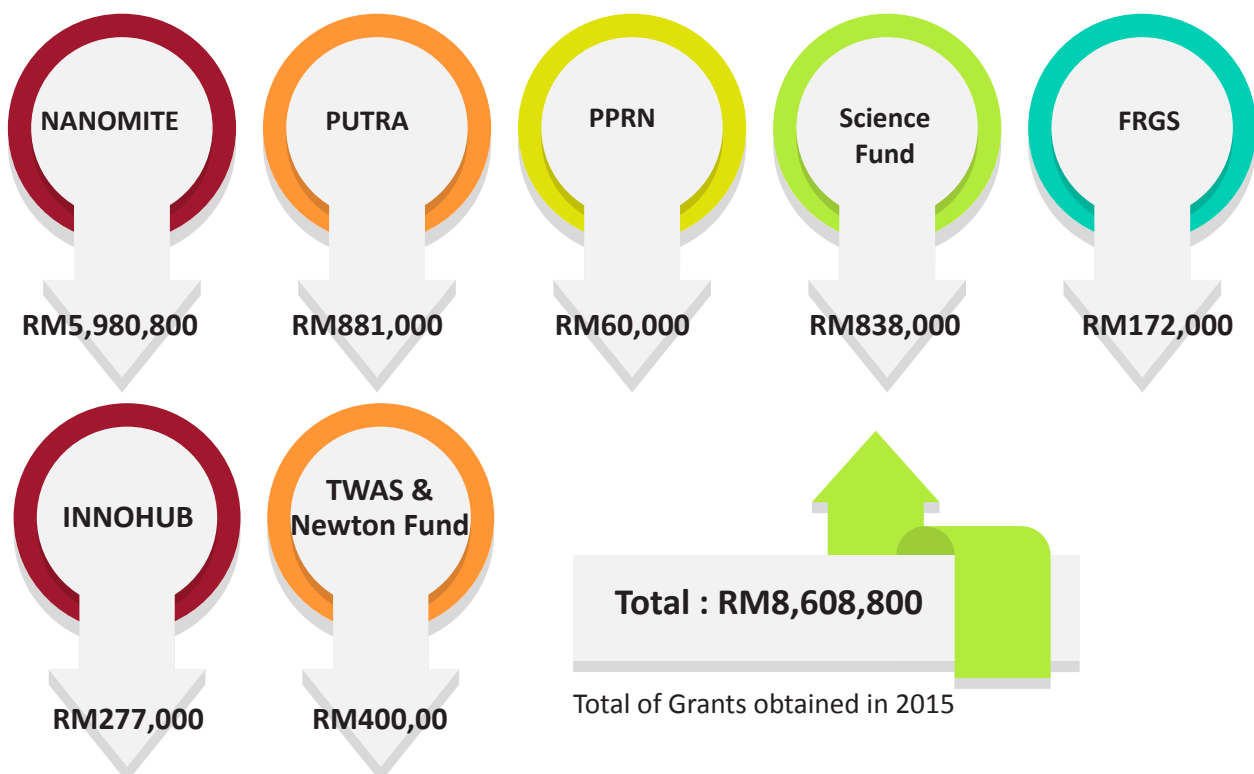
ORGANIZATIONAL STRUCTURE

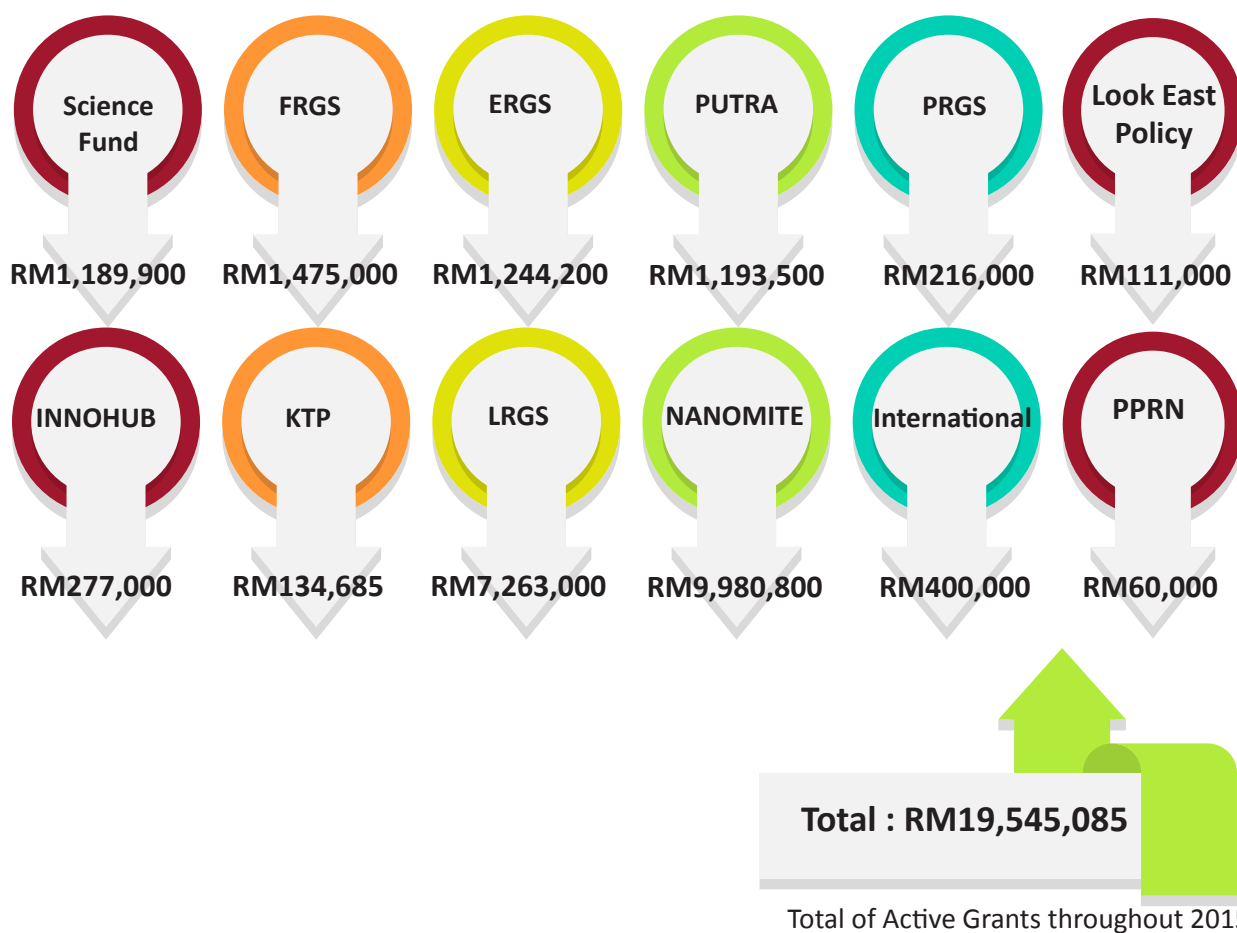




RESEARCH GRANTS

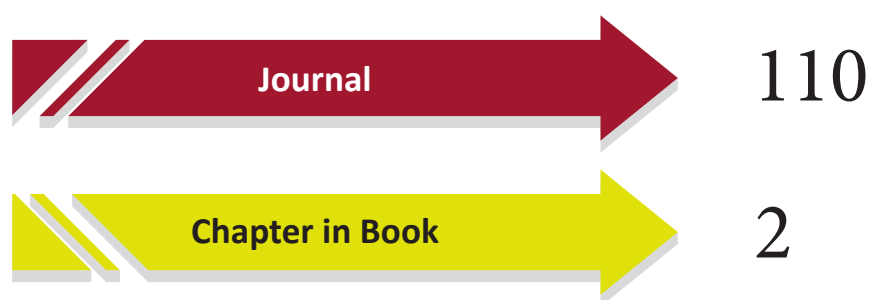
The total revenue of ITMA's research funds in 2015 amounted to RM8,608,800. Sources of funds were from NANOMITE (RM5,980,800), PUTRA Grant (RM881,000), PPRN (RM60,000), Science Fund (RM838,000), FRGS (RM172,000), INNOHUB (RM277,000) and lastly the international grants which were from TWAS and Newton Fund amounting to RM 400,000. These funding sources were obtained to finance 14 projects led by ITMA. This amount contributed to the total amount of active grants which was RM19,545,085 to support 55 research projects.





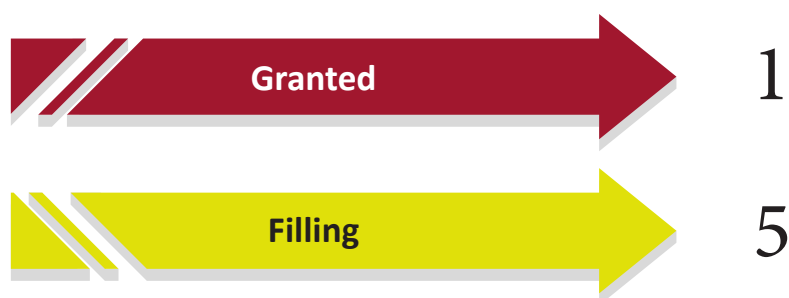
PUBLICATIONS 2015

ITMA had exceeded our KPI of 110 publications



Number of Publications throughout 2015

PATENTS 2015



Number of patents throughout 2015

No.	Title of Project/ Product	Country of Filing	Researcher	Status
1	Motorized Cutter	South Africa	Assoc. Prof. Dr. Norhisam Misron	Granted
2	Graphene Ribbons and A Process for Preparation Therof	Malaysia	Assoc. Prof. Dr. Suraya Abdul Rashid	Filed
3	A Method for Converting Millscale Into Pure Iron Oxide	Malaysia	Assoc. Prof. Dr. Mansor bin Hashim	Filed
4	A Multistage Fruit Decorticator	Malaysia	Prof. Dr. Robiah Yunus	Filed
5	Molecular imprinted Polymer for Removal of Mercury and Method of Preparation of the Same	Malaysia	Prof. Dr. Nor Azah Yusof	Filed
6	A formulated 2-Ethylhexyl Ester	Malaysia	Prof. Dr. Robiah Yunus	Filed

List of patents throughout 2015

AWARDS 2015

MALAYSIA'S RISING STAR RESEARCHER AWARD

FOURTEEN local researchers have been recognised as the recipients of Malaysia's Rising Star Award for obtaining the top 1% of Highly Cited Papers published worldwide. The information was extracted from the Essential Science Indicators (ESI) for the period from 2005 to 2014 by Thompson Reuters.

Articles by the award recipients have been frequently referred by researchers worldwide in a broad range of fields. The Higher Education Minister Datuk Seri Idris Jusoh presented the awards at the launch of the National Conference for Published High Impact Journals in Langkawi.

The recipients for the Malaysia's Rising Star Awards were Prof. Datuk Dr Abdul Khalil H P Shawkataly, Prof. Dr. Abdul Latif Ahmad, Prof. Dr. Abdul Rahman Mohamed, Prof. Dr. Abd Karim Alias, Prof. Dr. Hazizan Md.Akil, Assoc. Prof. Dr. Mohd Roslee Othman and Prof. Dr. Wan Saime Wan Ngah from Universiti Sains Malaysia; Prof. Dr. Wan Mohd Ashri Wan Daud from Universiti Malaya; Prof Dr Siti Kartom Kamarudin and Prof. Dr. Ishak Hashim Assoc Prof Dr Wong Kuan Yew from Universiti Teknologi Malaysia and Norliana Mohd Abbas from Universiti Teknologi Mara.

from Universiti Kebangsaan Malaysia; Prof. Dr. Luqman Chuah Abdullah and Assoc. Prof. Dr. Abdul Halim Abdullah from Universiti Putra Malaysia; Assoc Prof Dr Wong Kuan Yew from Universiti Teknologi Malaysia and Norliana Mohd Abbas from Universiti Teknologi Mara.

Malaysia's research output had grown almost six-fold in just nine years.

According to a statement from the Higher Education Ministry, the Thomson Reuters Web of Science and InCites, Malaysia's research output had grown almost six-fold in just nine years.



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Research Associate

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TOP RESEARCH SCIENTIST MALAYSIA 2015



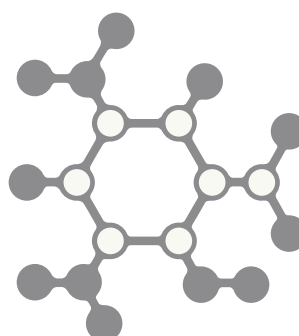
Prof. Dr. Robiah Yunus the former Director of ITMA (Feb 2012 - Feb 2015) and our research associate, has been awarded Malaysia's Top Research Scientist Award 2015.

Her research area is on the synthesis of the biobased products, which encompass chemicals and energy transformation from biorenewable resources involving separation and conversion technology research. The biobased products such as biofuels and biolubricants have received significant attention due to their importance in a sustainable economy. Separation research projects include the adsorption and supercritical extraction of natural products from plants.

Her research project on environmentally friendly synthetic lubricant from palm oil has received recognitions of innovative excellence and valuable accomplishments in research from various institutions.

Research Associate

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robiah@upm.edu.my



39TH UPM CONVOCATION STUDENT AWARDS



31 October 2015, Universiti Putra Malaysia -Two postgraduate students from ITMA had won the medals during the 39th Convocation of University Putra Malaysia. They are Tumirah binti Khadiran who won Gold Medal for Doctor of Philosophy and Nur Atiqah binti Mohammad Aziz who won Gold Medal for Master with Thesis.

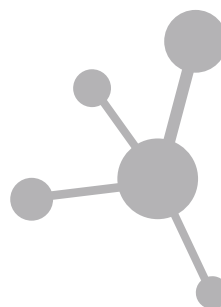
Tumirah binti Khadiran is students under supervision of Prof. Dr. Mohd Zobir bin Hussein while Nur Atiqah binti Mohammad Aziz the students under the supervision of Prof. Dr. Robiah Yunus.

Their thesis both entitled Nano-encapsulated organic phase change materials as thermal energy storage medium and The Development of Food Grade Green Lubricant from Palm Oil Methyl ester.

Currently, Dr. Tumirah binti Khadiran is working as Research Officer at the Forest Research Institute Malaysia (FRIM). Meanwhile Nur Atiqah binti Mohammad Aziz is continuing her studies for Doctor of Philosophy.

