

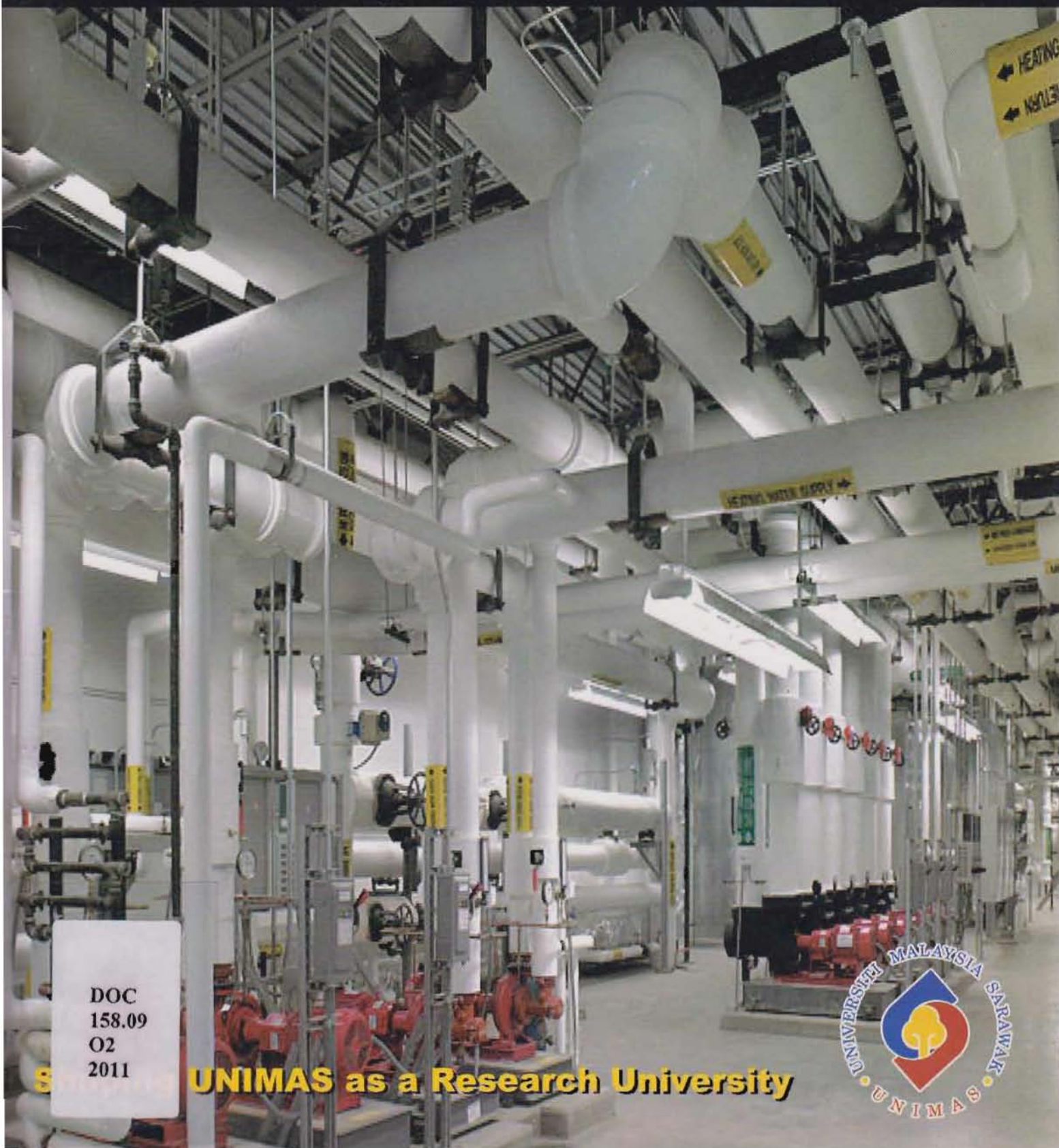
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UNIMAS as a Research University



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Editor

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Editorial Policy

The FENG Research Bulletin is a yearly publication of the Faculty of Engineering, Universiti Malaysia Sarawak. It publishes information related to the recent research publications by the Faculty, recent research equipment, research news/seminars, research grants and research student activities at the Faculty.

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Dean's Message

Congratulations to the Editor and Editorial panel for successfully compiling and publishing the 4th edition of the FENG Research Bulletin.

A clear objective is outlined with its theme "Shaping UNIMAS as a Research University". The Faculty members, on their part, have done a great effort as the research activities being conducted at the Faculty during 2010/2011 have increased from the previous years. The present bulletin reflects this upward trend.

Finally, a big thanks to all those who published their quality research in recognized journals and conference proceedings and also to those who were capable of earning research grants. The future looks bright when such competent and energetic scientists and engineers are working together in perfect synergy.

Prof. Dr. Wan Hashim Wan Ibrahim



Editor's Note

I would like to emphasize that the editorial team has come up with some new ideas to enhance the outlook of the present issue. The readers will find a balanced synthesis of the research activities at the Faculty of Engineering in a clear and attractive way. The contents of this issue include, compared to the previous one, addition of post graduate students section as well as a section about the conferences/seminars organized by the Faculty.

I do hope that this bulletin is able to show how the Faculty performed since the last edition. This shows to the whole world what we are capable of doing as researchers. Keeping in line with our University's vision of turning UNIMAS into a Research University by 2015, we hope our efforts will go a long way to materialize this goal.

Dr Syed Tarmizi Syed Shazali





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Research Grants

List of Ongoing Research Grants

Fundamental Research Grant Scheme (FRGS) Ministry of Higher Education

No	Principal Researcher	Co-Researchers	Field	Title	Funding Period (months)	Total (RM)
FRGS/03(06)/803/2011(72)	Assoc. Prof. Dr Mohd Omar Abdullah	Dr. Tay Kai Meng, Shanti Faridah Saleh, Dr Hussain H. Al- Kayiem	Engineering and Technology	Intelligent performance optimization framework for collaborative hybrid energy system (I-PORCHES) : Theoretical development, mathematical formulation, laboratory experimentations and applications	24	175,200.00
FRGS/02(12)/733/2010(19)	Dr Syed Tarmizi Syed Shazali	Abang Mohd Nizam Abang Kamaruddin	Engineering and Technology	Human Walking Behavior Based on Different Layout Design using Computer Animation	24	24,000.00
FRGS/02(13)/734/2010(20)	Assoc. Prof. Dr Al-Khalid Haji Othman	Dr Wan Azlan Wan Zainal Abidin, Dr Hushairi Zen, Dr Kismet Anak Hong Ping	Engineering and Technology	Self Initialization Network Discovery and Localization Protocol for Underwater Acoustic Network	24	32,000.00
FRGS/02(14)/735/2010(21)	Dr Kismet Anak Hong Ping	Dr Wan Azlan Wan Zainal Abidin, Assoc. Prof. Dr Al-Khalid Haji Othman, Dr Thelaha Masri	Engineering and Technology	Processing of Time Domain Inverse Scattering Imaging Technique for Breast Tumour Detection	24	32,000.00
FRGS/02(15)/736/2010(22)	Ron Aldrino Chan @ Ron Buning	Tay Kai Meng, Prof Dr Wan Hashim Wan Ibrahim	Engineering and Technology	Theoretical Development of A Hybrid Fuzzy-Multiple Objective Evolutionary Based Risk Assessment and Decision Making Paradigm for River Transportation	18	24,000.00
FRGS/02(17)/738/2010(24)	Dr Lim Soh Fong	Assoc. Prof. Dr Andrew Ragai Henry Rigit, Assoc. Prof. Dr Hj Mohammad Omar Abdullah	Engineering and Technology	Solid State Carbon Sequestration by Utilization of Agro-Wastes to Produce Value-Added Products	24	24,000.00
FRGS/02(18)/739/2010(25)	Assoc. Prof Ir Dr Andrew Ragai Henry Rigit	Ir David Bong Boon Liang	Engineering and Technology	A Study to Design an Electrohydrodynamics Micropump for Microelectronics Cooling	24	32,000.00

FRGS/02(20)/741/ 2010(27)	Prof Dr Sinin Bin Hamdan	Dr Zainal Abidin Talib, Assoc. Prof. Dr Ismail Jusoh, Dr Abu Saleh Ahmed	Engineering and Technology	Characterization of Wood-Polymer Composite (Wpc) for Bearing Materials	24	24,000.00
FRGS/02(21)/742/ 2010(28)	Prof Dr Ng Chee Khoon	Dr Delsye Teo Ching Lee	Engineering and Technology	Opening on Ultimate Load-Carrying Capacity of Square Slabs with Fixed Supports	24	47,232.00
FRGS/01(20)/752/ 2010(38)	Dr Tay Kai Meng	Dr Lim Soh Fong, Dr Chen Chwen Jen, Dr Jane Labadin	Pure Science	Development of Monotonic Sufficient Conditions Theorem in Fuzzy Systems with Case Studies for Education Assessment Problems	24	40,600.00
FRGS/03(02)/758/ 2010(44)	Dr Abu Saleh Ahmed	Prof Dr Sinin Hamdan, Assoc. Prof. Masjuki Hj Hassan, Dr Dayang Maryani Awg Hashim	Engineering and Technology	Biodiesel production from waste fat and oil as renewable energy sources	24	43,000.00
FRGS/03(03)/771/ 2010(52)	Ir David Bong Boon Liang	Assoc. Prof. Dr Yap Vooi Voon, Assoc. Prof. Ir Dr Andrew Ragai Henry Rigit, Dr Tay Kai Meng, Annie Ak Joseph	Engineering and Technology	Multilayer Bit-Plane Extraction Approach For Biometric Identification	24	52,000.00
FRGS/03(04)/772/ 2010(53)	Norsuzailina Binti Mohamed Sutan	Prof. Dr Sinin Hamdan	Engineering and Technology	Parametric Study On The Effect Of Using Industrial By-Products And Polymeric Additives In Cement To The Development Of Efflorescence On Concrete Structures	24	56,000.00

Exploratory Research Grant Scheme (ERGS), Ministry of Higher Education

No	Principal Researcher	Co- Researchers	Field	Title	Funding Period (months)	Total (RM)
ERGS/02(01)/807/ 2011(02)	Dr. Tay Kai Meng	Prof. Dr. Ng Chee Khoon, Prof. Dr. Lim Chee Peng (USM), Dr. Neoh Siew Chin (UNIMAP), Dr. Nordiana Rajaei, Siti Nor Ain Musa	Engineering and Technology	Development of a Novel Type- 2 Fuzzy Logic Based Group Decision Support Model for the Local (Sarawak) Food Industry	36	94,000.00

Dana Penyelidikan Khas (DPK), Special Research Grants, UNIMAS

No	Principal Researcher	Co-Researchers	Title	Funding Period (months)	Total (RM)	Approval Date
DPK/01/2010	Dr Ivy Tan Ai Wei	Assoc. Prof. Dr Hj Mohammad Omar Abdullah	Investigation on Properties and Characteristics of Adsorbent for Efficiency Enhancement of Chemical-Driven air-Conditioning System Powered by Waste Heat	24	11,413.00	05.01.2010
DPK/02/2010	Shafrida Sahrani	Assoc. Prof. Dr Ehsan Ahmed, Ir Dr Shahril Osman, Annie Joseph, Dr Tay Kai Meng	Finite Analysis For Micro-electro Mechanical System (MEMS) Structure	24	6,684.50	05.01.2010
DPK/03/2010	Ir David Bong Boon Liang	Assoc. Prof. Dr Andrew Ragai Henry Rigit, Annie Joseph, Dr Tay Kai Meng	Investigation of Bit-Plane Approach for Face Recognition	24	9,202.70	05.01.2010
DPK/04/2010	Shahrol bin Mohamaddan	Noor Hisyam Noor Mohamed, Abg Mohd Nizam Abg Kamaruddin, Tengku Mohd Afendi Zulcaffle, Kasumawati Lias	Dual Functional Automated Guided Vehicles in Flexible Manufacturing System	24	7,660.00	05.01.2010
DPK/09/2010	Dr Hushairi Hj Zen	Assoc. Prof. Dr Al-Khalid Hj Othman, Dr Wan Azlan Wan Zainal Abidin, Ade Syaheda Wani Marzuki	Theoretical Development of Medium Access Control (MAC) Protocol for Real-time Traffic in Wireless LAN	24	10,915.50	05.01.2010
DPK/10/2010	Dr Wan Azlan bin Wan Zainal Abidin	Assoc. Prof. Dr Al-Khalid HJ Othman, Dr Kismet Hong Ping, Dr Thelaha Masri, Dr Hushairi Zen, Tengku Mohd Affendi Zulcaffle	Measurement Based Open Space Channel Modelling in Sarawak by Using Portable GPS Receiver	24	10,494.00	05.01.2010
DPK/11/2010	Dr Abu Saleh Ahmed	Prof. Dr Sinin Hamdan, Prof Dr Masjuki Hj Hassan, Dr Syed Tarmizi Syed Shazali	Prospect of Biodiesel Production From Algae as a Renewable Energy Source in Sarawak	24	19,150.00	05.01.2010

Funding through Diverse External Agencies

Project Title	Funding Agency	Total (RM)	Project Start Date	Project End Date	Coordinator
Proposed Study on the Usage of TVRO in Sarawak	MCMC	199,950.00	Apr-10	Jun-10	Dr Wan Azlan Wan Zainal Abidin
Sustainable instream horizontal micro hydro turbine generator -Jarimas turbine	Public Works Department (JKR)	1,249,500	May 2010	2012	Assoc. Prof. Dr Al-Khalid hj Othman
Osaka Gas Foundation Research Grant	OGFICE research grant for 2010-2011 - 5 projects	USD 15,000.00 (RM50,000.00)	Dec 2010	Nov 2011	Ir Dr Mohd Shahril Osman
Osaka Gas Foundation Research Grant	OGFICE research grant for 2011-2012 - 12 projects	USD 16,000.00 (RM55,000.00)	Dec 2011	Nov 2012	Ir Dr Mohd Shahril Osman

Non Funded Grants

No	Principal Researcher	Co-Researcher	Title	Year
NF(F02)/99/2010 (02)	Charles Bong Hin Joo	Dr Tay Kai Meng	A Study on the Impact of Climate Change on the Hydrology of Sarawak River Basin	2010
NF(F02)/113/2010 (16)	Dr Delsye Teo Ching Lee	-	The use of solid waste as partial raw material replacement in concrete	2010
NF(F02)/114/2010 (17)	Ir David Bong Boon Liang	Annie ak. Joseph	Palm print verification system	2010
NF(F02)/120/2010 (23)	Prof Dr F.J Putuhena	Prof Salim Said, Ting Sie Chun	Modeling and Controlling Runoff from Urban Peatlands Environment Case study: Sungai Merah, at Sibu Town	2010
NF(F02)/126/2010 (29)	Jethro Henry Adam	Mahsuri Yusof, Ervina Junaidi, Rosmina Ahmad Bustami	Potential of Razor Clam as Coagulant in Water Treatment	2010
NF(F02)/129/2010 (32)	Prof. Dr Kohilawatte Gamage Harry Chandra Nimal Seneviratne	Dr Siti Noor Linda, Dygku Salma Awg Ismail	Analysis and Improvement of Sarawak Fibrous Peat Environments for Engineering Purposes	2010
NF(F02)/131/2010 (34)	Ade Syaheda Wan Marzuki	Dr Hushairi Zen, Kasumawati Lias, Dyg Azra Awg Mat	Performances analysis of VoIP over 802.11b and 802.11e using different CODECs	2010
NF(F02)/132/2010 (35)	Noor Hisyam Noor Mohamed	S.Rajiv (Student)	Mechanical Strength Evaluation Of Bagasse Fiber Reinforced Polyester Resin	2010
NF(F02)/138/2010 (41)	Kho Lee Chin	-	Novel Fractal Microstrip Antenna Design using Koch Snowflake + Fractal Square Curve	2010

NF(F02)/143/2010 (46)	Tengku Mohd Afendi Zulcaffle	Assoc. Prof. Dr Al-Khalid Othman, Dr Wan Azlan Bin Wan Zainal Abidin, Shahrol Mohammaddan, Kasumawati Lias	Restoration of Degraded Jawi Documents Based On Automated Thresholding Algorithm	2010
NF(F02)/144/2010 (47)	Kuryati Binti Kipli	Dyg Azra Awg Mat, Kasumawati Lias, Dr Mohd Saufee Muhammad, Sh Masniah Wan Masra, Nurdiani Zamhari	Development of a New Universal Objective Image Quality Metrics	2010
NF(F02)/150/2010 (53)	Nurdiani Zamhari	Kuryati Kipli, Dr Mohd Saufee Sh Masniah Wan Masra, Nurciani Zamhari, Peter Voon	Comparison of Parallel Prefix Adder (PPA)	2010

Funding through MOSTI (eScience Fund)

No	Title	Principal Researcher	Co-Researchers	Start Date	Time Period (months)	Total (RM)
06-01-09-SF0066	Design and Development of an Electrohydrodynamic (EHD) Micropump with a Flow Simulation Study	Assoc. Prof. Ir. Dr Andrew Ragai Henry Rigit	Lai Koon Chun, Dr Jane Labadin, Annie ak Joseph, Mohd Azree bin Idris, David Bong Boon Liang	Feb-2010	24	101,100

Small Grant Scheme (SGS), UNIMAS

No	Principal Researcher	Co-Researchers	Title	Time Period (months)	Amount	Year
02(S71)/799/2011(05)	Dygku Salma bt Awg Ismail	Prof. Dr Kohilawatte Gamage Harry Chandra Nimal Seneviratne, Dr Siti Noor Linda Taib	Improved Determination of Physical Properties of Sarawak Fibrous Peat for Engineering Purposes	12	7,500.00	2011
02(S50)/715/2010(01)	Dr Delsye Teo Ching Lee	Prof Dr Ng Chee Khoon	Value-added utilisation of waste polystyrene and Rice Husk Ash (RHA) for the production of bricks	12	9,500.00	2010
02(S61)/750/2010(36)	Kasumawati bt Lias	Dr Thelaha Masri, Assoc. Prof. Dr Al-Khalid bin Hj Othman	Characterization of Green Electromagnetic Wave Absorber for Minimal Environmental and Electromagnetic interference	12	7,000.00	2010

Osaka Gas Foundation Research Grant Scheme

2011				
Principal Researcher	Co-researchers	Project Title	Total (RM)	Year
Shirley Johnathan Tanjong	Dr Magdalene ak Andrew Munot	Modeling the Effect of High Product Mix on Factory Performances	6,860.00	2011-2012
Nor Azalina Bt Rosli	Prof FJ Putuhena Rosmina Ahmad Bustami Mohd Hafiz Zawawi	Ground Water and Surface Water Interaction Study at Pulau Salak	5,500.00	2011-2012
Mohamad Iskandar Jobli	Ir Dr Mohd Shahril Osman Kertini Monir Abg Mohd Nizam Abg Kamaruddin	Analysis of Multi-Scale Microbial Fuel Cell for Simple Electrification in Rural Areas	6,500.00	2011-2012
Mohd Farid Atan	Dr Rubiyah Baini Nazeri Abdul Rahman Norfamila Che Mat	Absorption of Toxic Heavy Metals Ions by Using Agricultural Wastes in Sarawak	3,500.00	2011-2012
Hazrul bin Mohamed Basri	Assoc. Prof. Dr. Al-Khalid bin Othman Dr. Wan Azlan bin Wan Zainal Abidin Dr Thelaha Masri Kasumawati Lias Mr. Asrani Lit	Development of Direct Power Control Space Vector Modulation (DPC – SVM) for Doubly Fed Induction Generator (DFIG)	4,000.00	2011-2012
Dr Mohd Danial Ibrahim	Mdm Ervina Junaidi Ir Dr Mohd Shahril Osman Prof Dr Amir Azam Khan	Improvements of Static and Dynamic Characteristics for High Performance Mobile Hard Disk Drives	9,500.00	2011-2012
Dr Ivy Tan Ai Wei	Dr Leonard Lim Lik Pueh	Feasibility Study of Oil-Palm Waste-Derived Adsorbent for Removal of Pesticides from Water and Wastewater	6,000.00	2011-2012
Nazeri Abdul Rahman	Dr Rubiyah Baini Mr. Mohd Farid Atan Ms Norfamila Che Mat	Pelletization of Agricultural Residues for Power Generation	6,000.00	2011-2012
Dr. Siti Noor Linda	Ervina Junaidi Mahshuri Yusof	Design of a Household Device Utilizing Bio Fuel (Pelletized Peat)	7,000.00	2011-2012
Siti Nor Ain Musa	Ervina Junaidi Mahshuri Yusof Dr. Siti Noor Linda	Thermophysical Properties of Oil Palm Fibre and Clam Shell Powder Reinforced in Thermoplastic Matrix Composite	5,000.00	2011-2012

Ervina Junaidi	Abg Mohd Nizam Abg Kamaruddin Dr. Siti Noor Linda Mahshuri Yusof Ir Dr Mohd Shahril Osman Dr Mohd Danial Ibrahim	Improving Rice Milling Machine for Domestic Application	5,000.00	2011-2012
Dr. Onni Suhaiza Selaman	Siti Nor Ain Musa Dr. Abu Saleh	Turning Agricultural By-Products into Solid Fuel for Energy Generation	6,000.00	2011-2012

2010				
Principal Researcher	Co-researchers	Project Title	Total (RM)	Year
Tengku Mohd Afendi Zulcaffle	Kasumawati Lias, Shahrol Mohammaddan, Nurdiani Zamhari	A Low Power Multimodal Deception Detection System Using Image Processing and Pattern Recognition Techniques	4,000.00	2010-2011
Norfamilla binti Che Mat	Mahshuri Yusuf	Evaluation of Nafion-Calcium Oxide Composite Membrane for Direct Methanol Fuel Cell (DMFC) Applications	5,000.00	2010-2011
Shahrol Mohammaddan	Dr Abdullah Yassin Assoc. Prof. Ahmad Hata Rasit	Development of Non-Invasive Biomechanical Device for Club-Foot Medical Treatment	12,000.00	2010-2011
Abang Mohammad Nizam bin Abang Kamaruddin	Dr Abdullah Yassin Noor Hisyam Noor Mohamed	The Study of Vegetable Based Cutting Fluid Performance in Turning Process	12,000.00	2010-2011
Noor Hisyam Noor Mohamed	Mdm Mahshuri Yusof Aidil Azli Alias	Investigation on Energy Absorption Characteristics of Natural Fiber Composite	12,000.00	2010-2011

Design and Development of an Electrohydrodynamic (EHD) Micropump with a Flow Simulation Study

Andrew Ragai Henry Rigit
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Extended Abstract

The use of electrical forces in microfluidics has been the subject of intense research and it is likely to increase in the near future. For these microfluidics system, gravity plays a negligible role, and electric and capillary forces become dominant. In the absence of free surfaces, the electrical force is the best candidate for moving fluids and particles, for heat removal, and for mixing enhancement. In the case of weak electrolytes, the role of these forces has been investigated intensively since they can be used to control bioparticles. Thus their knowledge is required for building lab-on-a-chip devices used to detect and diagnose cancer cells, noxious bacteria, viruses and other potentially dangerous toxins. In insulating systems, the main actual thrive is the development of liquid-based cooling solutions for increasing heat removal as electronic systems decrease in size. Liquids are chosen since they have much higher removal capacities as compared to air-cooling systems.

We consider microsystems where electric fields act in dielectric or insulating liquids, and in weak electrolytes. In insulating liquids, electrical forces act in the bulk due to charge injection, i.e. enhanced at wedges and end points of electrodes, and via induced changes of conductivity and permittivity due to thermal gradients originated in most cases by Joule heating. The latter forces, called electro-thermal, are also present in the bulk of electrolytes. The distribution of charges in isothermal electrolytes is very different from the case of isothermal insulating liquids due to the strong tendency in electrolytes to electro-neutrality. As a consequence, the electrical charge is present only near the electrodes, i.e. in the charged double layer, at least for low voltages. The electrical forces, acting on the double layer, often give rise to liquid flow. For high voltages, the flow may reverse its direction. The reason of this phenomenon is still not clear, though several mechanisms have been advanced in the literature.

We investigate the mechanisms of charge generation both in insulating liquids and electrolytes. This will allow us to understand the origin of the different electrical forces and their relative importance, depending on the size of the system, the electrical properties of the liquid, the amplitude and frequency of the applied voltage, and the electrode-liquid transfer reactions. Finally, we investigate the relevance of fluid motion for particle manipulation. To this end, we need to compare the motion due to the drag force to the direct motion induced by dielectrophoresis (DEP). This analysis is particularly necessary for submicron particles, since overcoming the Brownian motion by DEP requires intense electric fields, which inevitably will put the liquid into motion.