From left :

1. Dr. Tumirah binti Khadiran
2. Nur Atiqah binti Mohammad Aziz



BOOK

RFID Applications in Chemical Storage Management System

Rosiah Osman

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Research Officer (FDL)



Abstract

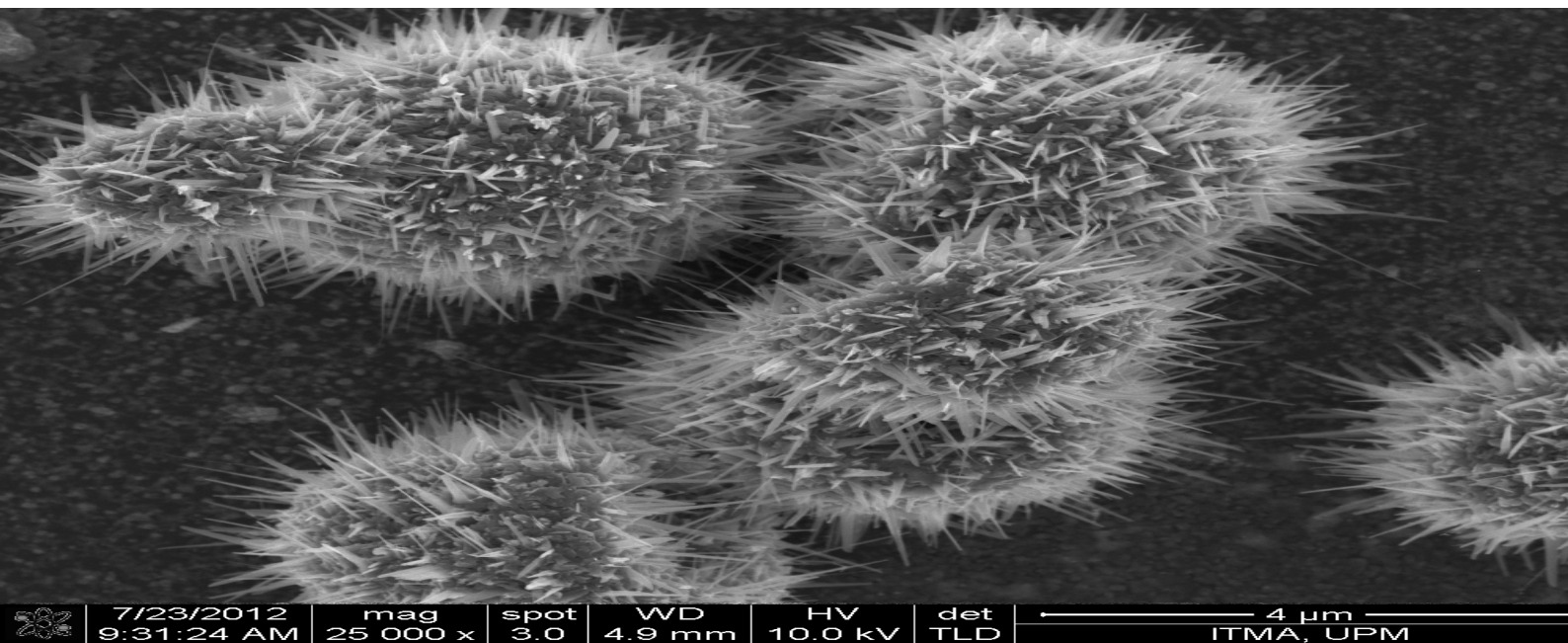
The management of chemical inventory in laboratories is necessary for safety purpose as well as fulfilling regulatory compliance. As for academia laboratories, frequent inspections and data updating of chemicals storage are very crucial to prevent unforeseen accidents to students and researchers. In most academia laboratories, management of chemicals are normally still being done manually which is very time consuming. As a result, the report data is not being updated and expired chemicals may accidentally being used.

The main objective of the project described in this book is to implement RFID technology to perform the management of chemical storage system which will shorten the inventory process time. This project uses Gen2 Ultra High Frequency (UHF) RFID technology to create chemical inventory database and perform the chemical tracking. The UHF technology is used because it has longer reading range which is more than one meter, compare to High Frequency (HF) and the passive tags are chosen because of the lower cost compare to active tags.

The information system can be developed using the existing system such as Microsoft Excel Spreadsheet or Microsoft Access Database with low monetary investment.

The system can be integrated with web based system through internet connection. It will focus on sending the alert message through short message system (SMS) when the system found that one particular chemical is going to expire. The users do not have to perform the inventory checking on the expiration date manually since they will receive alert notification message about expiring chemicals via their mobile devices in real-time. The system was tested and the recipients received the notifications accordingly through their mobile phones.

This system has been implemented in chemical environment of academia laboratories only however it is applicable for other asset tracking environment for future use.



RESEARCH PROGRAMS



Nanomaterials



Materials Processing



Sensor Technology



Electron Devices



Materials Technology



**Functional and Structural
Materials**

RESEARCH HIGHLIGHTS

Nanoparticles



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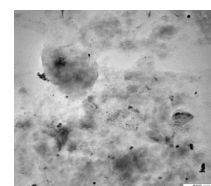
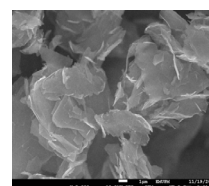
Nanotechnology is employed in the drilling fluid to generate customized nanoparticles for the development of smart drilling fluids equipped with the necessary physical, chemical, economical and thermal qualities. The usage of nano-based drilling fluid (NDF) has gained popularity among the oil and gas industry players to cope with wide ranging requirements currently plaguing the oil and gas industry. Appropriately designed nanoparticles-based drilling fluid have the capability to disperse through a conventional reservoir pore space measuring less than 1 micron as the physical dimension of a nano-sized particle is one billionth of a meter. NDF has a low additive concentration; it can be effective with very much less additives while offering the potential for higher fluid properties.

Recently, drilling operations face a great challenge of high temperature high pressure (HTHP) wells with bottom-hole temperatures ranging from 149 to 250°C and pressures from 10,000 to 30,000 psi. In such fields, the rheological parameters of drilling fluids are difficult to control in view of the extreme temperatures and pressures, thus requiring the use of special formulations and systems. With the incorporation of nanotechnology, the extraordinary properties like rheological, filtration, mechanical and thermal properties of the drilling fluids can be enhanced for optimum drilling performance. Nano additives in drilling fluid formulations are applied as rheology enhancer, fluid loss controller, and emulsion stabilizer.

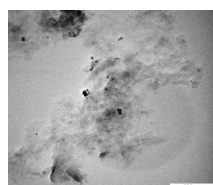
Since oil-based drilling fluids possess high thermal stability, they are the best candidates in high temperature high pressure (HTHP) wells.

However, their usages have been limited and banned by various environmental legislations. This limitation has led to the development of synthetic drilling fluids, specifically for extreme temperature applications. One of environmental friendly synthetic based drilling fluids is an ester-based drilling fluid (EBDF), proved to have promising capability in industrial applications. However, rheological properties of EBDF have adverse effect under harsh conditions of high temperature high pressure. To overcome this intrinsic limitation, the transesterification synthesis approach combined with nanotechnology application is applied. It controls the loss of ester-based drilling fluids without generating formation damage as well as enhancing the rheological characteristics.

Among the nanomaterials, three types namely platelets and powder commercial graphene (6×8 nm), and nano carbon sphere particles NCS (in-house) were used as nano-additives. They are compatible and easily dispersed in our EBDF. Furthermore, their excellent performances as nano emulsifier, fluid loss agents, loss of circulation agents, and rheology modifier have been verified.



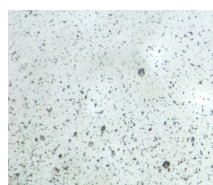
Graphene platelet type



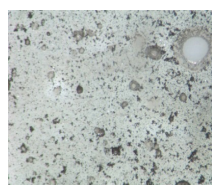
Graphene powder type



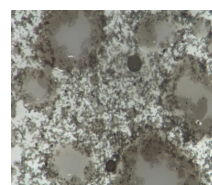
Carbon nano tube



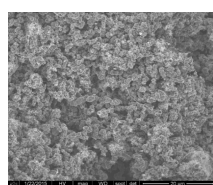
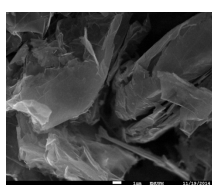
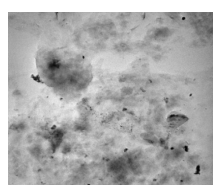
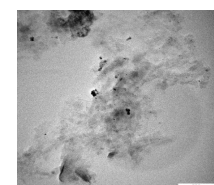
Nano emulsifier using platelet type



Nano emulsifier using powder type graphene



Nano emulsifier using CNT



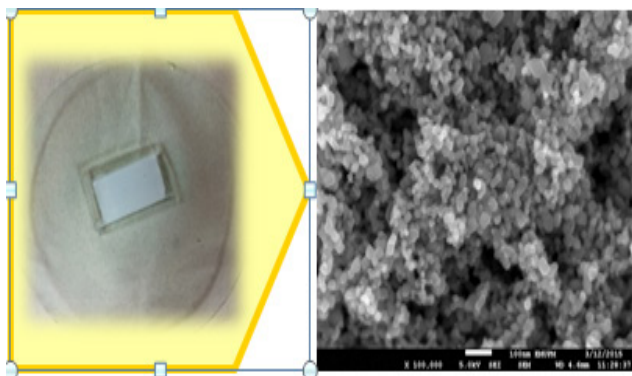
RESEARCH HIGHLIGHTS

Electrochemical Materials for Energy Conversion, Energy Storage and Environmental Conservation

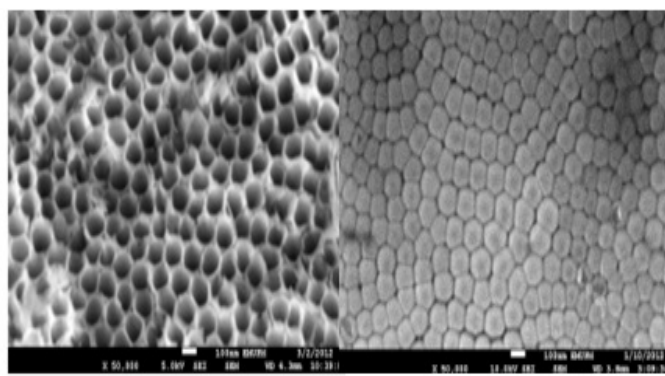
Prof. Dr. Zulkarnain Zainal
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Depletion of fossil fuels has prompted alarming situation in search for alternative energy storage and conversion systems. Further more as the public concern increases over environmental impact of energy generation and green house emission, clean renewable energy sources have been extensively explored. Alternative strategies in energy conversion and storage systems involving electrochemical materials consisting of organic and inorganic semiconductors are being heavily studied and evaluated for solar cells, fuel cells, batteries and capacitors. Oxide semiconductors are also utilised in photocatalytic and photoelectrocatalytic systems in conserving the environment. Till now, a broad range of solar cell research like dye-sensitized solar cell, organic solar cell, silicon solar cell and heterojunction solar cell are currently underway.

Considering the needs of new, low cost and environmentally friendly energy harvesting and storage system, the fabrication of devices with greater efficiency and longer shelf life like electrochemical capacitors is undoubtedly essential. This is accomplished by manipulating nanotechnology in materials synthesis for assembling highly efficient and robust nanostructured electrodes in form of semiconductor nanotubes, nanorods, nanolayers or nanoparticles. Anodic oxidation is capable to tailor an ordered or self-organized oxide layer with controllable pore thickness, regularity, roughness and morphology by tuning the electrolyte and electrochemical parameters.



The introduction of dye-sensitized solar cell (DSSCs) as the third generation solar cell has garnered a huge interest due to its economical cost while maintaining high efficiency. Quantum dots- sensitised solar cells (QDSSCs) have been brought in to improve the performance of DSSCs. In our research works, emphasis is placed on QDSSCs by applying nanostructured metal oxides as electrodes, while metal chalcogenides act as sensitizers. Preparation of metal oxides electrodes for QDSSC involves sol-gel, hydrothermal, anodic oxidation as well as electrodeposition. Besides, there are attempts in improving the efficiency of metal oxide photoanodes by introducing various dopants. It is proven that the introduction of these dopants able to extend the light absorption into the visible region as well as increasing the effective path length of incident light of the semiconductor. On the other hand, inorganic chalcogenide sensitizers can be incorporated by electrochemical deposition, pulsed electrodeposition or successive ionic layer adsorption and reaction. Binary layer of metal chalcogenides demonstrate further improvement in energy conversion efficiency in a novel QDSSC system.



Even though in many cases nonaqueous electrolytes are the preference due to the ability to be induced at higher operating voltages with larger decomposition limits, combination with aqueous electrolytes were proven to offer some competitive advantages in producing efficient oxides semiconductor nanotubes. On the other hand, co-precipitation method has been applied in synthesising various metal oxides in developing electrode materials for electrochemical capacitor.

Nanostructured oxides exhibit impressive characteristics that caught worldwide attention due to their promising capacitive performance, excellent electrochemical stability and low resistance. This type of electrochemical capacitors is also known as pseudocapacitors which chemically store their charge via redox reaction at the vicinity of the surface electrode material. Meanwhile, electrochemical double layer capacitors (EDLCs) that utilise large area charge separation at the electrolyte-electrode interface are studied for some carbonaceous materials. The combination of pseudocapacitor and EDLC forms

hybrid capacitor with more interesting properties.

Metal oxides have also been employed in photoelectrochemical and photocatalytic degradation pollutants for environmental conservation. A wide option of preparative methods such as sol-gel, electrochemical deposition, solvothermal, hydrothermal and co-precipitation can be conducted to

The prepared semiconductors are applied in various types of dye removal systems as well as in degradation of palm oil mill secondary effluent. Works on binary systems by introducing adsorptive materials like activated carbon or chitosan to the semiconducting materials are also conducted. The combination of photocatalysis and adsorption enhances the overall performance of the removal systems.

RESEARCH HIGHLIGHTS

Nanomaterials

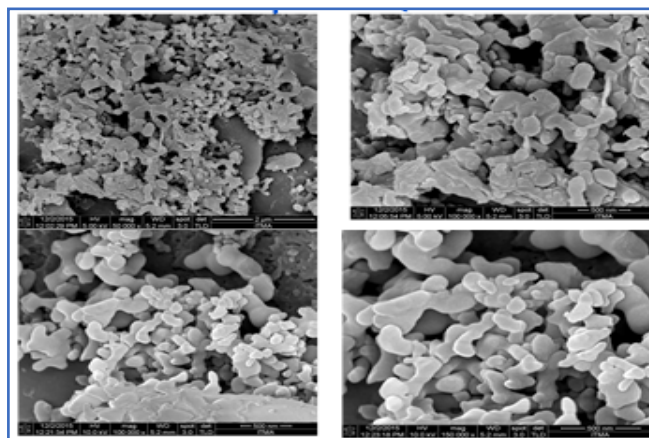


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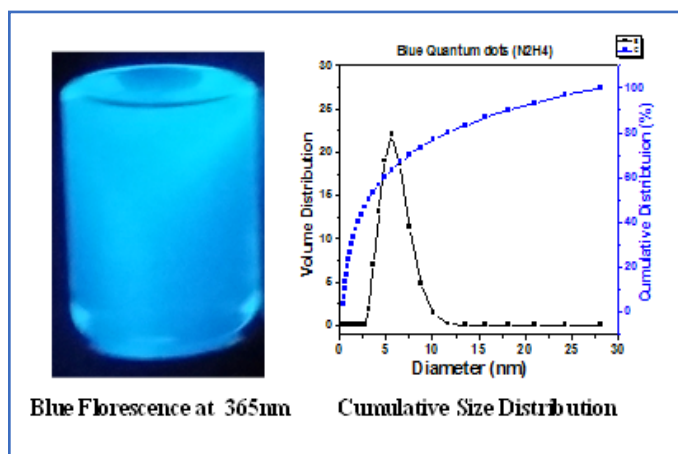
Our research group, Nanomaterials Science and Technology (NAMASTE) is currently working on the design and synthesis of various types of nanomaterials for various applications such as graphene, graphene oxide, graphene quantum dots, single wall and multi-walled carbon nanotubes, inorganic nanolayers such as Mg/Al-layered double hydroxide, Zn/Al-layered double hydroxides, zinc layered hydroxides and magnesium layered hydroxides etc., magnetite nanoparticles, layered double hydroxides-iron oxide core shell nanoparticles, chitosan nanoparticles, activated carbon, shape-stabilised and core-shell phase change materials.