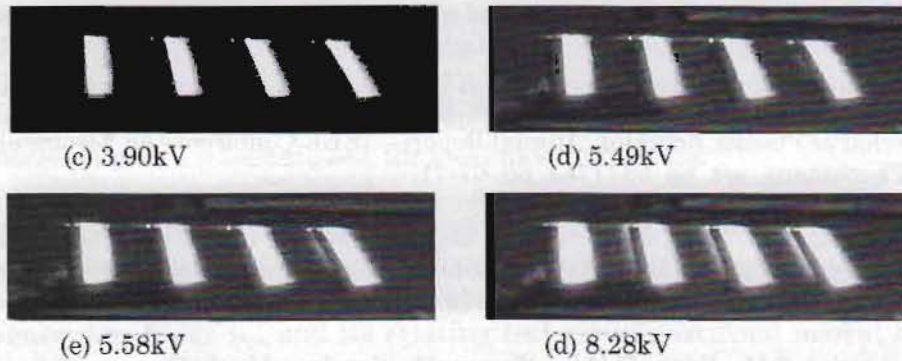
Related results;



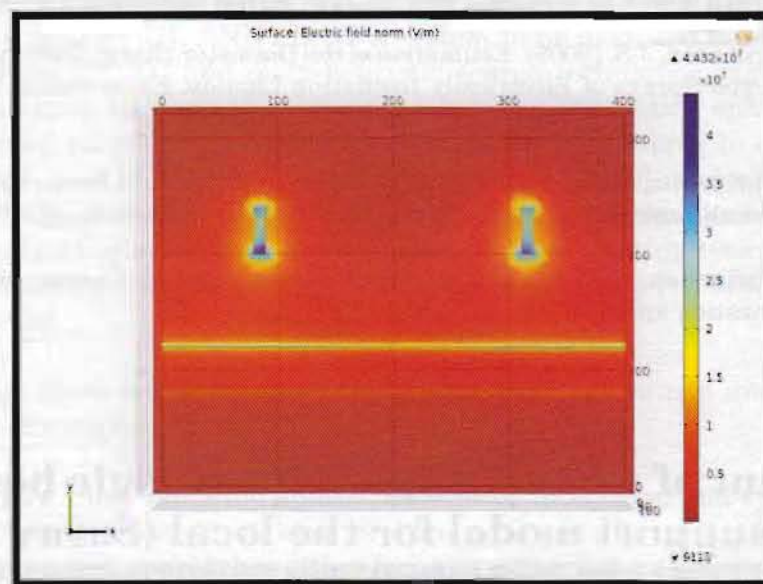
(a) 3.48kV (POV)



(b) 3.62kV



Plasma formation as observed in the dark at different applied voltage (courtesy of I. Dakek, 2009)



Simulation of electric field around two micropillars with a width of $10\ \mu\text{m}$ (courtesy of M.C. Chiong, 2010)

Related research grants;

- [1] A Study to Design an Electrohydrodynamics Micropump for Microelectronics Cooling. Researchers: A.R.H. Rigit (Leader) & D.B.L. Bong. Budget: RM32,000, MOHE FRG Fund, March 2010, Ref. No: FRGS/1/10/TK/UNIMAS/02/1. Status: On-going.
- [2] Design and Development of an Electrohydrodynamic (EHD) Micropump with a Flow Simulation Study. Researchers: A.R.H. Rigit (Leader), A. Idris, L.C. Lai, J. Labadin, D.B.L. Bong & A. Joseph. Budget: RM101,100, MOSTI eScience Fund, February 2010, Ref. No: 06-01-09-SF0066. Status: On-going.
- [3] Performance of Dielectric Barrier Discharger and Flow Visualization. Researchers: A.R.H. Rigit (Leader), M.S. Osman, M. Hassan, D. Bong, E. Junaidi, M. Yusuf, A.R.M. Amin, J. Labadin, A. Chai & A. Valkguelt. Budget: RM100,000, MOSTI eScience Fund, September 2007, Project No: 06-01-09-SF0023. Status: Completed.

Related publications;

- [1] Ahmadi, A., Labadin, J., Piau, P., Rigit, A.R.H. (2010). Numerical Modeling of the Dielectric Barrier Discharges Plasma Flow. Asia Modelling Symposium 2010 - 4th International Conference on Mathematical Modelling and Computer Simulation, art. no. 5489149, pp. 420-423.

- [2] Rigit, A.R.H., Dakek, I. (2010). Performance of a Dielectric Barrier Discharge Plasma Actuator. 2nd International Conference on Computer Research and Development, art. no. 5489591, pp. 549-553.
- [3] Rigit, A.R.H., Lai, K.C., Liang, D.B.B.(2009). Electrical Performance Evaluations for a Dielectric Barrier Discharge Plasma Actuator. Annual Report – IEEE Conference on Electrical Insulation and Dielectric Phenomena, art. no. 5377784, pp. 67-71.
- [4] Rigit, A.R.H., Lai, K.C., Bong, D.B.L. (2009). Degradation of a Dielectric Barrier Discharge Plasma Actuator. Proceedings of the IEEE International Conference on Properties and Applications of Dielectric Materials, art. no. 5252365, pp. 569-572.
- [5] Lai, K.C., Rigit, A.R.H., Bong, D.B.L., Hasan, M., Sawawi, M., & Osman, M.S. (2009). Thermal Imaging of Dielectric Barrier Discharge Plasma Actuator Panels. International Symposium on Electrodynamics, Universiti Malaysia Sarawak, Kota Samarahan, Sarawak, Malaysia, Paper A5. ISBN 978-983-9257-95-3.
- [6] Rigit, A.R.H., Shrimpton, J.S. (2009). Estimation of the Diameter-charge Distribution in Polydisperse Electrically Charged Sprays of Electrically Insulating Liquids. *Experiments in Fluids*, 46 (6), pp. 1159-1171.
- [7] Rigit, A.R.H., Shrimpton, J.S. (2006). Spray Characteristics of Charge Injection Electrostatic Atomizers with small-orifice Diameters. *Atomization and Sprays*, 16 (4), pp. 421-442.
- [8] Rigit, A.R.H., Shrimpton, J.S. (2006). Electrical Performance of Charge Injection Electrostatic Atomizers. *Atomization and Sprays*, 16 (4), pp. 401-419.

Development of a novel Type-2 fuzzy logic based-group decision support model for the local (Sarawak) food industries

Tay Kai Meng

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Extended Abstract

Manufacturing is the backbone of any industrialized nation. Fast changing technologies on the product front have created a need for an equally fast response from manufacturing industries. To meet these challenges, manufacturing industries have to analyze the potential failures of product and process, select appropriate manufacturing strategies, product designs, manufacturing processes, work piece and tool materials, and machinery and equipment [1]. Decision makers in manufacturing frequently face the problems of understanding the potential failure of a product/process, assessing a wide range of alternative options/solutions, and selecting a (optimized) solution based on a set of criteria.

On one hand, conventional failure analysis techniques focus on collecting, analyzing and synthesizing data, where the root causes of a failure and the strategies to prevent it from recurring are determined [2-3]. Besides, it also aids in identifying the key design or process characteristics which require special controls for manufacturing, and in highlighting areas for improvement in characteristic control or performance. Examples of popular conventional failure analysis techniques are fault tree analysis (FTA) [2], Failure Mode and Effect Analysis (FMEA) [2,4-5], and etc. On the other hand, conventional multi-criteria decision making (MCDM)

focuses on selection of a course of action among several alternatives based on a set of objectives [1]. Group decision making techniques further focus on selection of a set of action based on preference relation from provided by a group of decision makers. The focus of this research is on the development of a group decision support model that is an integration/synthesis of both failure analysis and decision making techniques, for local food industries.

A search in literature reveals that recent advances of both failure analysis and (group) decision making techniques and technologies focused on the improvement of established failure analysis and (group) decision making techniques with the use of artificial intelligent (AI) related techniques, i.e., fuzzy set and its relating techniques, artificial neural network (ANN), evolutionary computation (EC), meta-heuristic search, rule based and knowledge based systems, computing with words (CWW) and etc. The concept of fuzzy is applied to failure analysis and decision making techniques so that the models are robust against uncertainty and imprecision [1, 6]. Rule based and knowledge based system are included to allow expert's knowledge to be captured in an easy manner [7]. ANN allows a system to be modelled based on numerical data and/or past experience [7]. EC and meta-heuristic search techniques can be used to optimize an algorithm to minimize risk and to search for a solution in solution space [8-9]. Some recent failure analysis model adopts an evolutionary computation technique to explore and evaluate algorithm under risk, and to search on problem space [7]. In [10], a comprehensive review on the use of CWW in risk assessment is presented. In [11], quiet a number of AI (as well as other complementary methodologies) failure analysis and decision making techniques with practical applications are presented. In short, these research results many AI- based failure analysis or decision making model.

Even through these research lines are popular, there are quite a number of un-answered research questions. Examples are

- [1] It is not sure how these proposed approaches can be integrated and synthesized for failure analysis and group decision making problems in manufacturing industry in practice. Indeed, most proposed approaches either focus on either failure analysis or decision making only [1, 6-13].
- [2] It is not sure how an AI- based failure analysis and decision making model/technique can be practically implemented. For example, works in [13-14] attempt to develop a practical procedure which is limited for fuzzy FMEA methodology only.

With regards to research in fuzzy logic, recent advances focus on type-2 fuzzy logic. Type-2 fuzzy logic was introduced as an improvement for the limited ability of conventional fuzzy logic in handle data uncertainty [17]. In [18], earlier works on Type-2 fuzzy logic in various domain, e.g., approximation, clustering, control, data base, decision making, healthcare, neural network, quality control and communication have been summarized. The use of Type-2 fuzzy logic in decision making and failure analysis problem are very new, and it is worth investigated.

This research attempts to tackle these research questions as mentioned above. The novelty of our proposed research lies on the development of an advanced Type-2 fuzzy logic-based group decision support model/tool with others complementary artificial intelligent (AI) techniques, e.g., computing with word, multi-objective evolutionary computations, machine learning techniques and etc, for failure analysis, optimization and group decision making problems in local (Sarawak) food industries. AI models (include Type-2 fuzzy logic system) are adopted to facilitate the information/data gathering and pre-process, to automate score ratings process that is based on historical data (which is done manually), to automate data analysis and synthesis, to search for a potential solution under a set conflicting criteria, and also to acts as a group decision making system.

Our model may further lead to time saving, cost reduction and automation in information gathering, scoring, analysis, as well as optimization and decision making processes. It is useful to facilitate today's competitive product/process design and development. For further evaluations, case studies will be conducted in several local manufacturing environments.

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Intelligent performance optimization framework for collaborative hybrid energy system (I-PORCHES): Theoretical development, mathematical formulation, laboratory experimentations and applications

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Extended Abstract

Recent advances in energy research mainly focus on hybrid energy system. From the literature, various hybrid energy systems have been proposed, either for a general application, or a customized and a specific application. In this proposal, a hybrid energy system is explained as a collaborative of several energy technologies, e.g., solar PV, battery cell, fuel cell, and etc, for achieving a desired performance. While hybrid energy system is popular, there are relative few articles on performance optimization of a hybrid energy system. A challenge in this line of research is how to collaborate a few energy technologies together in a hybrid energy system, for an optimized performance, for a specific application or general purpose application. The novelty of this research lies on a theoretical development and mathematical formulation of a new scheme that attempt to coordinate the operation and collaboration of several energy technologies with optimization, adaption, and/or evolving features, i.e., intelligent performance optimization framework for collaborative hybrid energy system (I-PORCHES). In this research, (qualitative and quantitative advantages and disadvantages for each of the energy technology is analyzed. We further introduce several operating modes for a hybrid energy system, i.e., save mode, optimal performance, and etc. I-PORCHES is an advanced general scheme that is equipped with Artificial intelligent models, and attempts to exploit the individual advantages for each of the energy technologies in a hybrid energy system. It further identifies an optimized and real-time strategy for a hybrid energy system, either for a specific application or a general application. In this research, I-PORCHES is to be implemented in a developed hybrid energy system based on various energy resources or schemes. Outcome of this research is important and significant, and I-PORCHES can be applied to various hybrid energy systems, for an optimized performance, either for a general-purpose or a specific application. It can be further customized for a hybrid energy system to be implemented in a rural area, or in a specific environment. Experimentations will be conducted for verification purpose.

A hybrid energy system usually consists of two or more energy sources used together to provide increased system efficiency as well as greater balance in energy supply. From the literature, various hybrid energy systems have been developed and investigated. A 2.24 kW hybrid photovoltaic (PV)-Proton exchanged membrane (PEM) fuel cell generation system employing an electrolyzer for hydrogen generation was designed and simulated by El-Shatter [1]. Lee et al. [2] studied and analyzed a 40W direct methanol fuel cell (DMFC) combined with battery hybrid power for portable application. The DMFC was used for main power source at average load while the battery was applied for auxiliary power at overload. The experiments were done on hybrid DMFC using a lead-acid battery, Ni-Cd battery and Ni-MH battery. Typical result shows that a stable transient characteristic for some seconds in the beginning of the load growth. To meet pulse-power demand, in which the power demand is impulsive rather than constant, a design and experimental tests of control strategies for active hybrid fuel cell/battery power source had been investigated by Jiang et al. [3]. A hybrid energy system consisting of a 5 kW wind turbine and a fuel cell system is presented in [4]. A novel wind/diesel/battery hybrid energy system is proposed in [5] for remote area in Australia.

A popular arising issue in hybrid energy research is how these technologies can be combined for an optimized performance, either on design phase [6-7] or operating phase [8-11]. This line of study is sometime referred as energy management [6]. In [6], a method for calculating the correct size of a photovoltaic (PV)-hybrid system and for optimizing its management is developed. In [7], several energy technologies is discussed and a general model to find an optimal combination of energy components for a typical rural community minimizing the life cycle cost is presented. The model helps in sizing hybrid energy system hardware and in selecting the operating options.

The importance of optimizing the performance of a hybrid energy system in operating phase has been highlighted in hybrid vehicles research. In [8], fuzzy-logic-based energy management and power control strategy for parallel hybrid vehicles is proposed. It optimizes the fuel economy and the operational efficiency of all its components. The proposed approach optimizes the power output of the electric motor/generator and the internal combustion engine by using vehicle speed, driver commands from accelerator and braking pedals, state of charge (SOC) of the battery, and the electric motor/generator speed. Separate controllers optimize braking and gear shifting. In [9-10], an intelligent energy management agent (IEMA) for parallel hybrid vehicles is proposed. It incorporates a driving situation identification component whose role is to assess the driving environment, the driving style of the driver and the operating mode of the vehicle using long and short term statistical features of the drive cycle. In [11], a procedure for the design of a near-optimal power management strategy is proposed. The design procedure starts by defining a cost function, such as minimizing a combination of fuel consumption and selected emission species over a driving cycle. Dynamic programming (DP) is then utilized to find the optimal control actions including the gear-shifting sequence and the power split between the engine and motor while subject to a battery SOC-sustaining constraint.

As compared with works in [8-11], we attempt to develop a general theoretical framework i.e., I-PORCHES, which can be applied to non- hybrid vehicles applications. This includes for portable purpose, or rural applications. Such framework is useful for rural area in Sarawak, Malaysia, where power grid is not available.

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Automobile adsorption air-conditioning system using oil palm biomass-based activated carbon: A review

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Extended Abstract

Refrigeration and air-conditioning technology are required to evolve in accordance to Montreal Protocol adopted in 1987 and Kyoto Protocol in 1997. This regulation concerns about the climate change in an attempt to phase-out chlorofluorocarbons (CFCs), followed by hydro-chlorofluorocarbons (HCFCs) and then moving to 1,1,1,2-tetrafluoroethane (HFC-134a) starting 2011. This trend leads to a strong demand of new systems for air-conditioning, especially in automobile. Adsorption cooling system, among other proposed cooling technologies, has a very good potential for automobile applications. Hence, there exists a need for a creative design and innovation to allow adsorption technology to be practical for air-conditioning in automobile in a near future. Oil palm shell-based activated carbon has been widely applied in various environmental pollution control technologies, mainly due to its high adsorption performance yet low cost. However, limited studies have been carried out on the characteristics and application of oil palm shell-based activated carbon in adsorption air-conditioning system.

Activated carbons have been tested with various adsorbates as the working pair in adsorption cooling system [1], [2], [3] and [4], however, most of the activated carbons studied were commercially available activated carbons which were synthesized from expensive and non-renewable materials. Activated carbon derived from oil palm shell has been widely used in various applications especially in environmental control technologies such as for the adsorption of methane [5], hexavalent chromium [6], copper ions [7], 4-chloroguaiacol [8], phenol [9] and treatment of landfill leachate [10]. Oil palm shell-based activated carbon has been proved to give high adsorption performance, however limited studies have been carried out on the application of this activated carbon in adsorption air-conditioning systems.

Activated carbon has specific properties depending on the material source and the mode of activation. In both physical and chemical activation processes, knowledge of different variables is very important in developing the porosity of the activated carbon. The adsorption capacity of an activated carbon is related to its properties such as surface area, pore volume, pore size distribution and pore structure. The development of micropores and mesopores is important as it allows the activated carbon to adsorb large amounts and various types of adsorbates either from gas or liquid streams [11].

Wood, bituminous coal, lignite, peat, petroleum residues and coconut shell are some of the conventional starting materials used to produce activated carbons. The selection of the precursor essentially determines the range of adsorptive and physical properties that can be attained in the activated carbon. The choice of precursor is largely dependent on its availability, cost, consistency of quality and purity [12]. In fact, any cheap material with high carbon content and low inorganics can be used as a raw material for the production of activated carbon. Due to the high cost of commercial activated carbons that limits their wide use, currently focus has been given on production of activated carbons from cheap and renewable materials such as agricultural wastes. Agricultural by-products have been proved to be promising raw materials for the production of activated carbons because of their availability at low price and they can be used to produce activated carbons with a high adsorption capacity and considerable mechanical strength [13]. Agricultural biomass is considered to be very important feedstock in virtue of especially two facts: they are renewable sources and low cost materials. Besides, this biomass contains high concentration of volatiles and low ash content which is ideal for creating highly

porous structures within the activated carbon matrix [14]. In Malaysia, agricultural by-products are the most abundant biomass resources, exceeding 70 million tonnes annually. The high production rate of biomass throughout the year is mainly due to the high sunlight intensity/time and high rainfall. Palm oil industry is the main contributor of agricultural biomass in Malaysia, generating 94% of the total agricultural biomass [15].

Table 1. Comparison between vapour-compression system and the adsorption system.

Vapour-compression system	Adsorption system
• Mechanical compressor is used to compress the refrigerant vapour between the evaporator and the condenser.	• Thermal compressor is used to compress the adsorbate by adsorbing and desorbing adsorbate vapour.
• Mechanical compressor is driven by the shaft powered by the engine.	• Waste heat from the automobile engine can be utilized to operate the system.
• CFC and HCFC are usually used as refrigerant.	• Water, methanol or other alternative clean refrigerant can be used.
• Compressor failure can be due to wear.	• Less moving parts.

One of the main limitations is due to the fact that most currently available adsorbents have low adsorptive-desorptive capacity, which could lead to huge system requirement and thus quite difficult to be installed into automobiles. In order to overcome this limitation, new synthetic or natural adsorbents with higher adsorptive capacity should be invented to build a compact system. Besides that, heat transfer rate inside the adsorber normally is quite slow and thus increase the overall cycle time. Coated adsorbent technology and heat pipe could be an alternative to improve the system efficiency by reducing the cycle time and overall heat transfer rate. Recent research has shown that new evolvement in adsorption technology has a promising potential to be adopted in automobile air-conditioning purpose. The technology is expected to be practical when further improvements are done to overcome some of the limitations mentioned above. Using clean refrigerants in adsorption air-conditioning systems will reduce the production of unwanted ozone depleting substances, such as CFCs and HCFCs. As such, adsorption air-conditioning system for automobile should be seriously looked into. Besides it being environmentally friendly, low maintenance cost could be expected. By implementing the adsorption air-conditioning system powered by waste heat may provide a comfort for the driver and/or passengers by lowering the air temperature level and also for air ventilation during driving or parking.

Table 2. Some adsorbent-adsorbate pair and their heat of adsorption.

Adsorbent	Adsorbate	Heat of adsorption (kJ/kg)
Silica gel	Water	2800
	Methyl alcohol	1000–1500
Zeolite (various grades)	Water	3300–4200
	Carbon dioxide	800–1000
	Methanol	2300–2600
	Ammonia	4000–6000
Activated alumina	Water	3000
Activated carbon	Ethene	1000–2000
	Ethanol	1200–1400
	Methanol	1800–2000
	Water	2300–2600
	Ammonia	2000–2700
Calcium chloride	Methanol	–

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Development of Strontium doped Perovskite type Ceramics for Ultrasonic Applications

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Extended Abstract

Lead Zirconate Titanate (PZT) with formulae $\text{Pb}_{0.91}\text{Sr}_{0.09}(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$ was prepared by conventional mixed oxide route with an objective to achieve dense piezoelectric sintered components exhibiting adequate properties for sonar applications. Dielectric and / piezoelectric properties of PZT are strongly influenced by composition, homogeneity and porosity in the densified part. To achieve the objective of a good homogenous and dense body, the initial powders and the final product were characterized by SEM equipped with EDX, XRD and Particle Size Analyzer during each processing step. Electrical characterization was carried out by LCR meter and piezoelectric constant (d_{33}) was measured by piezo meter. Planetary Mill instead of a conventional ball mill was employed for initial mixing and grinding of calcined powder. Properties achieved by sintering at 1200°C for 2 hours in lead rich atmosphere were Dielectric Constant (K) = 1440, Tangent Loss ($\tan\delta$) = 0.0062, and density = 7.55 g/cm^3 . XRD analysis of calcined powders showed that excess PbO added at the time of preparation of the mixture started to evaporate at the calcination stage. After sintering the observed grain size was $2\text{-}3 \mu\text{m}$ with clean grain boundaries.

Starting powders in the appropriate ratios were wet mixed with isopropanol in a planetary mill for 11 hours at 100 rpm. The rotation direction was reversed after 15 minute to get thorough mixing. Mixing was carried out in 250 ml WC bowls by using zirconia balls as grinding media. After mixing the powders were dried at 70°C for 24 hours. Dried powder was pressed at 100 MPa in the shape of disc of size diameter $25 \text{ mm} \times 10 \text{ mm}$ thickness and calcined at 850°C for 2 to 15 hours in alumina crucibles covered with lid. Heating rate was kept at $3^\circ\text{C}/\text{min}$ followed by furnace cooling. Calcined powder was ground and then characterized by XRD for perovskite phase formation and by SEM analysis for grain size and morphology. Calcined powder was mixed with 2% PVA binder in a planetary mill for 4 hours and then dried at 70°C . The powder was then passed through $150 \mu\text{m}$ sieve. Pellets of size, OD 13mm, ID 04 mm and thickness 5mm, were pressed at 180 MPa. After that samples were heated to 600°C at a rate of $2^\circ\text{C}/\text{min}$ and hold for 4 hours to ensure complete removal of organic binder. After debinding the samples were sintered at 1200°C for 2 hours in sealed alumina crucibles. Heating and cooling rate was maintained at $3^\circ\text{C}/\text{min}$. Pellets were surrounded by Pb rich powder to avoid PbO loss. Sealing was carried out by mixture of fine alumina powder and sodium silicate. Sintered pellets were metallized using cermet silver conductor (ESL 599-E).

Sintering was carried out in lead rich atmosphere to avoid loss of PbO at 1200°C for 2 hours of the samples that were calcined at 850°C for 15 hours and SEM micrographs of sintered samples taken at different magnifications are shown in Fig.7. Very dense structure is achieved at this temperature. Fig. 7(a) shows polished surface of sintered sample at low magnification. Some porosity in the sample is seen in this micrograph but the size of porosity is less than or equal to grain size ($2\text{-}3 \mu\text{m}$). The porosities less than grain size is normal feature in sintered parts in PZTs prepared by conventional slow heating cycle. SEM analysis of sintered and fractured samples reveal the morphology of grain and mode of fracture, Fig. 3 (b-d). These SEM micrographs of the fractured surface of sintered samples are taken at different magnifications and locations. It can be seen in Fig. 3 (d) that the grain surfaces are very clean and no secondary phase is present at the grain boundary and the mode of fracture (revealed in Fig. 3 b-c) is mixed. Grain size is about $2\text{-}3 \mu\text{m}$ and no abnormal grain growth is seen. Size of the grains is uniform.