We design, characterize and use these materials for different applications such as for multi-drug and multi-functional theranostics delivery system, thermal energy storage, etc.

FESEM of Graphene Quantum Dots



Graphene Quantum Dot



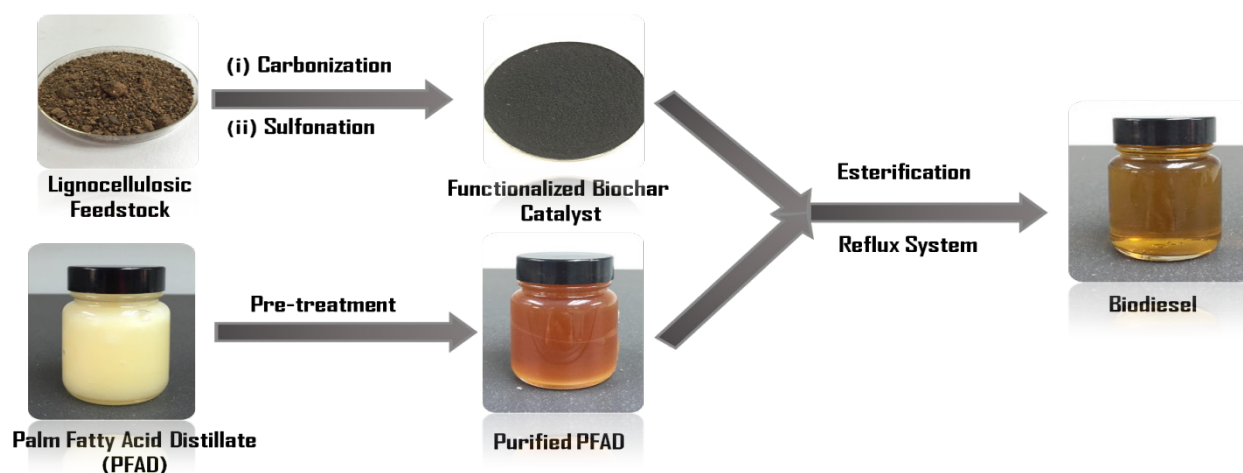
We are currently working on different research projects as listed below;

1. Development of graphene-based quantum dots for drug delivery, bioimaging and magnetic resonance (MRI) application.
2. Phase change material for smart building application.
3. Fungicides agronanochemicals for Ganoderma treatment.
4. Development of drug delivery systems for anti-tuberculosis drugs.
5. Single- and multiwall-functionalized carbon nanotubes for anticancer drug delivery application.



RESEARCH HIGHLIGHTS

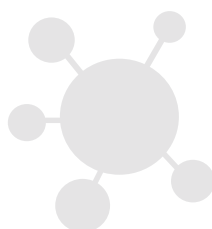
Bio-based Catalyst : A Possible Solution



Biomass is considered an important part of the modern bio-refinery. The unique structure and composition of lignocellulosic biomass may offer many effective ways to produce several chemicals and functional materials. Thermochemical conversion of lignocellulosic biomass to synthesize value-added functional materials has recently attracted a lot of attention.

Bio-char, a by-product from lignocellulosic biomass pyrolysis process, is a potential carbon source to be used as a support for solid acid catalyst. Pyrolysis of lignocellulosic biomass is one of the promising thermo-chemical methods to produce bio-oil, bio-char and combustible gases. Bio-char is commercially utilized for soil amendment and carbon sequestration. Using bio-char based catalyst for biodiesel production would have the added benefit of increasing the environmental viability by utilizing the waste agricultural biomass.

Converting cheap feedstock such as palm fatty acid distillate (PFAD) into liquid transportation fuels has also attracted significant attention because of depleting fossil fuel reserves and associated environmental concerns. Biodiesel can be produced through transesterification of vegetable oils or esterification of free fatty acids (FFAs).



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Nonetheless, using this kind of feedstock is challenging due to the presence of higher contents of FFAs in addition to the triglycerides (TGs). The higher amount of FFAs interferes with transesterification (in the presence of an alkali catalyst) resulting in the formation of unwanted soap by-product which requires expensive separations. Therefore, biodiesel production from FFAs feedstock should be conducted in a two-step process. Each step requires different catalyst in addition to costly washing and neutralization operations.

However, in the presence of functionalized bio-char solid catalyst, the two-step production can be conducted in one step while further washing and neutralizations can also be eliminated. Ease of separation and being cheaply synthesized bio-char solid catalyst are among the other advantages of the bio-char based solid catalyst. Therefore, developing a promising functionalized bio-char based solid catalyst for simultaneous transesterification of TGs and esterification of FFAs for PFAD is a crucial step for commercialization of catalyst and biodiesel.

RESEARCH HIGHLIGHTS



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Development Of Piezoelectric Materials From Rice Husk Silica For Sensor And Energy Harvesting Applications

Rice Husk (RH) is an abundant waste material in all rice producing countries including Malaysia. Although it has been used as a composite in alloy and ceramic industry but still millions of tons were wasted worldwide. In order to help in solving this problem, this project will look into how the abundant waste (RH) will be re-generated and turned into economic potentials.



Paddy field



Paddy



Rice Grain



Rice Husk

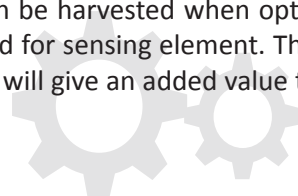
RH is a fibrous material with high silica content in range of 20-25wt%. Silica has a chemical compound silicon dioxide, which is an oxide of silicon with a chemical formula of SiO_2 . If a proper thermal treatment is applied, the silica will be converted into cristobalite, which is a crystalline form of silica and should have a chemistry formula like quartz crystal (a piezoelectric material). It is known that quartz crystals have piezoelectric properties, where they develop an electric potential upon the application of mechanical stress. By using piezoelectric material, energy can be generated by vibration. Thus it can be applied as sensing material in sensor technology.

On the other hand it is known that nowadays energy is produced mainly by utilizing fossil fuels. Although the amount of energy produced is great, the effects are deteriorating the environment. Energy harvesting from piezoelectric material can be considered as green technology.

This research will look at the potential of nano-sized RH to become a new source of sensing and energy harvesting material if they have piezoelectric properties and characteristics like quartz. The piezoelectric materials from rice husk shall be developed involving the following main steps:

1. Rice Husk burning and transformation into White Rice Husk Ash (WRHA)
2. Development of cristobalite pellets from WRHA powder
3. Polarization and metallization of cristobalite
4. Analysis of piezoelectric properties and characteristics of pellets
5. Design and determination of optimum piezoelectric materials for clean energy harvesting and sensor applications

It is expected that the RH will show a piezoelectric behavior thus energy can be harvested when optimum electrical characteristics applied and maximum signal output will be produced for sensing element. This potential then should be explored further for renewable green technology. This will give an added value to our paddy industry which is in-line with our government's NKEA (agriculture).



RESEARCH HIGHLIGHTS

Ferrites Based Thick Film Paste For Enhanced Antenna Performance

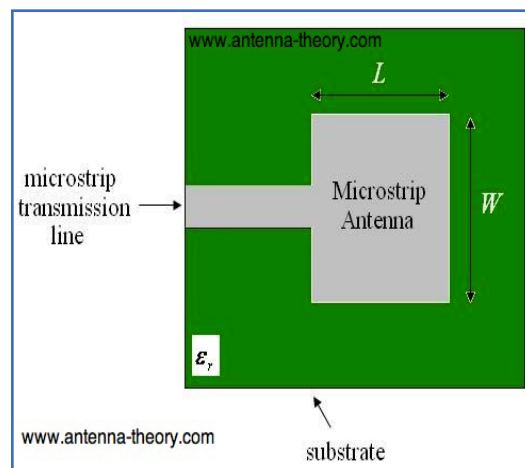
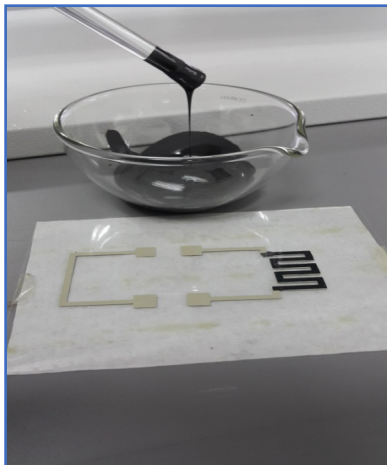


Intan Helina Hasan
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Thick film technology is the most commonly used technology for producing electronic devices due to its inexpensive production and simple method by using thick film paste. Thick film circuits and devices are fabricated by screen printing conductive, semiconductive, resistive or insulating materials in a form of a viscous film paste on ceramic or polymer substrates. Thick film paste plays an important role in thick film technology, since it relies heavily on the characteristics of the paste. One of the ingredients in the paste is the active element which will determine the properties and characteristics of the paste. For example, silver is used in conductive paste, carbon is used for resistive paste, while other metal-oxide materials are being used to produce semi-conductive paste. Therefore there are vast potentials in manipulating ingredients of the paste to fit into the advanced technology nowadays, including nanotechnology.

This research is focusing on the development of a new thick film paste using polycrystalline ferrites as the nanosized active powder combined with an environmental friendly organic binder for microstrip antenna fabrication with aim to incorporate nanotechnology with electronics engineering and antenna technology to produce improved paste with wider range of electrical performances. Ferrites which are mixed metal oxides containing iron oxide as their main component can be formed into soft magnetic materials which are used as core materials for transformers, inductors and in microwave systems, such as microstrip patch antenna. Microstrip patch antenna is a type of radio antenna which can be mounted on a flat surface, and commonly used in telecommunication due to its inexpensive manufacturing and design which is 2-dimensional physical geometry. Antenna characteristics depend on the permittivity and permeability of the element pattern.

The work scope of this project includes investigating the suitable ratio of ferrite nanopowder to the organic binder of the paste, which should be different for each material used since viscosity of the paste plays an important role for thick film screen printing. After the optimized ratio is found, characterization of the new thick film paste will be done in terms of morphology, magnetic and electric properties of the paste. The results obtained will be used during simulation of the patch antenna which is very crucial to this project as the parameters of the antenna can be optimized using the simulation. Finally fabrication of the antenna will be done after taking considerations of all the results obtained through characterization and simulation. It is expected that this research will result in improved thick film paste with better performances, and an improved microstrip patch antenna prototype with wider range of microwave frequencies.





Materials Synthesis and Characterization Laboratory

MSCL

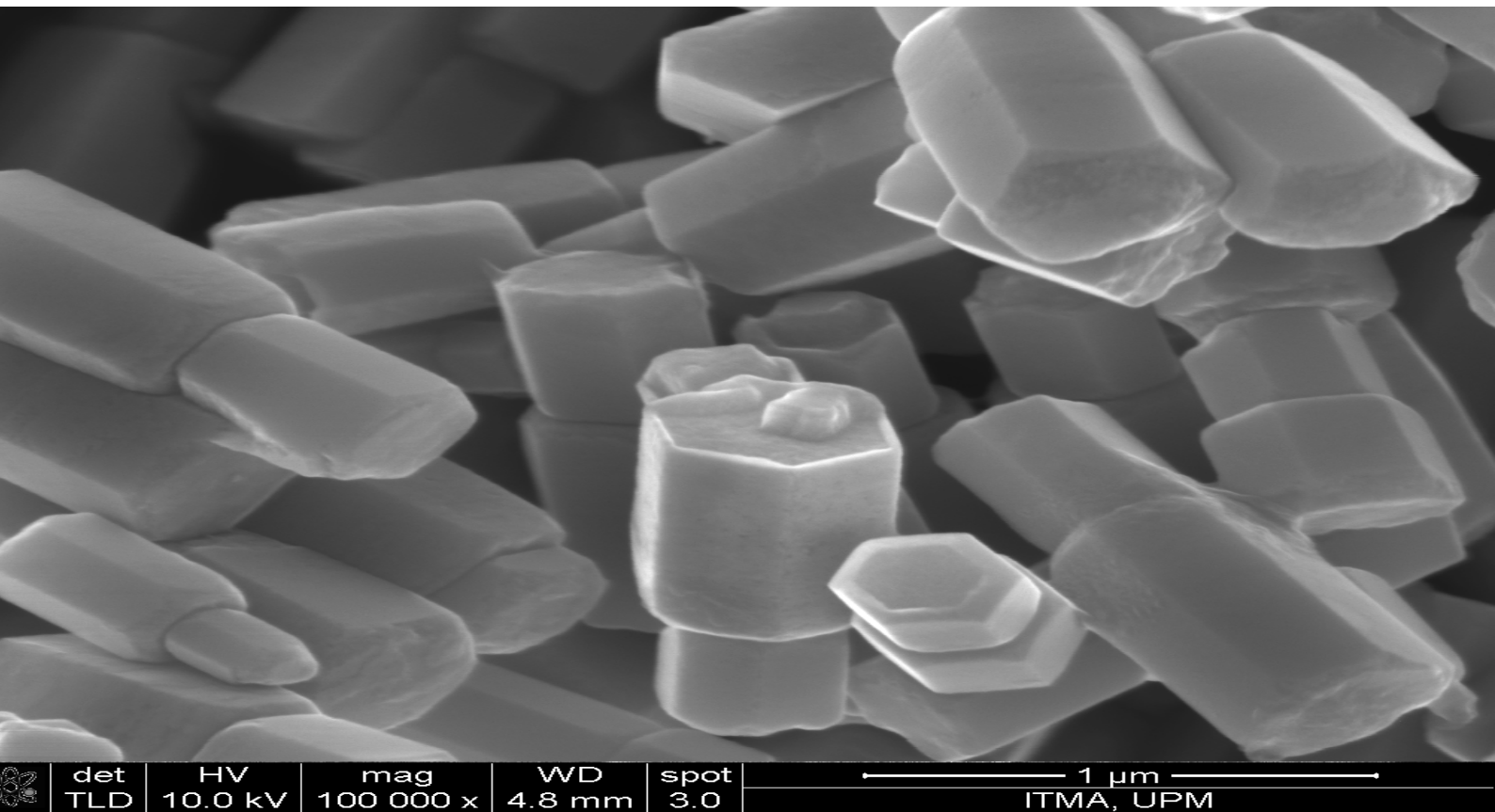
Materials Synthesis and Characterization Laboratory (MSCL) was established on 1st November 1999. It was formerly known as Advanced Materials Research Center (AMRC) and later was changed to Advanced Materials Laboratory (AML). In line with university's restructuring, its name was changed to Advanced Materials and Nanotechnology Laboratory (AMNL) in 2006. Recent restructuring in 2012 has seen AMNL evolving to Materials Synthesis and Characterization Laboratory (MSCL) to be in tune with advanced materials and nanotechnology research focus. This laboratory is one of the three research laboratories under the Institute of Advanced Technology (ITMA). MSCL focuses in three main ac-

1. Interdisciplinary research and development work in advanced materials and nanotechnology.
2. Postgraduate research programs.
3. Dissemination of innovative knowledge and technologies in advanced materials and nanotechnology.