Key words: Piezo Electric Effect, Perovskites, Sintering, Strontium doped PZT, Sonar application

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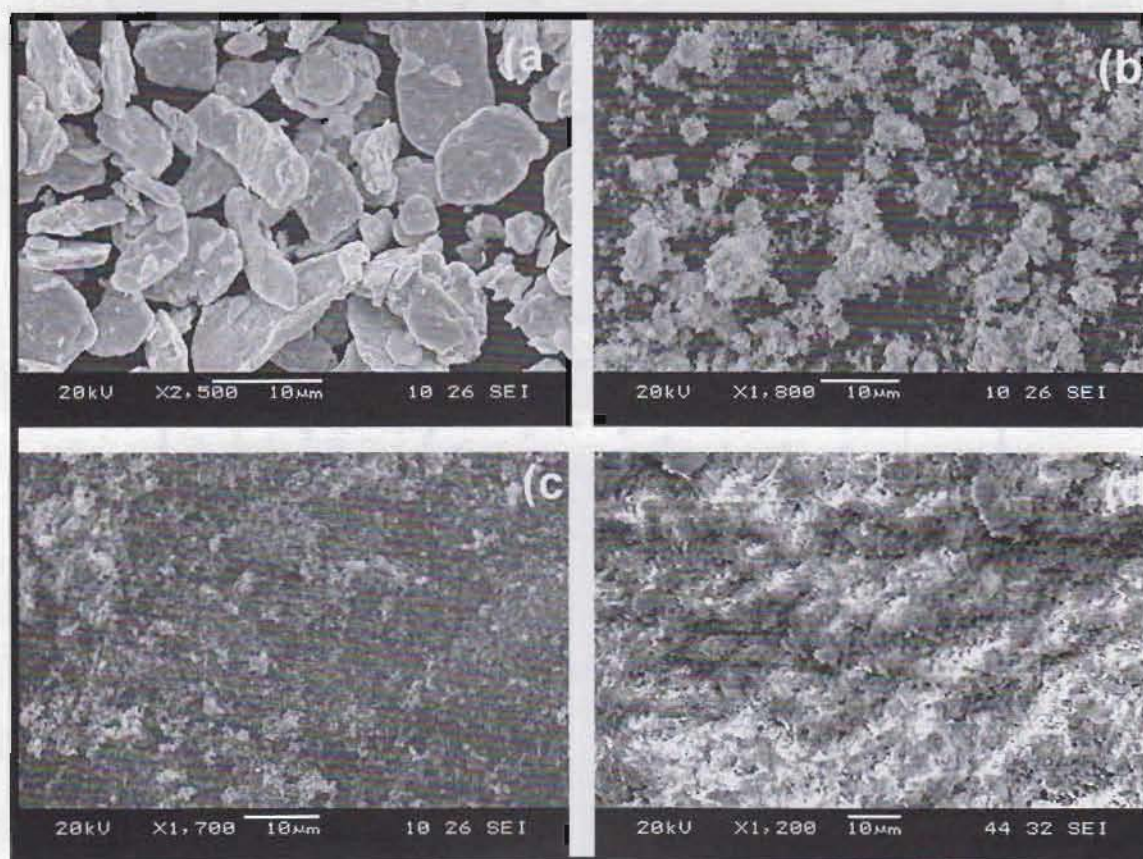


Figure 1 SEM micrographs of precursor powders. (a) PbO (b) ZrO₂ (c) TiO₂ (d) SrCO₃

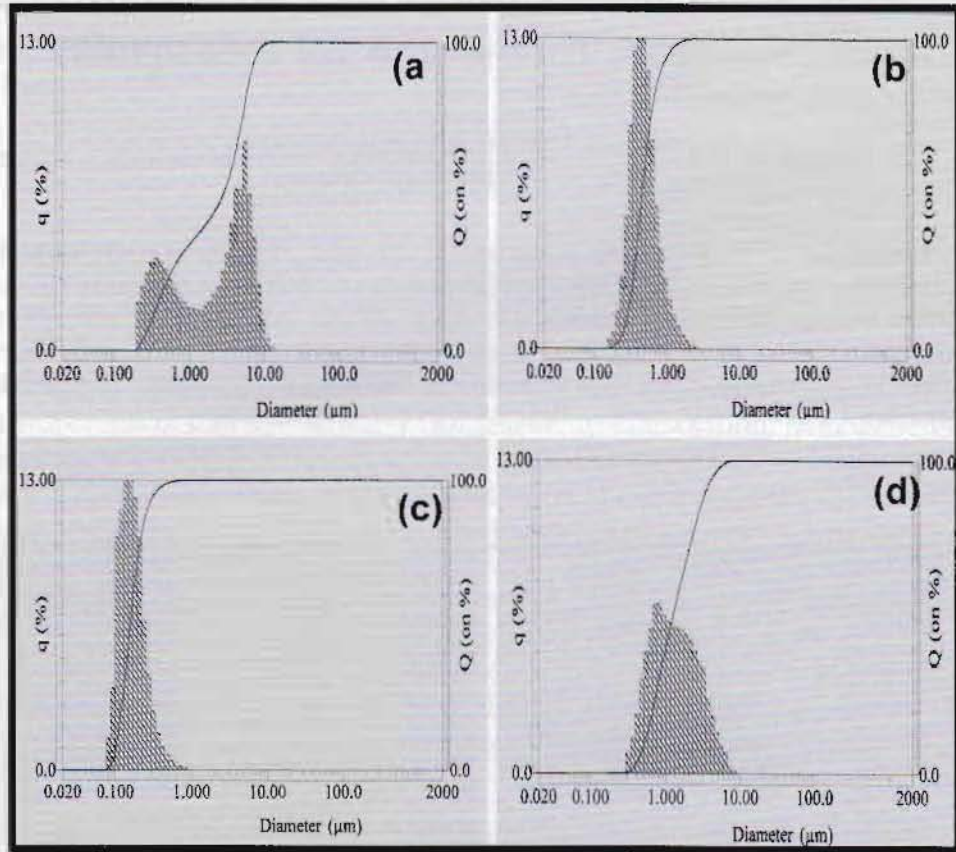


Figure 2. Laser particle size analysis of precursor powders (a) PbO (b) ZrO₂ (c) TiO₂ (d) SrCO₃.

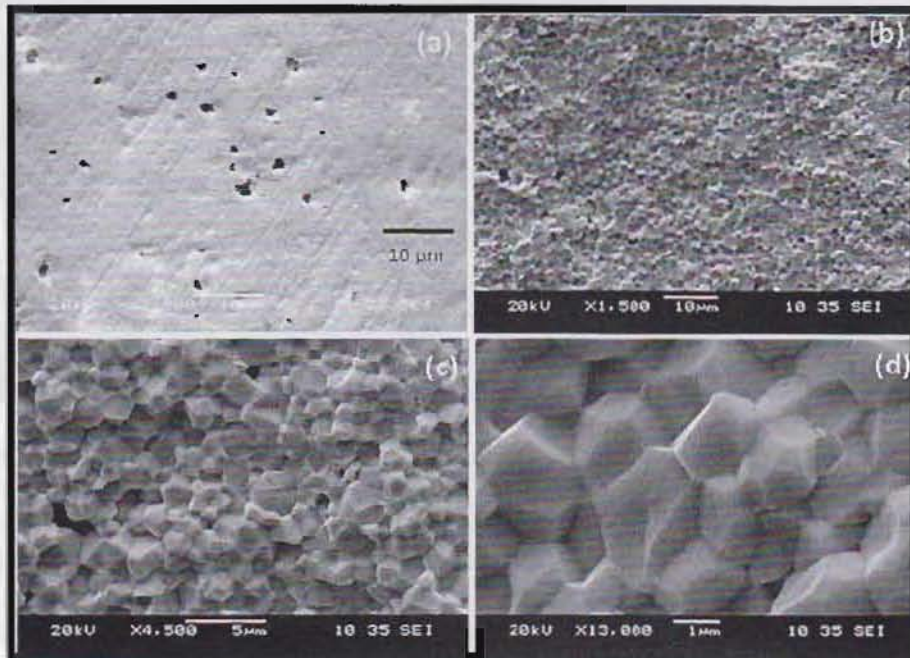


Figure 3 SEM micrographs after sintering (a) Polished surface 2000× (b) Fractured surface 1500× (c) Fractured surface 4500× (d) Fractured surface 13000×.

Nitric acid-treated bamboo waste as low-cost adsorbent for removal of cationic dye from aqueous solution

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Extended Abstract

The feasibility of nitric acid-treated bamboo waste (NBW) for the removal of methylene blue (MB) from aqueous solutions was investigated. Batch adsorption studies were conducted to study the effects of contact time (0-180 min), initial concentration (45-375 mg/L) and solution pH (2-10) on the removal of dye at 30°C. The adsorption of MB was minimum at pH 2, slightly increased with pH up to pH 3 and then remained constant over the solution pH range of 4–10. Fig. 1 shows the effect of initial dye concentration on adsorption of MB on NBW at 30 oC. The equilibrium adsorption increased from 10.60 mg/g to 56.05 mg/g, with increasing initial MB concentration from 45 to 375 mg/L.

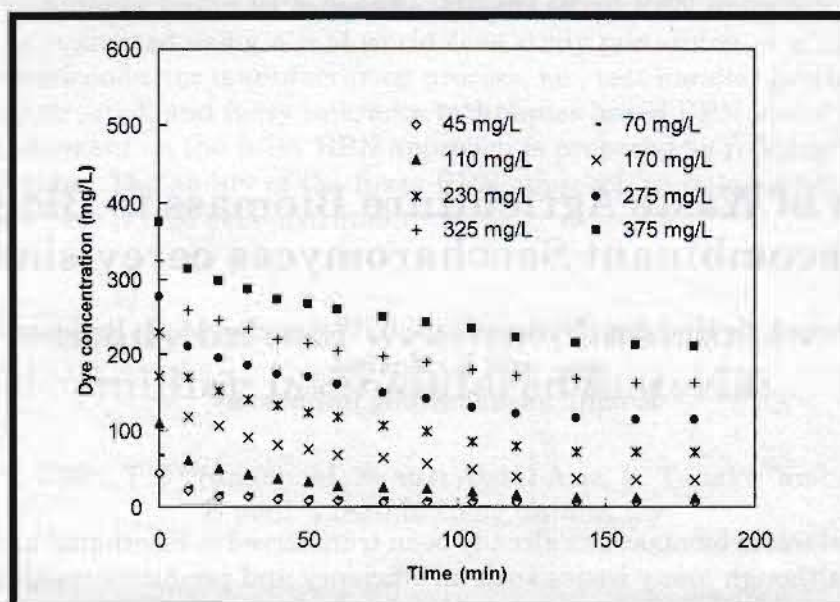


Fig. 1: Effect of initial dye concentration and contact time on adsorption of MB on NBW (W= 0.40 g; V= 0.20 L; T = 30 °C)

The experimental data were analyzed by using four different types of linearized Langmuir and the Freundlich isotherms. Equilibrium data fitted well with the type 1 Langmuir model, yielding maximum monolayer MB adsorption capacity of 87.719 mg/g. The kinetic data were found to conform to pseudo-second-order kinetic model with good correlation. Intraparticle diffusion model was further tested to identify the diffusion mechanism. The scanning electron micrographs showed that MB was adsorbed on the rough surface of NBW. It can be seen from Fig. 2(a) that NBW has a rough surface with a heterogeneous pores and cavities where there is a good possibility for MB dye molecules to be trapped and adsorbed on this surface. Fig. 2(b) in the other hand reveals that the surface morphology of the NBW after MB adsorption is different from the unused sample which is the indication of dye adsorption. The NBW prepared in this study was shown to be a promising low-cost material for adsorption of MB from aqueous solutions.

Keywords: Adsorption; Bamboo waste; Isotherm; Kinetics; Methylene blue

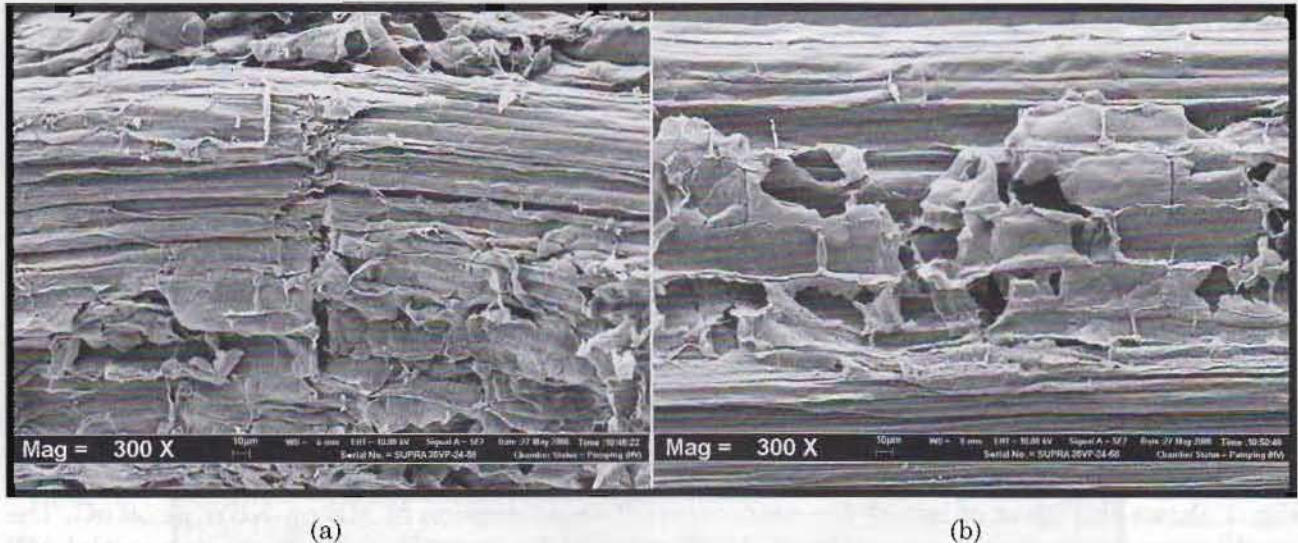


Fig. 2: SEM micrographs of NBW (magnification: 300x):
(a) before dye adsorption and
(b) after dye adsorption

Conversion of Waste Agriculture Biomass to Bioethanol by Recombinant *Saccharomyces cerevisiae*

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Abstract

Agricultural waste biomass has already been transferred to bioethanol and used as energy related products, although many issues such as efficiency and productivity still to be overcome. In this study, the protein engineering was applied to generate enzymes with completely reversed coenzyme specificity and developed recombinant yeasts containing those engineered enzymes for construction of an efficient biomass-ethanol conversion system. Recombinant yeasts were constructed with the genes encoding a wild type xylose reductase (XR) and the protein engineered xylitol dehydrogenase (XDH) (with NADP) of *Pichia stipitis*. These recombinant yeasts were characterized based on the enzyme activity and fermentation ability of xylose to ethanol. The protein engineered enzymes were expressed significantly in *Saccharomyces cerevisiae* as judged by the enzyme activity in vitro. Ethanol fermentation was measured in batch culture under anaerobic conditions. The significant enhancement was found in Y-ARS strain, in which NADP⁺-dependent XDH was expressed; 85% decrease of unfavorable xylitol excretion with 26% increased ethanol production, when compared with the reference strain expressing the wild-type XDH.

Keywords: *Agricultural waste biomass; Protein engineering; Xylitol dehydrogenase; Xylose-fermentation; Ethanol production.*

Enhancing the Failure Mode and Effect Analysis Methodology with Fuzzy Inference Techniques

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Abstract

Traditional Failure Mode and Effect Analysis (FMEA) uses Risk Priority Number (RPN) ranking system to evaluate the risk level of failures, to rank failures, as well as to prioritize actions. Although this approach is simple, it suffers from several shortcomings. In this paper, we investigate a number of fuzzy inference techniques for RPN determination in an attempt to overcome the weaknesses associated with the traditional RPN ranking system. In this paper, originalities of our works are two-folded. (1) We introduce and investigate on two important theoretical properties; i.e., monotone output and output resolution, that relating to the ability of fuzzy RPN model to produce RPN score that allow valid and useful comparisons of among failures. (2) We investigate on the possibility of the use of fuzzy rule reduction techniques in fuzzy inference techniques based RPN model. A novel fuzzy RPN approach is introduced and its performance is evaluated using a real-world case study pertaining to a Flip Chip Ball Grid Array (FCBGA) semiconductor manufacturing process, i.e., test handler process. FMEA for the test handler is constructed, and fuzzy inference techniques based RPN model is then developed. In addition, improvement on the fuzzy RPN approach is proposed by refining the weights of the fuzzy production rules. The ability of the fuzzy RPN approach in failure risk evaluation with a reduced fuzzy rule base is also demonstrated.

Study on tool wear mechanisms in milling laser sintered material

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Extended Abstract

A milling-combined laser sintering system (MLSS), which is a rapid tooling machine that combines laser assisted metal sintering and high speed end mill has been used to make a complicated injection mould that allows the creation of a deep rib. Two alternating processes occur in MLSS, namely, forming a layer profile by laser sintering and surface finishing by high speed milling. Fig. 1 illustrates the concept of the MLSS. The process of MLSS can be summarized as follows. A 3-D model is designed using CAD and is divided into sliced layers whose thickness is 50 μm . Then, this model is transferred to the MLSS. Prior to the laser sintering process, a sandblasted steel base plate is placed on the building platform. Next, a predetermined layer thickness of 50 μm of loose metallic powder is spread on the base plate using a recoating blade. Successively, the laser beam is irradiated to the surface of a layer of loose metallic powder and this will produce a layer-wise profile according to the CAD data of the sliced layer, see Fig. 1(a). After forming a few layers of sintered material, the milling process is executed at the periphery surface as shown in Fig. 1(b). The sintering and milling at the periphery surface are repeated whereas the top surface is not cut after all layers are sintered. The laser sintering and cutting processes are performed in a nitrogen atmosphere at room temperature to prevent oxidization. This paper investigates tool wear mechanisms of a ball end mill in cutting laser sintered material. Cutting edge temperature is measured by using a three-color pyrometer with an optical fiber.

Bulk carbon steel JIS S55C is selected as the standard steel. Experimental results show that tool life in cutting sintered material is shorter than that in cutting JIS S55C. Observations by SEM show that adhesion of the work material and micro chipping are the main wear mechanisms in cutting sintered material. The corresponding cutting edge temperature shows a continuous increase as wear evolves with cutting time.

Keywords: Ball end mill; Cutting edge temperature; Tool wear; Laser metal sintering.

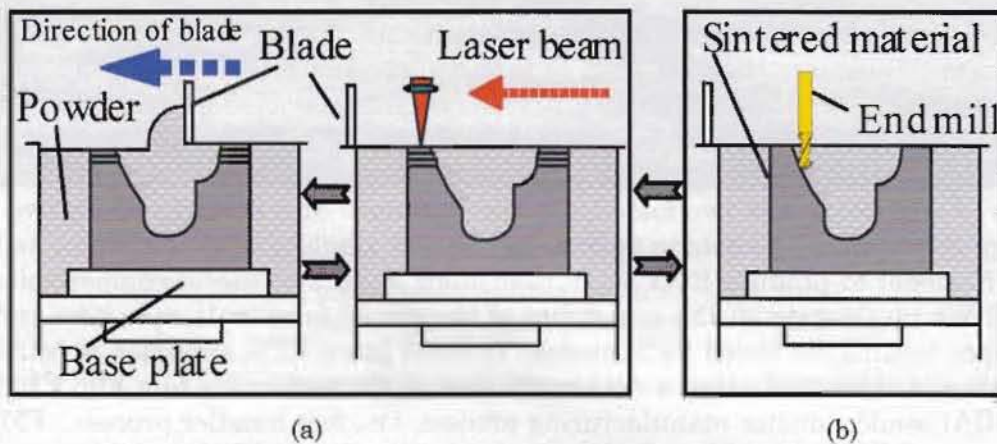


Fig. 1 - Concept of milling-combined laser sintering system (MLSS)
(a) forming layers and (b) high speed milling

Table 1 – Properties of metallic powder

Material		SCM	Ni	Cu
Particle diameter	μm	30	30	30
Powder density	kg/m^3	4690	4040	4690
Specific heat	J/g.K	0.45	0.49	0.38
Thermal conductivity	W/m.K	0.13	0.17	0.17

Table 2 – Experimental conditions

Tool material	Coated cemented carbide
Diameter	2.0 mm
Cutting speed	$V : 250 \text{ m/min}$
Feed per tooth	$f : 0.025 \text{ mm/tooth}$
Axial depth of cut	$Ad : 0.1 \text{ mm}$
Radial depth of cut	$Rd : 0.4 \text{ mm}$
Cutting method (Down cut without cutting fluid)	Peripheral milling

Influence of N, N-Dimethylacetamid on the Thermal and Mechanical Properties of Polymer-Filled Wood

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Abstract

Mercerized wood species were impregnated with N, N-dimethylacetamid. The FT-IR showed enhanced absorption at 1419 cm^{-1} (C/CH_3), and the 1267 cm^{-1} (N/CH_3) stretching band confirmed the polymerization reaction. Differential Scanning Calorimetric (DSC) analysis indicated that the decomposition temperature of polymer-filled wood gives a higher thermal stability compared to the raw material. Polymer-filled wood yielded higher MOE and MOR compared to the untreated wood. The Young's modulus of *Xylocarpus* Spp *Artocarpus Rigidus* and *Eugenia* Spp were significantly different between raw wood and WPC. The increase in the stiffness and the thermal stability of the composites increased due to the crystallinity of polymer-filled wood as indicated by XRD analysis. According to the experimental results, FT-IR spectra indicate the occurrence of chemical impregnation of wood by the monomer N,N-dimethylacetamid. The enhanced absorption at the 1419 cm^{-1} (C/CH_3) and 1267 cm^{-1} (N/CH_3) stretching bands confirmed the polymerization reaction. The wood polymer composites were thermally more stable at certain temperature ranges during this study. The MOE and MOR of polymer-filled wood were significantly increased for *Artocarpus elasticus*, *Artocarpus rigidus*, and *Eugenia* spp., respectively. The Young's modulus of *Xylocarpus* spp., *Artocarpus rigidus*, and *Eugenia* spp. were significantly different between raw wood and polymer-filled wood. The X-ray diffraction patterns indicate polymer-filled wood samples were more crystalline compared with raw wood.

Keywords: Tropical wood; DSC; Mechanical properties; Polymer-filled wood

The origin of emission in strontium magnesium pyrophosphate doped with Dy_2O_3

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Abstract

This paper reports on the luminescence properties of Dy^{3+} -doped $30\text{SrO}-30\text{MgO}-40\text{P}_2\text{O}_5$, which had been prepared by solid state reaction. The crystalline phases were identified using X-ray diffraction (XRD) and their luminescence properties were studied using excitation and emission spectra obtained from photoluminescence spectroscopy. The results of XRD patterns indicate that the prepared sample contain crystalline phase of MgP_2O_6 and SrMgP_2O_7 . The excitation spectrum of $30\text{SrO}-30\text{MgO}-40\text{P}_2\text{O}_5:\text{Dy}^{3+}$ consists of broad bands' centre at ~280, 310 and 400–600 nm associated with defects and vacancies of host material. The other feature of sharp peaks is very similar and belongs to Dy^{3+} ions. The f-f transitions in the range of 417–475 nm correspond to the transitions from $^6\text{H}_{15/2}$ to $^4\text{K}_{17/2}$ + $^4\text{M}_{19/2,21/2}$ + $^4\text{I}_{13/2}$ + $^4\text{F}_{7/2}$, $^4\text{G}_{11/2}$, $^4\text{I}_{15/2}$ and $^4\text{F}_{9/2}$, in the range of 392 nm to $^6\text{P}_{3/2}$ + $^6\text{P}_{5/2}$, and in the range of 312–370 nm to $^4\text{K}_{15/2}$, $^6\text{P}_{7/2}$ + $^4\text{M}_{15/2}$ and $^4\text{I}_{11/2}$, respectively. The peaks at 482, 465, and 455 nm could be assigned to the transition of $^4\text{F}_{9/2} \rightarrow ^6\text{H}_{15/2}$, $^4\text{I}_{15/2} \rightarrow ^6\text{H}_{15/2}$ and $^4\text{G}_{11/2} \rightarrow ^6\text{H}_{15/2}$ of Dy^{3+} , respectively. Dy^{3+} has emissions due to the atomic energy levels of itself and emissions due to the acceptor levels of defect sites formed by Dy^{3+} .

Keywords: Photoluminescence spectroscopy, Luminescent, X-ray diffraction, Crystalline phosphate

Modelling the Flood Vulnerability of Deltaic Kuching City, Malaysia.

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Abstract

The main objective of this writing is to present a practical way to envisage the flood vulnerability in deltaic region, particularly on the concern of sea level rise. Kuching city of Malaysia is established on banks of Sarawak River, 30 km from the sea. Therefore it is subjected to fluvial and tidal floods. Kuching Bay experiences the highest King Tides in Southeast Asia region. These tide magnitudes could be a glimpse of future sea level rise. By means of modelling these tides, it provides an understanding and preparation for the impacts of sea level rise on the flood mitigation infrastructures and the city itself. The modelling efforts had created an illustration that a 10% rise in tide levels would result in increase of flooding areas up to 6% relative to existing tide levels.

Effect of Alkali on Tropical Peat Stabilized with Different Stabilizers

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Abstract

The paper presents the effect of alkali on tropical peat stabilized with ordinary portland cement (OPC), fly ash (FA) and different chemicals e.g., accelerator (a combination of 2.0% sodium sulfate, 0.5% sodium chloride and 0.1% triethanolamine); 2.6% aluminum sulfate; and 2.6% calcium sulfate. Various physical and engineering properties tests were conducted on original peat, FA and stabilized peat samples to check the effect of alkali and chemicals. Unconfined Compressive Strength (UCS) tests were carried out on treated (i.e., peat treated with 2.0% NaOH to reduce its acidity) and untreated stabilized peat samples with OPC, FA, and different chemicals for various curing periods. The results show that UCS value increases with curing periods and treated peat samples show better results than untreated peat for both OPC and FA stabilized peat samples. The highest UCS value was found on treated stabilized peat where calcium sulfate and OPC were used as stabilizers for 120 days curing period. In addition, specific gravity (Gs), pH, loss on ignition (N), Organic Content (OC) and Scanning Electron Microscope (SEM) studies were also carried out on stabilized peat samples to investigate the stabilized behavior and micro-structure of the peat.