OBJECTIVES

1. To be a leading research centre in advanced materials and nanotechnology.
2. To develop world class research laboratory in advanced materials and nanotechnology.
3. To disseminate knowledge and innovative technologies through publications, seminars and conferences.





MSCL Research Group

Nanomaterials

This program focuses on the synthesis and characterization of nanomaterials and their building blocks which involves the use of nanosized materials. The study of these materials covers the fundamental aspects towards their potential application. The research on nanocomposite materials and nanostructured materials includes but is not limited to nanometals, nanoalloys, nanoceramics, carbon nanotubes and layered double hydroxides.

Functional and Structural Materials

This program focuses on synthesis and characterization of nanomaterials and their building blocks which involves the use of nanosized materials. The study of these materials covers the fundamental aspects towards their potential application. The research on nanocomposite materials and nanostructured materials includes but is not limited to nanometals, nanoalloys, nanoceramics, carbon nanotubes and layered double hydroxides.

Lab Members

Assoc. Prof. Dr. Khamirul Amin Matori
Head of Laboratory
B. Sc. (Hons) (UPM), M. Sc. (UPM),
Ph. D (Sheffield, U.K)
Expertise :
Glass, Glass Ceramic

Prof. Dr. Mohd Zobir Hussein
Head of Nano Materials
B. Sc. (Hons) (UKM), Ph. D (Reading, U.K)
Expertise :
Nano Materials and Materials Chemistry

Assoc. Prof. Dr. Mansor bin Hashim
Head of Advanced and Functional Materials
B. Sc. (UM), M. Sc. (Dundee, U.K), Ph. D (Dundee, U.K)
Expertise :
Magnetic Materials,
High T_c Superconductor

Prof. Dr. Azmi Zakaria
Research Associate
B. Sc. (Hons) (UKM), M. Sc. (Belfast, U.K), Postgraduate
Diploma (Wales, U.K), Ph. D (Wales, U.K)
Expertise :
Applied Optics (Photothermal Physics, Solar Energy),
Material Science (Zinc Oxide based ceramics)

Prof. Dr. Zulkarnain Zainal
Research Associate
B. Sc. (Hons) (UKM), Ph. D (UMIST, U.K)
Expertise :
Physical Chemistry
High T_c Superconductor

Prof. Dr. Abdul Halim Shaari
Research Associate
B. Sc. (Hons) (UKM), M.Sc. (Southampton, U.K), Ph. D
(Hull, U.K)
Expertise :
High T_c Superconductor, Magnetic Materials, Thin Films
Physics

Prof. Dr. Taufiq Yap Yun Hin
Research Associate
B.Sc. (Chemistry) (UPM), M. Sc. (UPM), Ph.D
(UMIST, U.K.)
Expertise :
Heterogeneous Catalysis, Selective Oxidation,
Advanced Materials, Renewable Energy, Biodiesel
Production, Biomass Conversion, Hydrogen
Production and Natural Products Chemistry

Assoc. Prof. Dr. Abdul Halim Abdullah
Research Associate
B. Sc. (Hons) (New Brunswick),
Ph.D (Dundee, U.K).
Expertise :
Materials Chemistry

Assoc. Prof. Dr. Jumiah Hassan
Research Associate
B.Sc. (Northern Illinois, U.S.), M.Sc.
(Washington State, U.S.), Ph.D (UPM)
Expertise :
Dielectric Properties of Materials At Microwave
And Low Frequencies

Dr. Ismayadi Ismail
Research Officer
B.Sc. (UKM) , M.Sc. (UPM), Ph.D (UPM)
Expertise :
Magnetic Materials

Dr. Md Shuhazlly Mamat@ Mat Nazir
Research Associate
B.Eng (Hons) Nottingham, UK
Ph.D Nottingham, UK
Expertise :
Carbon nanostructures: Synthesis and
applications Nanomaterials Characterisations
PEM Fuel Cells and Electrolysers Nanomaterials
Characterisations

Dr. Samikannu Kanagesan
Post Doctoral
M.Sc., Mphil., Ph.D.
Expertise :
Magnetic Materials

Lab Members

Rosnah Nawang
Research Officer
B.Sc. (USM), M.Sc. (USM)
Expertise :
Polymer Technology

Noor Lina Shamsuddin
Assistant Engineer
Certificate of Power Electronic Engineering,
Diploma of Electronic Engineering
Expertise :
Repairing of Computers and Electrical Equipment

Sarinawani Abdul Ghani
Science Officer)
B.Sc. (UPM)
Expertise :
Nano Materials

Mohd Kadri Masaud
Assistant Engineer
Certificate of Electronic Engineering(Relationship),
Diplomae of Electronic Engineering
Expertise :
Repairing of Computers and Electrical Equipment



Materials Processing and Technology Laboratory

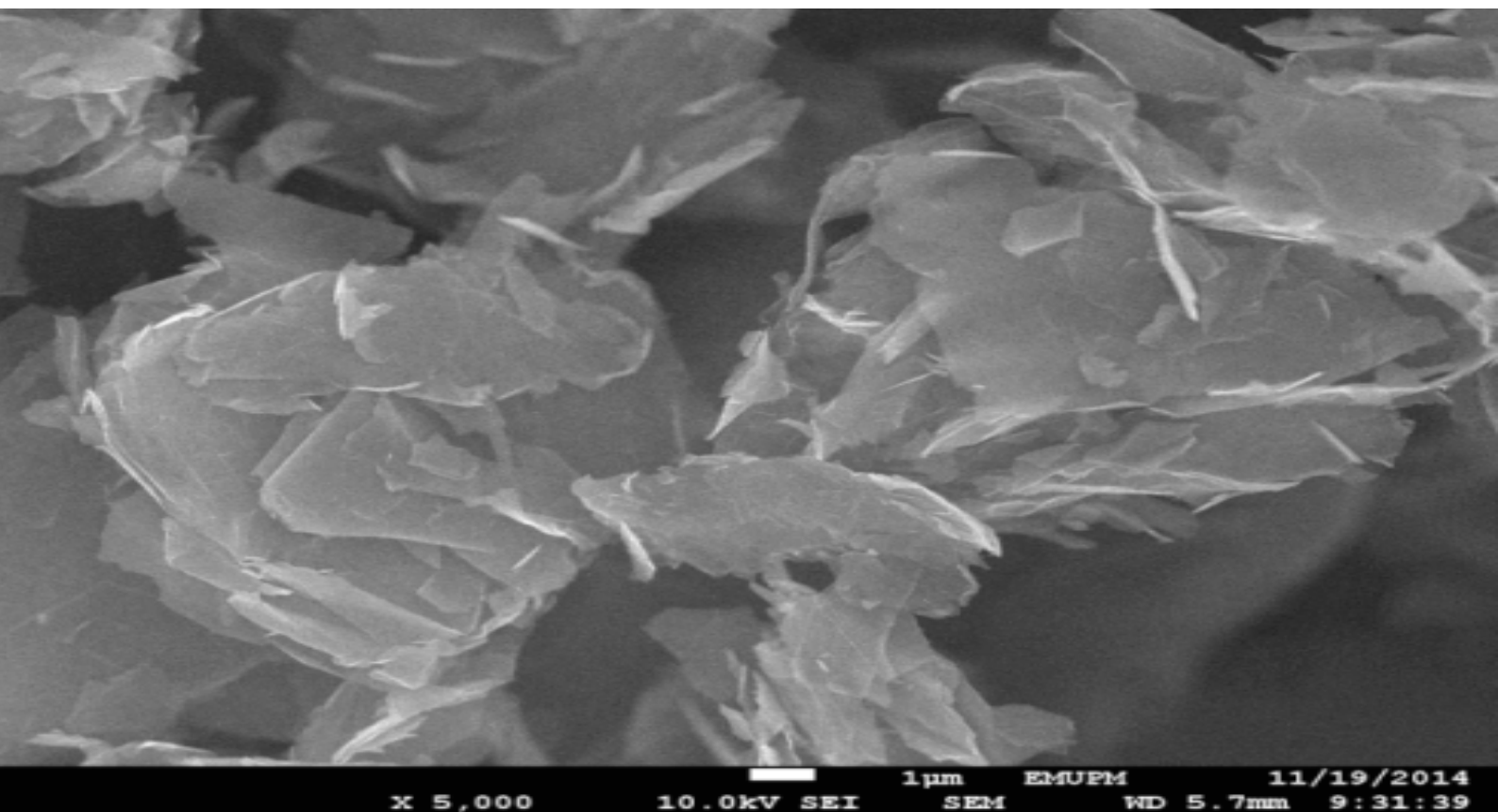
MPTL

Materials Processing and Technology Laboratory (MPTL) was established to fulfill the research necessity in Advanced Materials Processing and Nano Materials. MPTL was developed to complement the ITMA ecosystem, which aims to be a leader in the field of Nanotechnology and Advanced Materials. MPTL focuses on developing and promoting research in Materials Technology and Advanced and Nano Materials Processing in Malaysia. The main activities of the laboratory are :

1. Conducting research in related fields.
2. Postgraduate research programs.
3. Provide trainings and consultancy services.

OBJECTIVES

1. To be a leading research center in processing and technology for advanced materials and nanomaterials.
2. To produce experts in the field of processing and technology for advanced materials and nanomaterials.
3. To be a knowledge dissemination center of processing and technology for advanced materials and nanomaterials
4. To build a network of strategic partnership between local and international researchers from public and private institutions.



MPTL Research Group

Materials Processing

This program focuses on developing research related to scalable processing of advanced materials and nanomaterials. We have expertise in synthesis of carbon nanostructures such as carbon nanotubes (CNT) and CNT cotton by both batch and continuous chemical vapour deposition (CVD) processes. The existing know how and facilities in CVD processing open other venues for research such as superconductor thin film and bottom-up synthesis of graphene and homologous graphene. Scalable top-down processes for preparation of graphene oxide and graphene quantum dots are also being actively pursued. Other scalable processes for synthesis of advanced materials advanced catalysis.

Nanomaterials Technology

This program focuses on research in nanotechnology and advanced materials production in a scale which allows for commercialization step of the materials. This requires in-depth research in several fields. The first part is in the field of modelling and simulation process that can determine the parameters in material's processing. The second part is designing a reactor for materials production optimizing. The third part is safety in materials handling, particularly nano materials. The successful processing technology has been achieved by this group is technology in processing Carbon Fibre and Carbon Nanotubes using Chemical Vapor Deposition (CVD).

Lab Members

Assoc. Prof. Dr. Suraya Abdul Rashid
Head of Laboratory
B. Chemical Engineering (University of Nottingham, U.K) , Ph.D (Imperial College London, U.K)
Expertise :
Nanotechnology and Nanomaterials

Prof. Dr. Robiah Yunus
Research Associate
B.Sc.(Chemical Eng),M.Sc. in Integrated Design of Chemical Plant,PhD in Chemical Engineering
Expertise :
Renewable Energy, Reaction Engineering, Process Engineering

Prof. Madya Dr. Norhisam Mison
Research Associate
B. Eng. (Shinshu University, Japan), M. Eng. (Shinshu University, Japan), Ph.D Eng. (Shinshu University, Japan)
Japanese Language Intensive Course(UM, Malaysia)
Expertise :
Electrical Machine, Power Electronic Drive, Magnetic Sensor

Prof. Dr. Ir Thomas Choong Shean Yaw
Research Associate
B.Sc. (Hons) (UTM), M.Sc. (UTM), Ph.D. (Cambridge)
Expertise :
Chemical Engineering, Process Modeling & Simulation, Separation Processes, Material Engineering

Dr. Dayang Radiah Awang Biak
Research Associate
B.Eng. (Hons) (CWRU), PhD (Birmingham)
Expertise :
Heat Transfer; Modelling; Food Processing; Crystallisation; Pharmaceutical Products, Nanoscale Technology

Dr. Siti Hajar Othman
Research Associate
BEng. (Vanderbilt), PhD (UPM)
Expertise : Nanotechnology, food packaging Engineering

Dr. Mohamad Amran Mohd Salleh
Research Associate
Bachelor Sc. Chemical Engineering (University of Western Ontario, Canada)
Ph.D Chemical Engineering (University of Birmingham, England)
Expertise :
Particle Technology, Biochar and Nanotechnology, Carbonaceous Particulates

Prof. Dr. Chuah Teong Guan @ Luqman Chuah Abdullah
Research Associate
B.Sc. (Hons) (UTM), Ph.D. (Birmingham)
Expertise :
Separation Technology, Chemical and Environmental Technology, Material Engineering (Polymer) and Particle Technology

Dr. Shafreeza Sobri
Research Associate
B. Engineering, Chemical Engineering (UTM, Malaysia), Ph.D, Chemical Engineering (Electrochemistry), (University of Newcastle upon Tyne, U.K)
Expertise :
Electrocrystallisation and Electrochemical Engineering

Dr. Faizah Mohd Yasin
Research Associate
B.Eng. (Hons) (UMIST), M. Sc. (UPM), PhD (Univ. of Western Australia)
Expertise :
Nanotechnology, Advanced Materials

Dr. Nordin Bin Hj. Sabli
Research Associate
B.Eng (TUT), M.Eng (UPM), Ph.D (UPM)
Expertise :
Photoelectrochemical cell, Fuel Cell

Lab Members

Dr. Umer Rashid
Research Fellow
B.Sc. Sciences (University of The Punjab, Lahore, Pakistan), M.Sc. Chemistry (University of Agriculture, Faisalabad, Pakistan), PhD. Chemistry (University of Agriculture, Faisalabad, Pakistan)
Expertise :
Renewable Energy (Biodiesel)

Siti Zulaika Razali
Research Officer
Bc. of Chemicals Engineering (UPM), M.Sc. Science (UPM)
Expertise :
Chemical Engineering (Process)

Roslina Abdul Rashid
Science Officer
B.Sc. of Electrical & Electronic Engineering (USM)
Expertise :
Electrical and Electronics Engineering- Control, Robotics and Automation

Zakky Yamanie Jamiauddin
Assistant Engineer
Certificate of Mechanical Engineering
Expertise : Mechanical

Juraina Md Yusof
Research Officer
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Expertise :
Electrical and Electronics Engineering-Control, Robotics and Automation