Dynamics of Manufacturing Productivity: Lesson learnt from labor intensive industries

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Abstract

Purpose – This study is designed to examine the impact of favorable working environment (FWE) and R&D on manufacturing productivity of labor intensive industries. More specifically, the purpose of this study is to generate quantitative evidence of the effect of FWE and R&D-based manufacturing process on outputs and productivity.

Design/methodology/approach – Convenience sampling method has been used to conduct this study. This method provides the opportunity for selecting those manufacturing industries that are convenient to get access for collecting relevant information. Three categories of labor intensive manufacturing industries such as category A, B and C have been chosen to perform this research. Industrial category A represents the manufacturing operations which are based on skill of labor. Category B is a group of industries which provides the FWE the ability to utilize the potential of skill in the manufacturing process. However, category C is a specialized group of industries and its manufacturing process is dependent on R&D. The operating data of inputs cost and the revenue of corresponding outputs have been gathered from audited documents of the relevant sample industries and the data have been analyzed by using standard statistical techniques in order to establish the relationship between dependent and independent variables.

Findings – It is found that the industrial category B has spent about 1 percent of revenue on FWE and gained 9.5 percent higher productivity compare to industrial category A. However, the result has shown that the expenditure on FWE is positively associated with productivity ($r = 0.5$). Whereas, the study has revealed that industrial category C has spent about 1.5 percent of revenue on R&D activities for improving manufacturing process and gained 20 higher productivity compare to industrial category A. Nevertheless, the expenditure on R&D is strongly correlated with productivity ($r = 0.7$). The study concludes that FWE as proxy of job satisfaction of workforce and R&D on manufacturing process are value-added inputs for labor intensive industries and it is positively associated with manufacturing productivity.

Originality/value – This paper presents three original case studies on labor intensive manufacturing industries. This study has addressed an important issue of labor intensive manufacturing industries and generated quantitative evidence of the impact of FWE and R&D activities on productivity. These issues have been well researched in developed and many developing countries in capital-intensive industries, but no dedicated study is available that has addressed this issue from the perspective of the highly labor intensive industries such as the garment industry. The findings of this research would enrich the present knowledge stock of manufacturing systems. Eventually, the findings would be the basis for further research on manufacturing process for enhancing performance. Based on this concept, this study would be valuable to policy makers, academics and government agencies.

Keywords *Manufacturing systems, Productivity capacity, Working conditions, Research and development, Skills*

Research News

Conferences Organized

3rd Engineering Conference (EnCon 2010)

14-16 April, 2010, Pullman Hotel, Kuching, Sarawak, Malaysia

The Faculty of Engineering successfully organized the 3rd Engineering Conference 2010 (EnCon 2010) on 14 to 16 April 2010. The conference which took place at Pullman Hotel Kuching was chaired by Ir. Dr Mohd Shahril Osman and jointly organized by Institute of Engineers of Malaysia (Sarawak Branch).

With the theme of 'Advancement in Mechanical and Manufacturing Engineering for Sustainable Environment', the conference managed to gather around 150 researchers, engineers and academicians from all over the world to participate in this conference for oral and poster sessions on latest technologies and innovation in engineering. The conference was launched by YB Datuk Amar Abang Haji Abdul Rahman Zohari bin Tun Datuk Abang Haji Openg (Minister of Housing and Urban Development).

In this conference, the organizer has invited Prof. Ir. Dr. Wan Ali bin Wan Mat from Universiti Pertahanan Nasional Malaysia (UPNM) as the keynote speaker with a speech on "NGV Problems and Home Refueling Appliances (HRA) with Nobel Multi-stage Symmetrical Wobble-plate Compressor". Vice Chancellor of UNIMAS, Prof. Dr Khairuddin Ab. Hamid looked forward to organize another series of this conference as a platform to those in related areas and disciplines to share knowledge and experience.

3rd International Conference on Solid State Science and Technology (ICSSST 2010)

01-03 December, 2010, Hilton Hotel, Kuching, Sarawak, Malaysia

The Faculty of Engineering together with Malaysian Solid State Science & Technology Society (MASS) has successfully organized The 3rd International Conference in Solid State Science and Technology 2010 (ICSSST2010) on 1-3 December 2010. The conference was held at Hilton Kuching Hotel with the theme "Innovation and Advances in Solid State Science and Technology". The conference was launched by Yang Amat Berhormat Datuk Patinggi Tan Sri Dr. George Chan Hong Nam (the then Deputy Chief Minister of Sarawak), representing The Right Honourable Yang Amat Berhormat Pehin Sri Hj Abdul Taib bin Mahmud, The Chief Minister of Sarawak. The two plenary talks were given by Professor Jean Claude Labbe from University of Limoges, France and Prof. Rosli Hussin from University Technology Malaysia. Prof. Labbe talked about the role of Ceramics in the Development of Low Temperature Solid oxide Fuel Cells. He presented recent research conducted in this field at his Laboratory in France. Prof Rosli presented his work on the Solid State Nuclear Magnetic Resonance techniques for organic materials characterization. More than 150 researchers and academicians from all over the world participated in this conference for oral and poster sessions. The conference was a success since it attracted many participants who had presented high quality research. The selected papers are published in the MASS journal.

7th International Materials Technology Conference and Exhibition (IMTCE 2010)

13-16 July, 2010, Hilton Hotel, Kuching, Sarawak, Malaysia

The 7th International Materials Technology Conference and Exhibition (IMTCE 2010) was held on the 13th to 16th of July 2010 at the Hilton Kuching in the Malaysian State of Sarawak. It was organised by The Institute of Materials Malaysia in collaboration with various

public and private agencies including Universiti Malaysia Sarawak (UNIMAS). The conference was officiated by The Right Honourable Chief Minister of Sarawak, Yang Amat Berhormat Pehin Sri Haji Abdul Taib bin Mahmud. The keynote lecture was given by Prof. Dr Amir Azam Khan from Faculty of Engineering, University Malaysia Sarawak. He presented his recent research conducted on the development of Plasma Sprayed Thermal Barrier Coatings for applications in Aero Space Industry.

The topics covered in the conference are coatings technology, composites, corrosion control, green materials, inspection & testing, materials characterization, materials research and application, nano materials and welding technology & applied process. More than 200 participants, many of whom from foreign countries, jam packed the main conference room during the official opening. The conference also received more than 100 papers covering a wide range of topics including for the first time, Green Materials. The ambience turned more business-like the following two days when the full Technical Conference started in earnest, in conjunction with an exhibition to showcase 'state-of-the-art' manufacturing technologies and testing equipment, advanced materials and auxiliary services.

Technical visits to SESCO Sejingkat Coal Power Plant and Brooke Dockyard and Engineering Works Corporation were the highlights on the last day. Both places offered valuable insights of the running of their operations to those who visited. The IMTCE presents an excellent platform for networking, exchange of knowledge, information and business opportunities between individuals as well as strategic partnership between exhibitors and conference participants. The next opportunity will be in 2012.

8th Asia-Pacific Symposium on Information and Telecommunication Technologies (APSITT 2010)

Jun 15-18, 2010, Damai Beach resort, Kuching, Sarawak, Malaysia

The Department of Electronic Engineering, Faculty of Engineering, Universiti Malaysia Sarawak and APSITT Committee, Japan has successfully organized a conference between 15 – 18 June 2010. The conference was officiated by YB Datuk Talib Zulpilip (Assistant Minister of Tourism and Heritage and welcoming speech were delivered by Dr. George Kimura (APSITT Representative) and Prof. Dr. Peter Songan (Deputy Vice Chancellor Universiti Malaysia Sarawak).

The objective of the conference was to offer the opportunity to exchange opinions among different countries in a co-operative atmosphere in the rapid changing information and telecommunication field. The aim was towards the prosperity of Asia-Pacific region by presenting the opportunities of academic forum for mutual understanding and friendship among researchers and leaders in this region. APSITT 2010 provided a forum for researchers and professionals to present their findings on the broad areas of Information and Telecommunications Technologies. About 90 papers were presented by participants from many countries such as Malaysia, Japan, Korea, India and France.

During the conference, Technical Program Overview was given by Prof. Hiroyuki Morikawa from the University of Tokyo, Japan while Keynote Speeches were presented by Dr. Yuji Inoue (The Telecommunication Technology Committee, Japan) with the title of Challenge in Climate Change; Carbon Initiative based on Sensing Technology in Tropical Peat and Forest and also by Mr Aisharuddin bin Nuruddin (Director, Resource Assignment Management Department Resource Assignment and Management Division Malaysian Communications and Multimedia Commission, Malaysia) with the title of Regulatory Challenges in Managing Communications Industry Development. Prof. Tomonori Aoyama from Keio University, Japan delivered Guest Speech with the title of ICT Paradigm Shift in 2010s. The conference ended with a visit to the Universiti Malaysia Sarawak and also the Semengoh Wild Life sanctuary.

Seminars / Workshops

Seminar on Research Possibilities in the Field of Ceramic Materials and Surface Treatment Processes.

Professor Jean Claude Labbe, Professor Emeritus, University of Limoges, France

A seminar was conducted at the Faculty of Engineering on Research Possibilities in the Field of Ceramic Materials and Surface Treatment Processes, by Professor Jean Claude Labbe, Professor Emeritus, University of Limoges, France, on the 8th of December 2010. Prof Jean Claude Labbe is a reference in his field of research, having supervised more than 50 PhD students and published more than 250 research articles. The seminar was attended by the faculty members and postgraduate students of the Faculty of Engineering, who gained useful insight into the state-of-the-art research being conducted at the laboratory of *Science de Procédés Céramiques et Traitements de Surface* (SPCTS), University of Limoges, France. Prof. Labbe also presented information during his seminar about different funding agencies at the EU and possibility of a joint PhD program between Faculty of Engineering UNIMAS and SPCTS, University of Limoges.

Seminar on Practicing as an Engineer and product liability.

Mr Robert T.E. Wee, Robert Wee & Associates, Australia.

A seminar was conducted at the Department of Mechanical Engineering and Manufacturing, Faculty of Engineering, UNIMAS on 23rd August 2010 by Mr Robert T.E. Wee. Currently, Mr Robert T.E. Wee is a principal engineer at Robert Wee & Associates. He has 20 years of industrial experience with Mitsubishi Motors Australia. Two topics were presented during the seminar;

[1] Practicing as an Engineer

This presentation tracked a macro view of the presenter's engineering career from a Trainee Aircraft Maintenance Engineer with Hornbill Skyways to a General Manager of Engineering with a National Company in Australia and now operating his own consultancy practice.

[2] Product liability awareness for Engineers.

This presentation is only to provide an awareness of Product Liability responsibility as an engineer.

The seminar was also attended by the senior students of Mechanical and Manufacturing Engineering department.

Seminar on Laser Assisted Milling of sintered materials and optimization of sintering condition.

Dr Tatsuaki Furumoto, Institute of Science and Technology, Kanazawa University, Japan

A seminar was conducted at the Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, UNIMAS on 2nd August 2010 by Dr Tatsuaki Furumoto. Currently, Dr Tatsuaki Furumoto is a lecturer at Institute of Science and Technology, Kanazawa University, Japan. Furumoto's research interests include dental therapy with laser irradiation, laser processing, and rapid prototyping. The seminar was attended by the faculty members, who gained useful insight into laser processing research being conducted at the laboratory of Manufacturing Engineering, Kanazawa University.

**Seminar on Research Projects in Manufacturing
Systems Laboratory, Kanazawa University.**

Prof Dr. Takashi Ueda, Institute of Science and Technology, Kanazawa University, Japan

A seminar was conducted at the Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, UNIMAS on 26th April 2011 by Prof Takashi Ueda. Prof Takashi Ueda is an external examiner for Department of Mechanical and Manufacturing Engineering. The seminar was attended by the faculty members, who gained useful insight into the state-of-the-art research being conducted at the laboratory of Manufacturing Engineering, Kanazawa University.

**Workshop on Research Methodology for Young Scientists
and Post Graduate students**

Prof Dr. Amir Azam Khan, Faculty of Engineering, UNIMAS

A workshop on the Research Methodology was organized in the Faculty of Engineering, UNIMAS, on the 31st of March, 2010. The workshop, attended by about 45 Post Graduate students and interested Faculty Members, was conducted by Prof. Dr Amir Azam Khan. He also distributed to those present, a document edited by him entitled "A Guide for Post Graduate Research".

The Dean of Faculty of Engineering, Prof. Dr Wan Hashim Wan Ibrahim, opened the workshop while expressing his remarks about the need for guidance and orientation of Post Graduate students. He said that many of the Post Graduate students at the Faculty of Engineering come from different universities and diverse academic background, thus organizing such workshops is at a high priority for Faculty. He thanked Prof. Khan for willing to share his experience. The workshop covered topics related to scientific method in research, errors and confidence of data analysis and precision, writing of scientific papers and reports.