Mohd Ali Mat Nong
Research Officer
B.Sc. of Electrical & Electronic Engineering (UPM)
Expertise :
Electric and Electrical Engineering

Ab Haffiz Ab Jalil
Assistant Engineer
Diploma of Electrical Engineering
(Politeknik Sultan Salahuddin Abdul Aziz Shah)
Expertise : Electronics



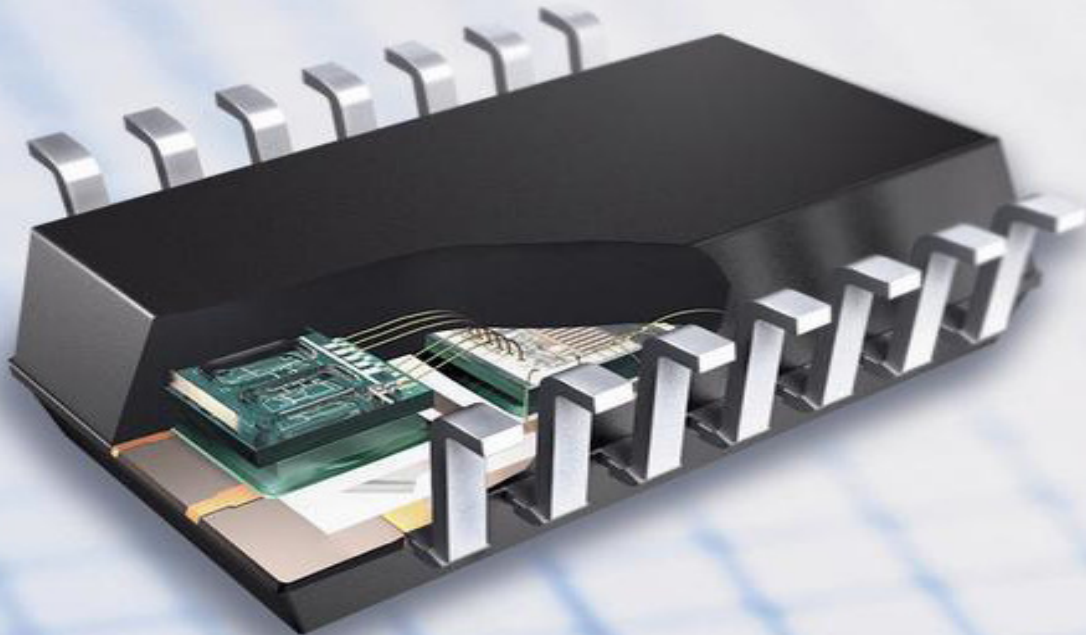
Functional Devices Laboratory

FDL

Functional Devices Laboratory (FDL), formerly known as Sensor Technology Laboratory (STL) had been restructured and renamed in line with ITMA new ecosystem. The laboratory aims to be a leader in sensor technology and electron devices for nanotechnology and advanced materials. The main activities of the laboratory are conducting research in related fields, postgraduate programs, provide trainings and consultancy services.

OBJECTIVES

1. To be a leading research center in sensor technology and electron devices for advanced materials and nanomaterials.
2. To produce experts in the field of sensor technology and electron devices for advanced materials and nanomaterials.
3. To be a knowledge dissemination center of sensor technology and electron devices for advanced materials and nanomaterials.
4. To build a network of strategic partnership between local and international researchers from public and private institutions.



FDL Research Group

Sensor Technology

Sensor technology includes the study and preparation of sensing material and characterized by related transducer, signal processing and design of system or devices (including micro and nano-scale) in development of sensor to meet society and industrial demands. Sensor system includes (but not limited to) electronic sensors, biosensors, and chemical sensors. Sensor technology has a very important role as the key technology to support a wide variety of research and industrial applications. It is also a vital element that can be applicable to water security, environment and green technology.

Electron Devices

Electron Devices is a program that has been offered under this laboratory starting from 2012. This program aims to perform basic and applied research in the growth of semiconductors and related electronic materials, as well as micro analysis with the aim of developing new and improved electronic devices. The vision in this area is next generation electronic devices and sensors for improved performance and reliability in complex environments. Research areas include nanoelectronics and MEMS, RF and energy harvesting.

Lab Members

Assoc. Prof. Dr. Suhaidi Shafie
Head of Laboratory
B.Eng. University of Ryukyus, M.Sc. Tokyo University of Agriculture and Technology, Japan,
D. Eng. (Nanovision) Shizuoka University, Japan
Expertise :
CMOS Image Sensor, Porous Silicon, Solar Cell, VLSI Design, Analog TV/VCR Tuners

Prof. Dr. Nor Azah Yusof
Director of ITMA
B.Sc. (Hons), Universiti Kebangsaan Malaysia
Ph.D., Universiti Kebangsaan Malaysia
Postdoctoral in Institute of Biotechnology, University of Cambridge
Expertise :
Chemical and Biosensor, Molecular Imprinted Polymer

Prof. Ir. Dr. Mohd Zainal Abidin Abdul Kadir
Research Associate
B.Eng (UPM), PhD (Manchester), P.Eng, C.Eng (UK), MIET, SMIEEE, MIAENG
Expertise :
Lightning Protection, High Voltage Engineering, Insulation Coordination

Dr. Mohd Hanif Yaacob
Research Associate
B.Eng (Hons) Electronic Computer System (Salford University, U.K),
M.Sc. Communications and Network Engineering (UPM, Malaysia), Ph.D in Electrical and Computer Engineering (RMIT University, Australia)
Expertise :
Electronic & Optical Communication

Dr. Jaafar Abdullah
Research Associate
B.Sc. (Hons.) in Chemistry, Ph.D in Analytical Chemistry Biosensor, Universiti Kebangsaan Malaysia,
Expertise :
Chemical and Biosensor

Assoc. Prof. Dr. Mohamad Nizar Hamidon
Head of Electron Devices Program
B.Sc. Hons. Universiti Malaya, M.Sc. Universiti Kebangsaan Malaysia,
Ph.D (University of Southampton)
Expertise :
Microelectronics (Sensor Technology), MEMS, Devices Fabrication and Packaging, Wireless System

Dr Shahrul Ainliah Binti Alang Ahmad
Research Associate
B.Sc. (Hons) in Industrial Chemistry, Universiti Putra Malaysia, Ph.D in Physical and Analytical Chemistry, University Of Sheffield, Postdoctoral in Physical and Analytical, University Of Sheffield, Postdoctoral in Organic Synthesis , Surface Modification and Electrochemistry, University Of New South Wales
Kepakaran / Expertise :
Industrial Chemistry

Dr. Mohd. Nazim Mokhtar
Research Associate
B.Eng (Hons) (Surrey), Ph.d (Surrey)
Expertise :
Biomedical Nanoelectronics Engineering, Lab on a Chip, Energy Harvesting

Dr. Yap Wing Fen
Research Associate
B.Sc. in Physics (with education) , Ph.D in Applied Optics, Universiti Putra Malaysia
Expertise :
Optical Based Sensor

Dr. Janet Lim Hong Ngee
Research Associate
B.Sc. Oleochemistry, M.Sc. Catalysis and Surfactants Universiti Kebangsaan Malaysia, Ph.D Material Science Universiti Putra Malaysia
Expertise :
Graphene Based Polymer Nanocomposites

Dr. Nizam Tamchek
Research Associate
BSc. Kanazawa University(Japan), M.Sc. University of Malaya, Ph.D. University of Malaya
Expertise :
Photonics

Lab Members

Dr. Nasri Sulaiman
Research Officer
B.Eng, Universiti Putra Malaysia, M.Sc., University of Southampton, Ph.D University of Edinburgh
Expertise :
Evolvable Hardware (EHW) and Digital Signal Processing

Dr. Mohd Khair Bin Hassan
Research Associate
Diploma of Electrical & Electronic Engineering ,ITM, B.Eng. (Hons) Electrical and Electronic Engineering, University of Portsmouth, UK , M.Eng. (Electrical) Major in Control System, Universiti Teknologi Malaysia, Ph.D. Automotive Engineering, Universiti Putra Malaysia
Kepakaran / Expertise :
Energy Engineering, Control System

Dr. Reza Hajian
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B.Eng, Universiti Putra Malaysia, M.Sc., University of Southampton, Ph.D University of Edinburgh
Expertise :
Evolvable Hardware (EHW) and Digital Signal Processing

Intan Helina Hasan
Research Officer
B.Sc. Yokohama National University
Expertise :
Electronics and Computer Engineering

Md. Ali Rani
Science Officer
B.Sc. Universiti Putra Malaysia
Expertise :
Forest Management

Dr. Suriati Paiman
Research Associate
B.Sc. in Industrial Pysics, M.Sc. (Physics) in Thin Film Physics Universiti Teknologi Malaysia, Ph.D in III – V Compaund Semiconductor Nanotecnology Australian National Nanotechnology
Expertise :
Compound Semiconductor Materials Science (III-V semiconductors), Compound Semiconductor Nanotechnology and Photovoltaics

Dr. Yusran Sulaiman
Research Associate
B.Sc. (Hons) (UTM), M.Sc. (UTM), Ph. D (Durham, U.K)
Expertise :
Electroanalytical Chemistry and Materials Chemistry

Dr. Mohammad Faruq
Post Doctoral
B.Sc (Chemistry)& M.Sc (Organic Chemistry) Acharya Nagarjuna University
Ph.D. Southern University and A&M College, USA
Postdoctoral in Southern University and A&M College (USA), NorthWest University (South Africa)
Expertise :
Cancer nanotechnologies, Nanomaterials for biomedical applications, Nanotoxicology, Nanocatalysis

Rosiah Osman
Research Officer
B.Sc. The University of Southwestern Louisiana (Lafayette)
Expertise :
Electrical and Electronics Engineering

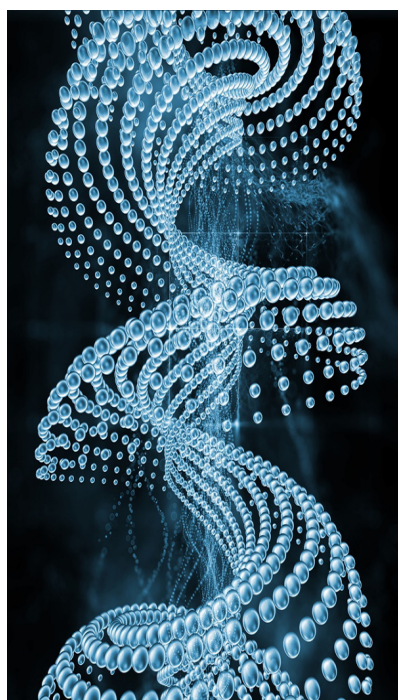
Wafi Azimin Mohd Jan
Assistant Engineer
Certificate of Electronic Communication
Expertise :
Electronics Communication

FIELD OF STUDY

Nanosciences

Nano-size materials exhibit novel and superior physical and chemical properties, phenomena and processes, which are different from those of bulk materials. Metal nanoparticles have been intensively studied recently due to their novel optical, electronic, magnetic and electrochemical properties. In particular, silver nanoparticles have many potential applications in optical waveguides, optical switches, molecular identification, catalysis, pronounced surface plasmon resonance absorption, surface enhanced Raman scattering and surface-enhanced fluorescence. The properties of metal nanoparticles depend on several factors such as the electron density, size and shape of the nanoparticles, dielectric constant of the medium. The group has embarked on the preparation of polymer/metal nanocomposites by reduction of g radiation, chemical and physical methods. Various characterization techniques are employed including SEM, TEM, XRD, UV-visible spectroscopy and electrical properties.

Nanotechnology has become one of the most important and exciting forefront fields. Various devices in the nanoscale will be created in the near future. Demands for nanosized materials are increasing due to new inventions and innovations in nanotechnology. One of nanomaterials that have garnered the interest of researchers in the world is CNTs which deemed to change the scale of our current equipment. Based on the need of rising interests in synthesizing CNTs for nanotechnology, commercial PLAD systems and components with low start-up cost must also reached the market. We have designed an inexpensive new chamber for the pulsed laser ablation deposition (PLAD) system to synthesis carbon nanotubes (CNTs). A T-shaped steel vacuum chamber was designed which has a cylindrical shape, with diameter of about 15cm and 45cm length.



Advanced Materials

Advanced Materials Engineering is designed to train students in the materials and processes fields, for the purpose of integrating them in high-tech and traditional technological industries or in materials research at advanced degree levels. This program aims at preparing students with in-depth multi disciplinary knowledge, current issues and practices in the field of Advanced Materials such as composite, ceramic, electronic materials, magnetic material, smart material, plastic and polymer.

Green Engineering

Green Engineering is the process and design of products that conserve natural resources, and impact the natural environment as little as possible. The term is often applied to system or device that requires engineering, and incorporates sound environment principles. Though green engineering is somewhat more expensive, many countries, recognizing the value of such work, have begun to offer tax breaks, and other incentives to those who incorporate its use.

Nanotechnology

This program aims at preparing students with knowledge related to Nanotechnology which deals with developing materials, devices, or other structures possessing at least one dimension sized from 1 to 100 nanometres. Nanotechnology is the study of manipulating matter on an atomic and molecular scale. Nanotechnology entails the application of fields of science as diverse as surface science, organic chemistry, molecular biology, semiconductor physics, microfabrication. Some of typical applications of nanotechnology are in sensor, in delivery system, nanoabsorbents, nano electronic, nano machine, nanocomposites, nanotubes, and nanocarbons.

Energy

The field of energy engineering covers both fundamental and applied research that involves development, design and usage of alternative energy, renewable energy and sustainable technology. Renewable energy covers solar, wind, hydro, tidal, biomass and hydrogen energies. Research areas for renewable energy covers machine development, instrumentation, energy generation, energy storage that are environmentally friendly. For development of solar energy system, its instrumentation covers solar tracking device, modification of stirling engine, water drainage system, solar mirrors and smooth operation for the energy generation for a solar bowl. Wind farm requires a generation system, energy distribution and energy storage facilities. Development of gasifier and purification of synthesis gas for generation of electrical energy direct from oil palm biomass and generation of gases from biomass and some aspects of biomass energy generation. Animal tracking system and development of automatic methane gas generation are challenges for this research. Development of smart window, smart chimney and use of photo voltaic in creating a healthy indoor environment are part of sustainable technology. Students are required to take courses in related fields as stated and to conduct research as well as presenting research results in seminars.

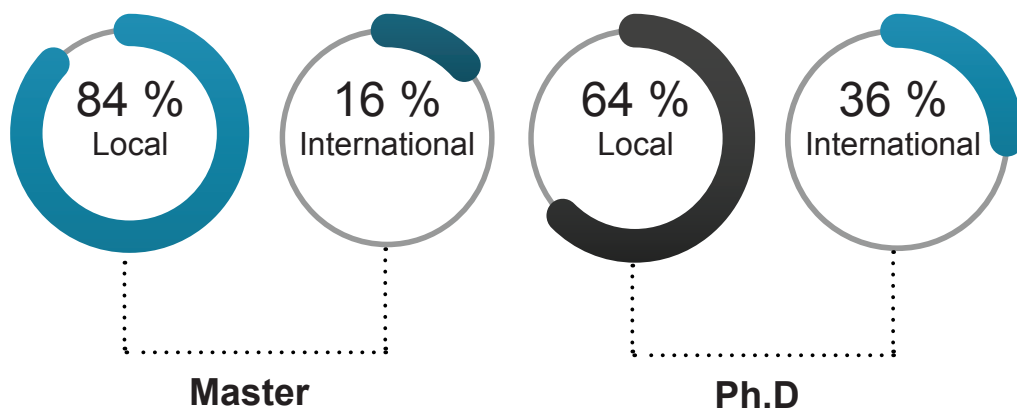
Sensor Technology

Sensor Technology Engineering is the design and development of sensors to meet the need of the growth in products and services that utilize information from different types of sensors. Sensor technology has a very important role as the key technology to support a wide variety of research and industrial application. It is also a vital element that can be applicable in agriculture, water security, environment and green technology. The term is applied mostly in development of sensor networks, which also include wireless sensor networks (WSN). Although sensors can include electronic sensors, biosensors, and chemical sensors, the focus will be on the development and design of the electronic sensors.

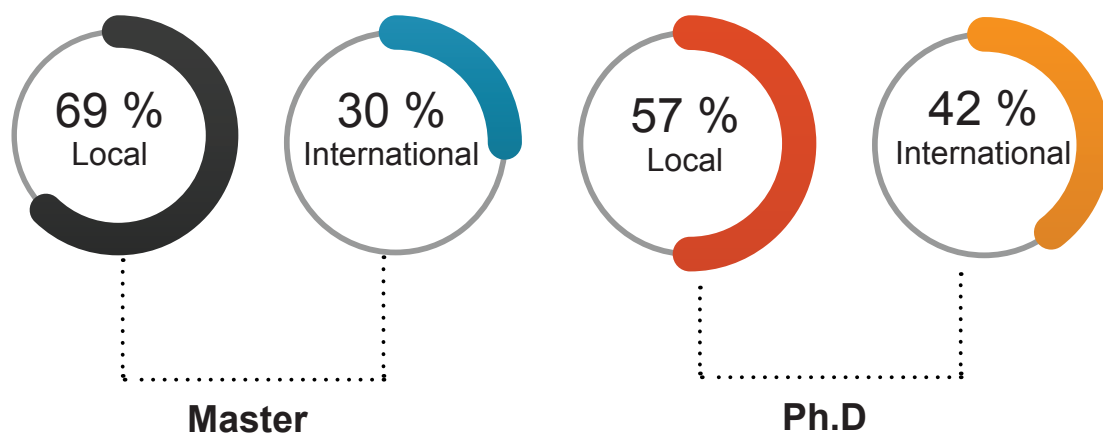




POST GRADUATES



Students enrollment in 2015



Student Admission to ITMA on 2015

Year	2014	2015	Total
Master	13	9	22
Ph.D	11	9	20

Number of Students Graduated in 2015



Linkages & Networking

REFRESHER COURSE ON PALM OIL MILLING PROCESS



ITMA has organized a series of refresher courses entitled "Engineering, Chemistry and Practices to Increase Recovery of Oil in the Palm Oil Milling Process". Four courses were held on 16 & 17 March, 27 & 28 April, 18 & 19 May and 27 & 28 July 2015. The main objective of this program was to provide a greater understanding on the theory and best practices of palm oil milling process, which may help to increase process efficiency and rate of recovery. The key topics of this course revolved around Oil Extraction Rate (OER), fresh fruit bunches (FFB) and the processing technology.

This refresher course was conducted by Assoc. Prof. Dr. Abdul Azis Ariffin, ITMA's Research Fellow who has over 10 years of experience in palm oil milling. Through this program, his invaluable experience and practical knowledge is poured back to the society.

The first day of the program was held at the Seminar Room, Faculty of Engineering, UPM. This session covered the theoretical aspects related to engineering and chemistry of palm oil milling process. On the second day, participants were brought to the Pilot Plant 7, Faculty of Food Science and Technology, UPM, for the practical session on the recovery of oil from fresh fruit bunches (FFB).

Around 80 participants attended this course involving engineers, researchers and students from UPM, other universities and palm oil industry players such as Tabung Haji Plantations, Fel-da Palm Industries Sdn. Bhd., Boustead Estates Agency Sdn Bhd., Sarawak Oil Palms Berhad and Sime Darby Research Sdn Bhd.



Linkages & Networking

WAMN 2015

(Workshop on Advanced Materials & Nanotechnology)

Nov 4-5, 2015, UPM Serdang. – The Materials Processing and Technology Laboratory, ITMA had successfully organized the Workshop on Advanced Materials and Nanotechnology (WAMN) 2015 with the theme "Green Nanotechnology: Synthesis and Application". The event was co-organized by the Chemical and Environmental Engineering Department, Faculty of Engineering and was held at the Seminar Room in the Faculty of Engineering, UPM. The event was officiated by the Deputy Director of UPM's Research Management Centre, Prof. Dr. Hamiruce Marhaban. Among the distinguished guests who attended this event were representatives from Nano Malaysia Berhad (NMB).

WAMN is an annual workshop series hosted by ITMA. The primary objective of this workshop is to update participants with current ideas and techniques in specific topics of interest by bringing speakers who are at the forefront of their research. This two days' workshop included plenary talks from invited speakers, a poster session as well as research demonstration sessions.

A total of five people were invited as speakers for the workshop. They were Prof. Dr. Ng Ka Ming (The Hong Kong University of Science and Technology, Hong Kong), Prof. Dr. Kuei-Hsein Chen (Institute of Atomic and Molecular Sciences, Academia Sinica, Taiwan), Prof. Dr. Hiroyuki Yoshida (UPM, Malaysia), Assoc. Prof. Dr. Arun M. Isloor (National Institute of Technology Karnataka,

-India) and Dr. Shutesh Krishnan (Graphene Nano-Chem Sdn. Bhd., Malaysia).

Around 20 posters were displayed during the event for competition. Research demonstration sessions (demos) were also conducted over the two days, with three demos on each day. The participants were divided into six groups and rotated to ensure that the demos could be conducted comfortably for all participants. The details of the demo title and presenter are:

1. Graphene Quantum Dot Synthesis and Sensor Application (demo 1)
by Dr. Amir Reza Sadrolhosseini
2. Low Cost and Efficient Catalyst for Biodiesel Synthesis (demo 2)
by Mr. Mohd Lokman Ibrahim
3. Field Emission Scanning Electron Microscope of Various Nano Structures (demo 3)
by Mr. Md Ali Rani and Mrs. Sarinawani
4. Ammonia Sensing Response of Optical Sensor Coated with Nano Structures (demo 4)
by Dr. Mohd Hanif Yaacob
5. Synthesis of CNT from Alcohol Solution (demo 5) by Dr. Ismayadi Ismail
6. RAMAN Spectroscopy of Carbon Nano Structures (demo 6) by Mrs. Roslina Abdul Rashid and Ms. Nurnazeera Zulkefli

Around 45 participants attended WAMN 2015, including student and researchers from within and outside UPM. All in all it was a successful event which received good feedback from participants.

Poster Winners

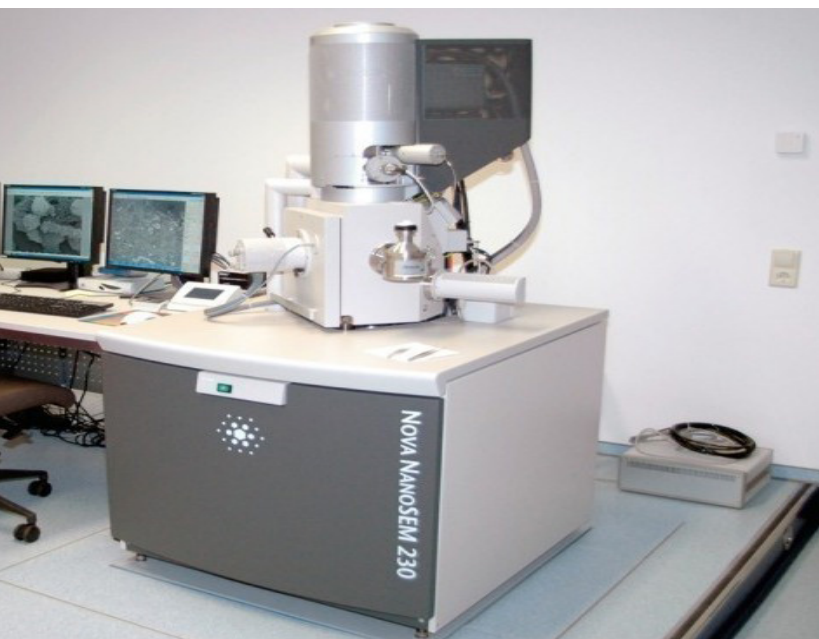
- 1st Prize** Author : Nazifah Ariffin
Title : Lateral Flow Immunoassay for Ultrasensitive and Affordable Naked Eye Detection of Tuberculosis.
- 2nd Prize** Author : Zulaiha Abdul Rahim
Title : Synthesis and Characterizations of Multiwalled-Carbon Nanotubes for Electrochemical Sensor.
- 3rd Prize** Author : Nurul Infaza Talalah Ramli
Title : The Effect of Metal Oxides Addition to the Properties of CNT/GNF Hybrid Nanocomposite for Enhanced Supercapacitor Performance

Visiting Professors

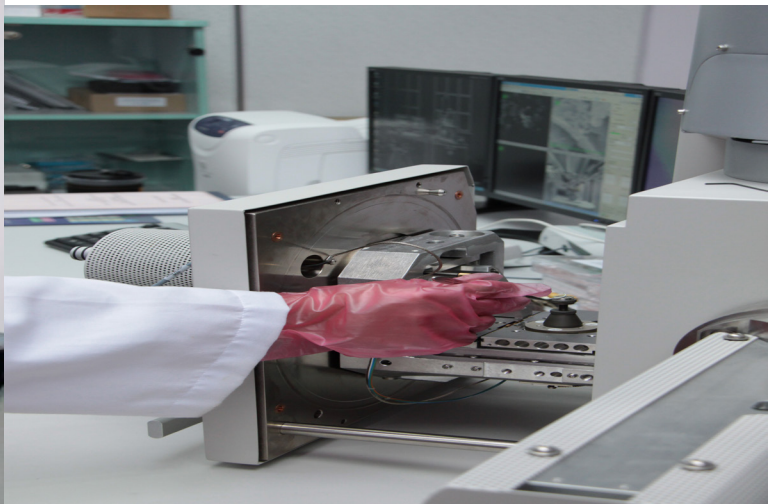
- 1 Prof. Dr. Ng Ka Ming
The Hong Kong University of Science and Technology, Hong Kong
- 2 Prof. Dr. Kuei-Hsein Chen
Institute of Atomic and Molecular Sciences, Academia Sinica, Taiwan
- 3 Assoc. Prof. Dr. Arun M. Isloor
National Institute of Technology Karnataka, India



Facilities at ITMA



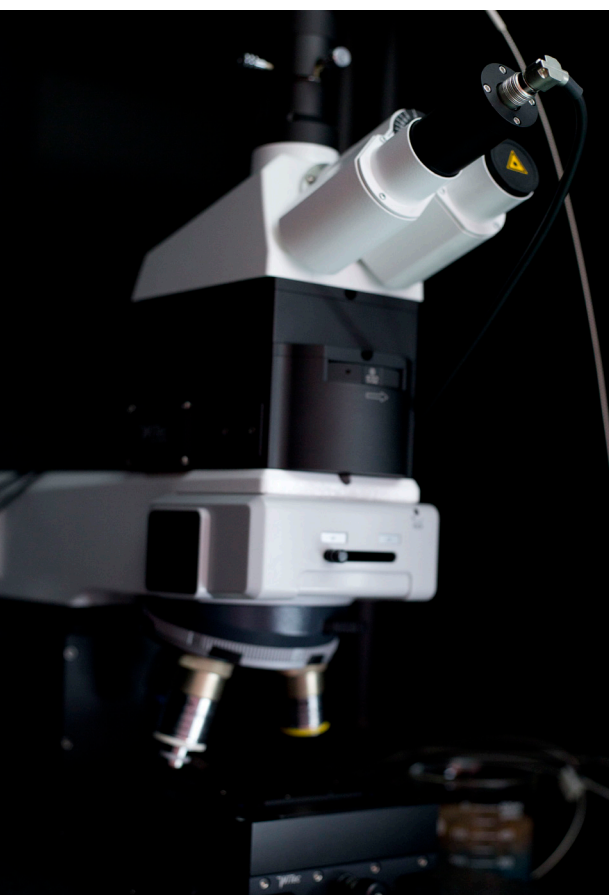
NOVA NANOSEM 230 FESEM



Ultra High Resolution Scanning Electron Microscope (FESEM) with Energy Dispersive X-Ray (EDX).

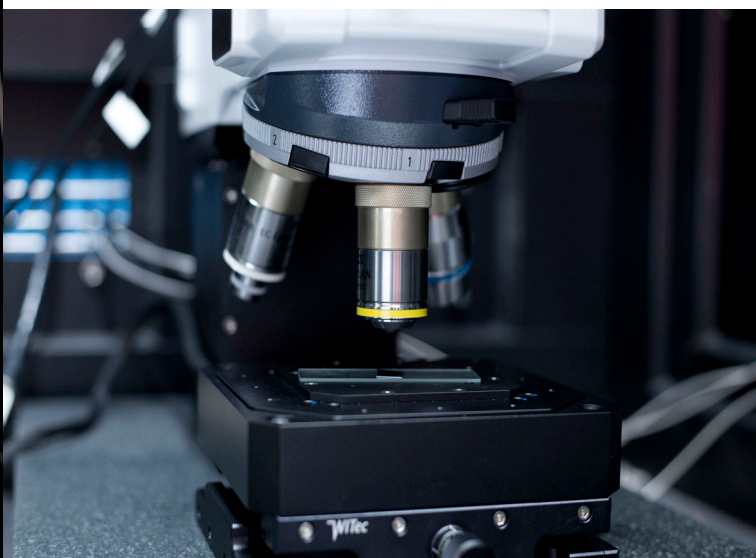
Able to produce enlarged images of a variety of specimens, achieving magnifications of over 500,000x providing ultra-high resolution imaging in a digital format. This equipment has two operating vacuum modes to deal with different types of sample i.e high vacuum (HiVac) dan low vacuum (LowVac).

ALPHA 300R RAMAN Spectroscopy



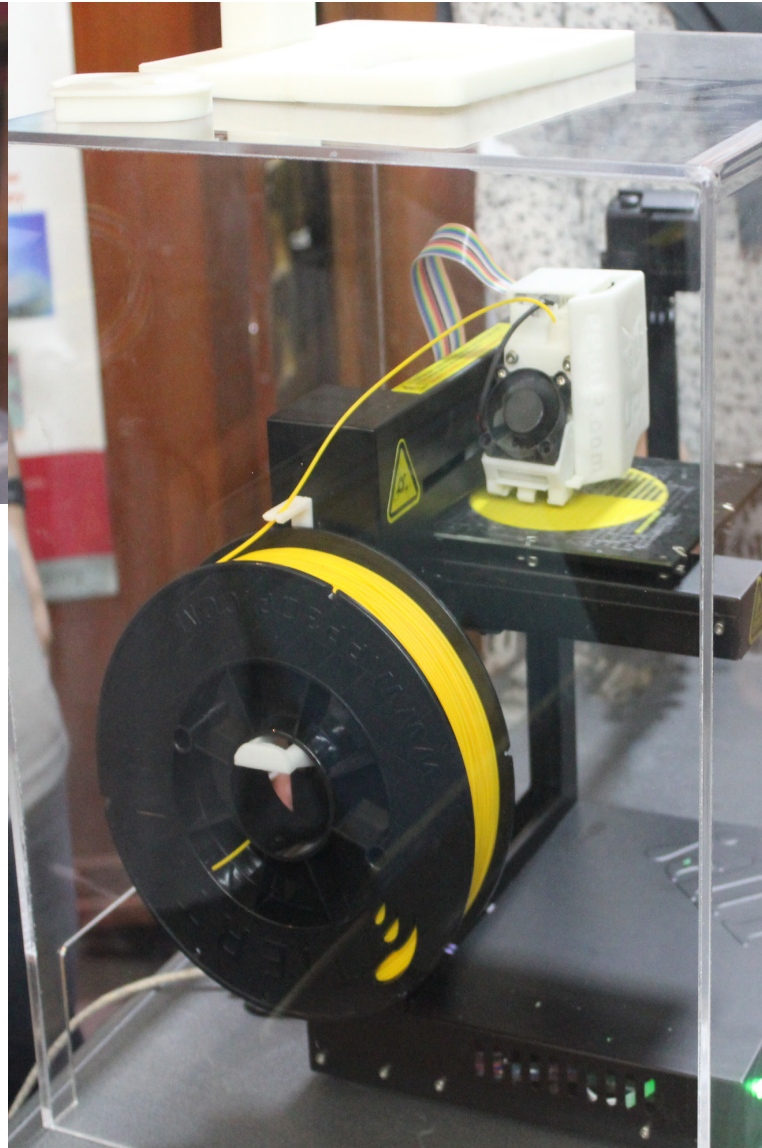
Able to determine the chemical structure of a sample and identify the compounds present by measuring molecular vibrations.

Available laser excitations are 488nm, 532nm and 633nm. There are several types of analyses such as single spectrum, mapping and line scanning.



UP PLUS 2

3D PRINTER



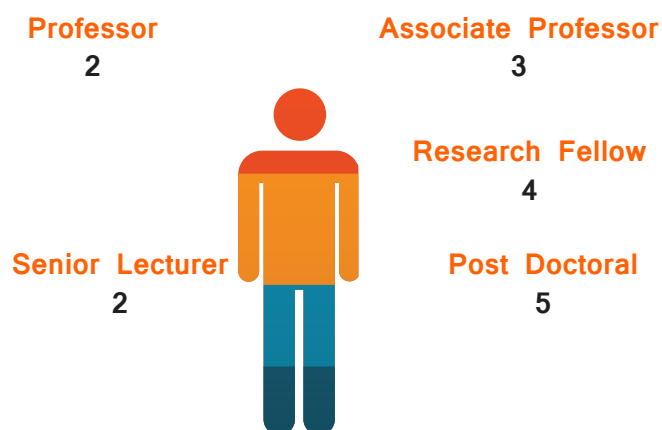
Precision Output : 10 Microns - 50 Microns
"Z" Thickness Resolution : 150 Microns - 400 Microns
Support Material : Smart Break-away support automatically generated by the 3D Printer



Human Resource

POST AT ITMA

In 2015, ITMA has 54 staffs including 16 from academics position and 38 from non-academics position.



Number of Academic Position

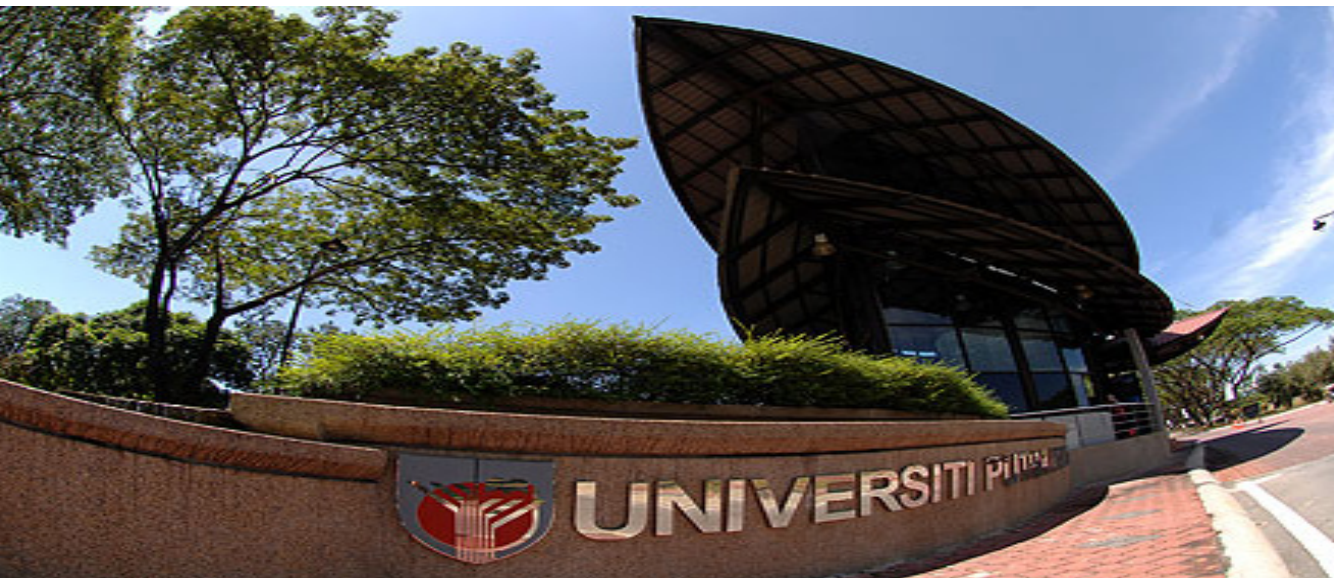


Number of Non-Academic Position

Table 10 :
Overall Total Staff by Grade in 2015

Position	Grade	Status		
		Permanent	Contract	Total
Professor	VK7	2	-	2
Associate Professor	DS54	1	-	1
Senior Lecturer	DS52	2	-	2
Research Fellow	UDQ10 UDQ5 UDQ8	-	1 1 2	4
Post Doctoral	UPD10-1 UPD8 UPD 9-1	-	2 2 1	5
Management Officer	N44 N41	2	1	3
Publication Officer	N41	-	1	1
Research Officer	Q43 Q41	3 4	-	7
Science Officer	C41	3	1	4
Assistant Engineer	J29	6	-	6
Secretary	N28 N27	1 1	-	2
Administrative Assistant	N17	6	2	8
Operation Assistant	N4 N1	1 1	-	2
Driver	R3	1	-	1
Total		34	14	48





UPM EXCELLENCE SERVICES AWARD

Each year, UPM will hold a ceremony to celebrate the staff for their outstanding performance. Four of ITMA staffs have been selected to receive the Anugerah Perkhidmatan Cemerlang (APC) for year 2015. A heartfelt congratulations to the recipients and may this reward will further motivate ITMA staff to excel in their duties in the future.



APC 2015 Recipient

Assoc. Prof. Dr. Khamirul Amin Matori (Head of Laboratory)
Rosiah Osman (Research Officer)
Din bin Ayup (Senior Assistant Registrar)
Khariza Abdul Wahab (Secretary)

LIST OF COMMITTEES

ITMA PUBLICATION & WEBSITE COMMITTEE 2015

Introduction

ITMA's Publication & Website Committee has agreed to publish Nanoscope 2014 to replace ITMA Annual Report. This magazine will cover ITMA activity, Laboratory Reports which includes research highlights and ITMA Annual Report. Meanwhile, ITMA now has six research group websites which provide the information of every research group activity. During the year 2015, ITMA's Publication & Website Committee was managed to publish Nanoscope 2014 and has been distributed to all faculties, institutes and relevant centers of UPM as well as visitors of ITMA.

Committee Members

ITMA Main Publication & Website Committee

Chairman : Assoc. Prof. Dr. Suraya Abdul Rashid

Secretary : Muhamad Zuhairi Bin Zainul Abidin

Members :

News - Intan Helina Hassan

Annual Report - Marzieana Ab Rahman

Lab Reports Unit - Rosnah Nawang

Publicity / ITMA brochure - Marzieana Ab Rahman

Webmaster - Marzieana Ab Rahman

Publication Unit - Marzieana Ab Rahman

Cameraman - Ab Haffiz bin Ab Jalil

Photo Unit - Norliyana binti Mahat

Activities

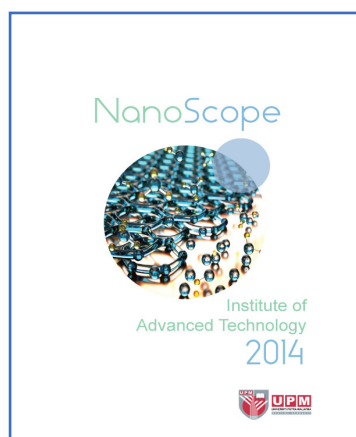
During the year 2015, ITMA publication & Website has introduced several changes and activities, among of these are :

Publishing Nanoscope 2014 – to replace Annual Report

Research Website – Appointment of researchers from the research group to manage the research website

Publicity –

- a) Design brochure for MSCL, MPTL & FDL
- b) Banner, bunting & poster for programs organized by ITMA.



OCCUPATIONAL SAFETY AND HEALTH COMMITTEE

Introduction

ITMA's Occupational Safety and Health Committee (COSHC) was established for the following purposes:-

1. To ensure ITMA comply with Occupational Safety and Health Act 1994 (Act 514), the Atomic Energy Licensing Act 1984 (Act 304) and other related acts and regulations.
2. To carry out the internal inspection and ready for occupational safety and health audit from UPM Occupational Safety and Health Office.
3. To carry out the investigations and accident studies, hazardous incident, occupational poisoning and diseases.
4. To plan, prepare and implement the appropriate training programs on occupational safety and health.
5. Responsible for any related matters on safety and health in ITMA and issue the directive thereon.

Committee Members

Chairman : Azmi Mohd Noordin (until 22 February 2015)
Assoc. Prof. Dr. Khamirul Amin Matori (starting from 22 February 2015)

Secretary : Marzieana Ab Rahman (until 22 Februari 2015)
Azmi Mohd Noordin (22 Februari 2015 to 2 November 2015)
Noor Lina Shamsuddin (2 November 2015)

Employer representative

Mr. Md . Ali Rani
Ms. Sarinawani Abdul Ghani
Ms. Roslina Abdul Rashid
Ms. Nurnazeera Zulkefli
Mr. Nazrul Abdullah

Employee representatives

Mr. Ab Haffiz Ab. Jalil
Mr. Mohd Wafi Azimin Mohammad Jan
Mr. Mohd Kadri Masaud
Mr. Zakky Yamanie Jamiauddin
Ms. Noor Lina Shamsuddin

Activities

During 2015, ITMA COSHC has conducted several activities as follows:

1. Visit to UPM Occupational Safety and Health (UPM OSH) Office and Gallery
Date: 12 May 2015
2. ITMA Fire Drill
Date: 13 May 2015
3. Workplace Audit by UPM OSH Team
Date: 21 May 2015

4. Safety Practices on Chemical and E-waste Management Talk by Ms. Nor Afida Miskam, UPM OSH Office
Date: 5 June 2015
5. First Aider Course by Malaysia Civil Defence Department Team, Putrajaya
Date: 28 May 2016

POSTGRADUATE CO-ORDINATOR

Introduction

Postgraduate coordinators role is to monitor and complete the required candidature milestones (such as the core component of the structured program and annual review of progress) on time. Another role is to provide our students important sources of their study such as 24-hour access to students room and internet hotspot. We also help to provide useful sources of information from all around the world to our students to help them in their research or career advice.

The director of ITMA has the ultimate responsibility for the quality of supervision and the provision of resources for all postgraduate programs by research students within the institute. Our prospective students are made aware of the development component of the structured program offers the opportunity to acquire generic skills that may increase employability, quality of research output, high impact publications; certificates will be awarded for any participation in training and courses.

Postgraduate Coordinator Members

Deputy Director : Associate Professor Dr. Mohd Nizar Hamidon

Administrative Officer : Norizanne Binti Abd Rahim

Administrative Assistant : Rokiah Deraman

Activities

1. Chemical Laboratory Safety and Security Talk

Date : 27 November 2015

Time : 8.00 a.m. – 11.00 p.m.

Venue : Bilik MLA/CRT, Block B, ITMA

Speaker: Dr. Mohamed Ibrahim Mohamed Tahir
Department of Chemical
Faculty Science
Universiti Putra Malaysia

2. Students Mobility: University Prince of Songkla, Thailand (OUTBOUND)

Date : 28 – 31 October 2015

Student Names:

1. Intan Helina Hasan
2. Mohd Hazani Mat Zaid
3. Muhammad Misbah bin Muhamad Zulkimi
4. Aznizan Shaari
5. Nur Hidayah Azeman
6. Nurliyana Abdul Raof
7. Nur Shamimi A Rahman
8. Low Zhi Huang

3. Student Mobility: Kyushu Institute of Technology, Kyutech (INBOUND)

First Batch

Date : 5 -10 Oktober 2015

Student Names:

1. Kiyotaka Furukawa
2. Yusuke Shimizu
3. Kazumasa Naguchi
4. Keisuke Ota
5. Eiichi Hayashi
6. Takuya Matsuo
7. Low Zhi Huang

Second Batch

Date : 16 - 27 November 2015

Student Names:

1. Nobunori Koga
2. Keita Kubo
3. Shoko Ishikawa
4. Asuka Kawano
5. Yuma Hirata
6. Sayaka Hashimoto
7. Takahiro Maekawa
8. Quan Wang
9. Taizo Fujiwara
10. Yoshinobu Fusao
11. Koji Yoshizu

4. Students Summer Internship/Short Visit/ Research

Name	Institution	Date
Anjaly N. Virjayan	Indian Institute of Science Education and Research, Bhopal, India	25/05/15 – 08/07/15
Srajan Shetty	National Institute of Technology, Karnataka, India	18/05/15 – 01/07/15
Daiki Karasawa	Shinshu University, Japan	05/10/15 – 31/12/15
Maeda Masayuki	Kyutech, Japan	27/02/15
Kazutoshi Kunimoto	Kyutech, Japan	27/02/15

ITMA LABORATORY ACTIVITIES

PUBLISHING IN Q1 JOURNALS WORKSHOP

April 8, 2015, UPM, Serdang. - A workshop on publishing articles in Q1 journals had been held on 7-8th April 2015 at the Titan 3 Room, Recidence Hotel UNITEN. This event was jointly organized by Functional Devices Laboratory, ITMA, Universiti Putra Malaysia and IEEE Electron Devices Society Malaysia Chapter.

About 50 participants attended the workshop. This workshop was held as a platform for researchers and students to gain knowledge on how to produce high impact articles suitable to be published in Q1 journals. ITMA's Research Fellow, Prof. Dr. Mohd. Zobir Hussein was invited to present tips and guidelines on this matter. At the end of the workshop about 30 articles were submitted through on-line submission.



Workshop on Introduction to Chemometrics: Solving Challenges in Science

June 9-10, UPM, Serdang - ITMA had organized a workshop on "Introduction to Chemometrics: Solving Challenges in Science". About 7 UPM students were involve in this workshop.

On the first day, the workshop covered subjects on optimization and Univariate calibration and hands on assignments involving Excel. All students were interested in solving the assignments and around 50% of participants could complete all assignments.

On the following day, the workshop covered "Multivariate calibration" and discussions on classical least square (CLS) and net analyte signal (NAS) calibrations. All theoretical concepts were discussed in detail by doing some assignments and modeling with Matlab software.

This workshop can be held every year to introduce the concept of chemometrics and its applications for UPM researchers in all fields to promote research and innovation projects.

IEEE REGIONAL SYMPOSIUM ON MICRO AND NANOELECTRONICS 2015 (RSM2015)

September 22, 2015, Kuala Terengganu - IEEE Regional Symposium on Micro and Nano Electronics 2015 (RSM2015) was held from 19-21 September 2015 at Primula Beach Hotel, Kuala Terengganu. The aim of this bi-annual technical conference is bringing researchers from industry and academia to gather and explore various issues and trends in the field of micro and nano electronics. This symposium was the 10th RSM organized by the Electron Devices Chapter of IEEE Malaysia Section. This year it was jointly co-organized by the ITMA, Universiti Putra Malaysia and Universiti Sultan Zainal Abidin (UnisZA).

In each RSM, several distinguished keynote speakers will be invited to present their current findings in the conference. RSM2015 had invited Dr. Meyya Meyyappan from NASA Ames Research Center, California to share his knowledge about "Nanotechnology: Development of Practical Systems and Nano-Micro-Macro Integration". The second keynote speaker was Prof. Dr. Hirofumi Tanaka with the title "Brain-like Signal Generating Electric Devices made of Single-Walled Carbon Nanotube and Nanoparticle Complex". Prof Hirosumi is from Department of Human Intelligence Systems, Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology, Japan. The third speaker was a speaker from industry, Dr. Hin Tze Yang (Packaging Materials Development, LUMILEDS Malaysia Sdn Bhd). He talked about "The Future of Optoelectronics Packaging in High Data Rates Application". Besides international speakers, RSM also invited local speaker, Prof. Dr. Sahbudin Shaari from Institute of Microengineering and Nanoelectronics (IMEN), Universiti Kebangsaan Malaysia. He shared his knowledge about "Parallel Injection Current Modulation of Mach-Zehnder Interferometer Modulator on Silicon on Insulator".

IEEE RSM2015 received 98 participants from locals and abroad. The participants were divided into three break-up sessions. The papers presented in this symposium were published in IEEE Explore.

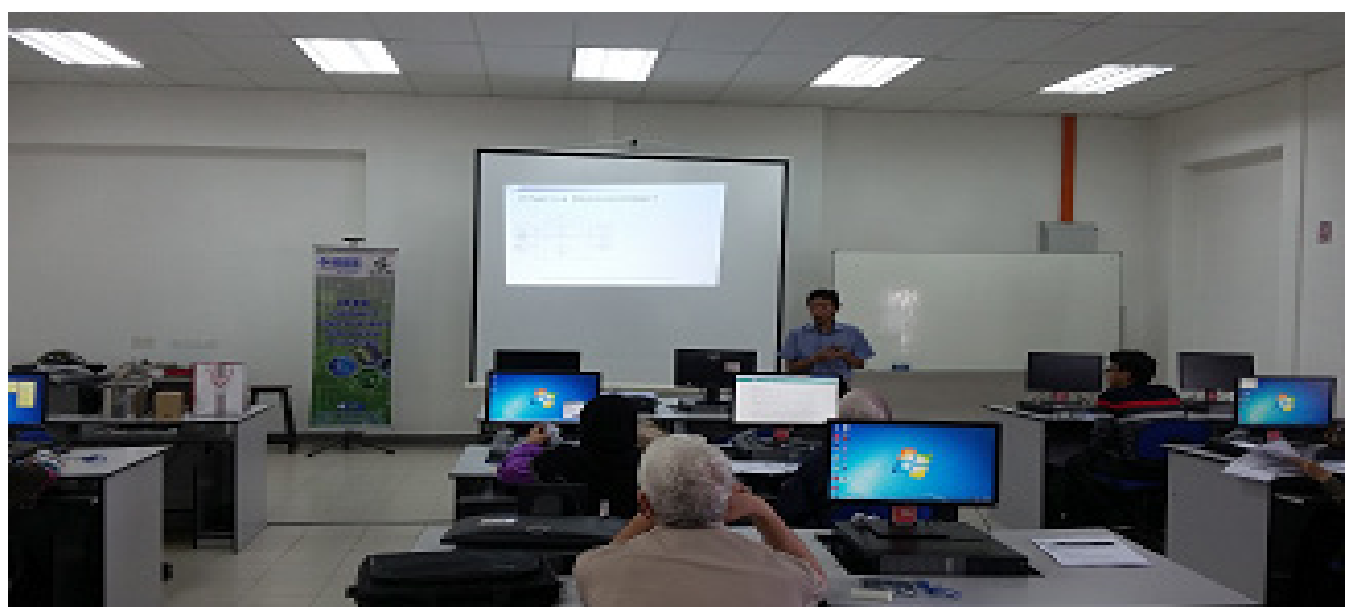


ARDUINO WORKSHOP 2015

November 11, 2015, UPM, Serdang - ITMA, Department of Electrical & Electronic Engineering, UPM and IEEE Circuit and Systems Society Malaysia (CAS) had organized the Arduino Workshop 2015 at the Microprocessor Laboratory, Faculty of Engineering, UPM.

A total of 16 participants attended the workshop which was held as a platform for researchers and students to become familiar with arduino hardware and programming. Dr. Nizam Tamchek from the Physics Department, Faculty of Science, UPM was invited as the trainer for this workshop.

The program included theoretical and hands on sessions which started from 8.30 a.m. until 4.30 p.m. At the end of the workshop, the participants uploaded the designed algorithm into the arduino hardware and tested several applications.



HANDS ON TRAINING ON DYE-SENSITIZED SOLAR CELLS 1.0

October 5, 2015, UPM, Serdang - ITMA, Department of Electrical & Electronic Engineering, UPM and Kyushu Institute of Technology (KYUTECH) had organized a Hands on Training on Dye-Sensitized Solar Cells (DSSC). The training was headed by Assoc. Prof. Dr. Suhaidi Shafie, and supervised by Mr. Buda Samaila (postgraduate student), Mr. Ali Khalifa (postgraduate student), Mrs. Intan Helina Hassan (research officer) and Mrs. Rosiah Osman (research officer).

The training period was two weeks, which started from 5 until 16 October 2016 and was held at the Functional Devices Laboratory, ITMA. The training was fully sponsored by KYUTECH.

A total of 16 participants including 11 Japanese students from KYUTECH and 5 UPM students participated in the training. The students learned the theory and step by step fabrication of DSSC. At the end of the training, each student group consisting of 4 students presented their fabricated DSSC to the UPM and KYUTECH professors via Skype.



DYE-SENSITIZED SOLAR CELLS WORKSHOP AND HANDS ON TRAINING 2.0

November 16, 2015, UPM, Serdang - Institute of Advanced Technology (ITMA), Department of Electrical & Electronic Engineering, UPM and Kyushu Institute of Technology (KYUTECH) had organized the Hands on Training on Dye-Sensitized Solar Cells (DSSC). The training was headed by Assoc. Prof. Dr. Suhaidi Shafie, and supervised by Mr. Buda Samaila, Mrs. Intan Helina Hassan and Mrs. Rosiah Osman.

The training period was two weeks, started from 16 to 27 November 2016 and was held at Functional Devices Laboratory, Institute of Advanced Technology, Universiti Putra Malaysia (UPM). The training was also fully sponsored by KYUTECH.

A total of 16 participants including 11 post graduate students from KYUTECH and 5 students from UPM participated the training. The students learn the theory and step by step fabrication of DSSC. At the end of the training, each student group consist of 4 students presented their progress and findings to the UPM and KYUTECH professors via Skype.



UPM-PSU COLLABORATION WORKSHOP

October 25, 2015, Songkhla, Thailand- ITMA had joined the Department of Electrical and Electronic Engineering, Faculty of Engineering to organize a Student Mobility Program at the Prince of Songkla University (PSU), Thailand from 26 to 31 October 2015. 28 students participated in this mobility program. ITMA sent 8 representatives and another 20 representatives were from Faculty of Engineering, lead by Dr. Amrallah Mustafa from Department of Electrical and Electronic Engineering, Faculty of Engineering. The main purpose of this program was to initiate competitiveness among the students and provide opportunity for the students to gain more experience at the international

The students travelled to the Thailand border on Sunday, 25th October by bus which took around 6 hours. Upon crossing Malaysia-Thailand border, they were greeted by PSU representatives lead by Dr Apidach Booranawong. The journey continued for about 1 hour by van to reach the hostel arranged by PSU.

On the first day, a welcoming ceremony and introduction of PSU to UPM was held, followed by poster presentations by PSU postgraduate students. After lunch, the students were taken to a PSU tour. PSU Hat Yai campus consists of 7 faculties, 1 hospital (Hospital Songklanagarind), a grocery store (7-eleven) and a food center called Rong- Chang. In addition, there are also domestic residences for students of PSU.

During the one-week workshop, the students attended lectures such as FPGA [need full name] programming workshop and lecture on Analytical Approach for Electrical Engineering students. Although ITMA students' backgrounds were mainly materials science, the lectures challenged them to experience life of an electrical engineering student. The PSU team also spent time to bring the UPM team to visit Samila Beach in Songkhla which took almost two hours to reach there. They learnt the history of the Naga statue and the Mermaid statue which is iconic symbol for Songkhla.



The main highlight of the program was on 29th October, when ITMA Head of Labs joined the students in PSU and then led by Dr Warit Wichakool to visit few laboratories which are similar to ITMA in terms of research areas. The first visit was to the Department of Material Engineering which includes visits to the Nanomaterials laboratory, the Ceramic and Composite laboratory, and Center of Excellence in Materials Engineering (CEME).



Next, the group visited the department of Materials Science and Technology, Faculty of Science. The department provides two branches of study fields, Polymer Science and Material Science. The next stop was the Trace Analysis and Biosensor Research Center (TAB-RC). Similar to ITMA, the group consists of lecturers and researchers from physics, chemistry, and biology department of Faculty of Science, and also collaborations from the Faculty of Engineering, PSU. This group

had conducted many researches in the sensor field, with one of their research works had already been commercialised. TAB-RC focused on the sample preparation techniques, analytical method, and computational biophysics.

On the last day of program, the students took advantage of the free time in the morning to visit Hat Yai Park which is one of the popular tourist places in Hat Yai. Hat Yai Cable Car is located on the hill top, which has its base station next to the picturesque look-out point of the amazing Phra Buddha Mongkol Maharaj (Standing Buddha). At 2 pm, all UPM students joined the sport activities arranged by PSU team. 'Chairball' is a game that is similar to netball, only that the goal is in the form of a person holding a basket while standing on a chair. UPM team won the game, while PSU team won the futsal game. This activity marked the end of the collaboration workshop and all students and lecturers came together for the closing ceremony, wishing the best and hopeful to meet again in the future. UPM delegates departed PSU the next day by bus to the Thailand border, then changed bus at the border to continue the journey back home and reached UPM at 10 pm.

This program was a true success thanks to careful and thorough planning by the PSU team. The program had achieved its main objective which was to expose the students to international networking and research environments, particularly in PSU. Students and lecturers from both universities have gained valuable knowledge, new friendship and unforgettable experiences throughout the workshop. We would like to express our gratitude to Assoc. Prof. Dr. Natta Jindapetch, Dr. Warit Wichakool, Dr. Apidach Booranawong, staffs and postgraduate students of Electrical Engineering Department, Faculty of Engineering for making this collaboration workshop a great success and making our stay in Hat Yai a pleasant and memorable trip. We believe that the friendship made during the trip will remain and we hope that with continuous networking will lead to great collaboration between UPM and PSU in near future.

2015

PICTORIAL

HIGHLIGHTS OF ITMA's ACTIVITIES

1

NLOC'15 PROGRAM



TALK ON SAFE PRACTICES AT THE LABORATORY

2



3

GREEN NANOTECHNOLOGY VISIT



4

EMERGENCY RESPONSE WORKSHOP



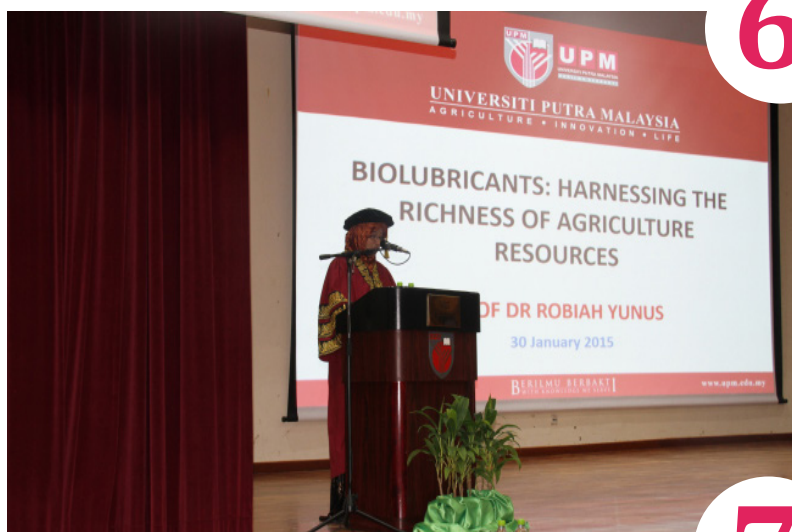
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AUDIT 17501



6

INAUGURAL OF PROF. DR. ROBIAH YUNUS



ITMA VISIT TO OSH UPM

7



8

VISIT FROM MAKTAB RENDAH SAINS MARA MUAR



9

HARI RAYA CELEBRATION



FAREWELL OF DR. AMRAN SALLEH

10



11

WORKSHOP ON X-RAY DIFFRACTION WITH ASSOC. PROF. DR. LIM KEAN PAH



FURTHER INFORMATION

Contact Us

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