Workshop on Ground Improvement Techniques on Peat soil in Sarawak
Department of Civil Engineering, Faculty of Engineering, UNIMAS

Most of cities and urban Centres in Sarawak are founded on thick deposits of peat and other soft soils which are not naturally suitable for engineering construction. Therefore, a thorough knowledge of ground improvement techniques is essential for all civil engineers in local practise. Not many opportunities are locally available for practising young civil engineers to learn about recent advances and practises in this area.

A Workshop on **Ground improvement techniques on peat soil in Sarawak** was successfully held in CAIS Auditorium, UNIMAS on 29th July 2010. The workshop was organized in collaboration with Research Centre for Soft Soil (RECESS), UTHM, JKR, Sarawak and Geological Survey Department Sarawak, in accordance with the MOU between UNIMAS and UTHM. About 50 engineering professionals from a number of state and private sector engineering organizations, based in Sarawak, including 29 from JKR attended the workshop. Prof. Chitral Wijesekera, University of East London, Dato' Prof. Dr. Ismail Abu Bakar from UTHM, Engr. Junaidi Shahdan and Engr. Vincent Tang from JKR Sarawak were the outside presenters. From UNIMAS, Prof. Nimal Seneviratne, AP. Dr. Prabir Kumar Kolay, Dr. Siti Noor Linda Taib and Puan Dygku Salma Ismail made contributions. The workshop terminated with a panel discussion among experts and participants on professional and academic perspectives in tackling the peat soil problem in Sarawak.

Research Students

Mechanical and Manufacturing Engineering

Name	Level	Type	Supervisor	Co-Supervisor(s)	Title
James Ho Thiam Hee	PhD	Full Time	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit	Dr. Jane Labadin	Modeling of Inter-Relationship Between Human Factors and Technical in Maintaining Air Safety of Large Passenger Aircrafts
Prashobh Karunakaran	PhD	Part Time	Ir Dr. Mohd. Shahril bin Osman	-	Optimization of a Flexible Manufacturing System (FMS) for High Technology Product Producing Factory via the Modularization of Production System
Robin Leong	Master	Part Time	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit	-	Performance of Agricultural Sprayers and Spray Characteristics
Jamuri Haji Zen	Master	Part Time	Assoc. Prof. Dr. Haji Mohd. Omar bin Abdullah	Puan Mahshuri Yusof	Risk and Reliability of Ammonia Storage Tanks Focusing on Ammonica Scc
Peter Yek Nai Yuh	Master	Full Time	Assoc. Prof. Dr. Haji Mohd. Omar bin Abdullah	Puan Ervina Junaidi	Computer Simulation Analysis for Statics Stability of Airboat in Sarawak Riverine Application
Voon Chun Yung	Master	Full Time	Assoc. Prof. Dr. Haji Mohd. Omar bin Abdullah	-	The Study of a Combined Solar Hydro Energy System for Powering e-Bario ICT Centre
Thandayuthapani a/l Seperamaniam	Master	Part Time	Ir Dr. Mohd. Shahril bin Osman	-	Vibration Analysis on Cast Iron Structure
Md. Saiful Islam	PhD	Full Time	Prof. Dr. Sinin bin Hamdan	Dr. Ismail bin Jusoh / Assoc. Prof. Dr. Mohamad Rusop bin Mahmood (UiTM Shah Alam)	Physical, Mechanical and Chemical Characterization of Tropical Wood Polymer Composite and Its Application
Patrick Low Tiong Kie	Master	Part Time	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit	Dr. Rubiyah binti Haji Baini	Indirect Mode Natural Convection Solar Dryer with Backup Burner for Small Scale Rural Pepper Farmers
Cheong Yaw Hong	Master	Part Time	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit	-	Harnessing Tidal Energy for Electricity Generation at Sejingkat, Kuching, Sarawak
Ijen anak Dakek	Master	Part Time	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit	-	Electrical Performance and Flow Characterization of Dielectric Barrier Discharge Plasma Actuator
Mohd. Narzam bin Jaafar	Master	Part Time	Assoc. Prof. Dr. Haji Mohd. Omar bin Abdullah	Dr. Abu Saleh Ahmed	Design, Materials Selection, Development and Specific Characteristics Study of a New Cooling Water Power Generator

Name	Level	Type	Supervisor	Co-Supervisor(s)	Title
Tian Chuan Min	Master	Full Time	Assoc. Prof. Dr. Haji Mohd. Omar bin Abdullah	Dr. Abu Saleh Ahmed	Custom Design, Development and Techno-Economical Study of a Small Cooling Water Power Generator for Sejangkat Power Corporate Sdn. Bhd
Gabriel anak Jatu	Master	Part Time	Dr. Hushairi Zen	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit	Design and Implementation of Micro-Hydropower System for a Stand-Alone Rural Village Electrification
Muhammad Abdul Mun'aim bin Mohd. Idrus	Master	Full Time	Prof. Dr. Sinin bin Hamdan	Dr. Abu Saleh Ahmed	Mechanical and Thermal Behavior of Liquefied Tropical Wood Polymer Composites
Ghazali bin Tambi	PhD	Part Time	Assoc. Prof. Dr. Haji Mohd. Omar bin Abdullah	Puan Ervina binti Junaidi / Prof. Datuk Dr. Khairudin Ab. Hamid	Axiomatic Design for Improvement of UNIMAS's District Cooling System
Jong Yang	Master	Full Time	Dr. Abu Saleh Ahmed	Prof. Dr. Sinin bin Hamdan	Biodiesel Production from Waste Fat and Oil as a Renewable Energy Source
Chiong Meng Chuong	Master	Full Time	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit	.	Design and Flow Simulation of Electrohydrodynamics Ion Drag Micro Pump for Cooling Application
Sarfaraj Khan	Master	Full Time	Dr. Abu Saleh Ahmed	Prof. Dr. Sinin bin Hamdan / Dr. Rubiyah binti Haji Baina	Biodiesel Production from Macro Algae as a Renewable Energy Source
Md. Nurul Hoque	PhD	Full Time	Prof. Dr. Sinin bin Hamdan	.	Studies on Polypropylene Composite Reinforced with Chemically Modified Sawdust
Cheong Wai Loon	Master	Full Time	Dr. Syed Tarmizi bin Syed Shazali	.	Motion Detection and Simulation Study on Human Walking Behavior
Michael Su Chuang Hung	Master	Full Time	Dr. Abu Saleh Ahmed	Prof. Dr. Sinin bin Hamdan	Biodiesel from Fish by Product
Chua Swee Ning	Master	Full Time	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit	.	Ion-Drag Electrohydrodynamic Micropump for Drug Delivery of Microfluidic Application
Akmal Hisyam bin Raduan @ Ruduan	Master	Full Time	Dr. M. Shahidul Islam	Dr. Syed Tarmizi bin Syed Shazali / Dr. Thelaha bin Haji Masri	Mechanical Transmission System for Sustainable Instream Horizontal Micro Hydro Turbine Generator
Hafiza Ramji	Master	Full Time	Dr. Syed Tarmizi bin Syed Shazali	Dr. Saiful Bahari bin Mohd. Yusoff (FSGK) / Abang Mohd. Nizam bin Abang Kamaruddin	Turbine Frame Design for Sustainable Instream Horizontal Micro Hydro Turbine Generator
Khairul Amri Sayuti	Master	Full Time	Puan Rosmina binti Ahmad Bustami	Assoc. Prof. Dr. Azhaili bin Baharun / Puan Norazlina binti Bateni	Potential Stream Kinetic Energy Mapping in Kapit, Sarawak for Implementation of Sustainable Instream Horizontal Micro Hydro Turbine

Name	Level	Type	Supervisor	Co-Supervisor(s)	Title
Mohd. Norddin bin Ismail	Master	Full Time	Dr. Syed Tarmizi bin Syed Shazali	Dr. M. Shahidul Islam / Abang Mohd. Nizam bin Abang Kamaruddin	Kajian dan Pembangunan Rekabentuk Bilah Turbin Air Melintang (Horizontal Water Turbine) untuk Kegunaan Penjana Kuasa Mikro Hidro Berdasarkan Konsep Tenaga Kinetik Aliran Sungai
Ahmad Shahir bin Jamaluddin	Master	Full Time	Dr. Abdullah bin Haji Yassin	Ir Dr. Mohd. Shahril bin Osman	A Study of Cutting Tool Temperature by Milling with the Application of Finite Element Method
Malisa binti Sahari	Master	Full Time	Prof. Dr. Sinin bin Hamdan	.	Mechanical Properties of Chemically Modified Bamboo / Nanoclay / Polypropylene Nano Composites
Voon Choon Siong	Master	Full Time	Ir Dr. Mohd. Shahril bin Osman	Nur Tahirah Razali / Aidil Azli Alias	Harnessing Vibration into Electrical Energy
Siti Mas Arena Liakbar	Master	Full Time	Dr. M. Shahidul Islam	.	Optimization of Energy Transmission System on In-Stream Micro Hydro Turbine
Tracy anak Dickie	PhD	Part Time	Ir Dr. Mohd. Shahril bin Osman	Puan Mahshuri Yusof	Fabrication and Mechanical Measurement of Nipah Palm Fiber Material

Electrical and Electronics Engineering

Name	Level	Type	Supervisor	Co-Supervisor(s)	Title
Kong Tzer Sin	Master	Full Time	Dr. Mohd. Saufee bin Muhammad	Prof. Datuk Dr. Khairuddin Ab. Hamid	Performance and Modeling of Sun Tracking and Cooling Effect for Solar PV System in Sarawak
James Tan Yia Beng	Master	Full Time	Ir David Bong Boon Liang	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit	Design of a Neuro-Fuzzy System for Prediction of Time Series Trends
Mahmoud Al-Hussein	Master	Part Time	Puan Sakena binti Abdul Jabar	Assoc. Prof. Dr. Al-Khalid bin Haji Othman	Fiber to the Home Based on WDP-PON
Sharifah Fatimah binti Tuanku Abdullah	Master	Part Time	Puan Sakena binti Abdul Jabar	Puan Nurdiani binti Zamhari	Fiber to the Home Based Over WDM for Dynamic Bandwidth in The Malaysian Environment
Siti Syafinah binti Ahmad Hassan	Master	Full Time	Ir David Bong Boon Liang	Dr. Mallika Premseenthil (FPSK)	Detection of Diabetic Retinopathy
Patrick Teo Tien	Master	Part Time	Ir David Bong Boon Liang	Puan Annie ak Joseph	Analysis and Modeling of Technical Losses in Distribution Networks
Guo Junwei	Master	Part Time	Ir David Bong Boon Liang	Dr. Tay Kai Meng	Development of Efficient and Accurate Model for High Voltage Mosfet Transistor
Bong Voon Pai	Master	Full Time	Dr. Wan Azlan bin Wan Zainal Abidin	Dr. Hushairi bin Zen / Dr. Thelaha bin Haji Masri	Open Space Modeling for the Mobile Satellite L-Band Signal in Sarawak

Name	Level	Type	Supervisor	Co-Supervisor(s)	Title
Ibrahim Abba	Master	Full Time	Dr. Wan Azlan bin Wan Zainal Abidin	Assoc. Prof. Dr. Al-Khalid bin Haji Othman / Dr. Kismet anak Hong Ping	Empirical Model Development for Effect of Ionosphere on Mobile Satellite Signal Performance: Sarawak
Saleem Ahmad Saleem Jayousi	PhD	Full Time	Dr. Mohd. Saufee bin Muhammad	-	Computerized Maintenance for Electronic Instrument
Krishna Veni a/p Selvan	Master	Full Time	Dr. Mohd. Saufee bin Muhammad	Puan Sharifah Masniah binti Wan Masra	Design and Development of DNA Sequences Based on Multi-Objective Particle Swarm Optimization for DNA Computing
Abdul Qayoom Jakhrani	PhD	Full Time	Assoc. Prof. Dr. Al-Khalid bin Haji Othman	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit / Dr. Rubiyah binti Haji Baini / Prof. Ir Dr. Law Puong Ling	Design and Development of Solar Wind Hybrid System
Azzyati binti Basrol	Master	Full Time	Dr. Wan Azlan bin Wan Zainal Abidin	Dr. Kismet Hong Ping	L-Band Mobile Satellite Signal Performance Using Handheld GPS Receiver on Building Effects
Wong Teck Kwong	Master	Part Time	Assoc. Prof. Dr. Al-Khalid bin Haji Othman	Dr. Wan Azlan bin Wan Zainal Abidin / Dr. Hushairi bin Zen	Underwater Wireless Protocol
Liew Hon Choi	Master	Full Time	Dr. Wan Azlan bin Wan Zainal Abidin	Assoc. Prof. Dr. Al-Khalid bin Haji Othman / Dr. Kismet Hong Ping	Turbine Smart Sensor Design for Monitoring Purpose
Ashriff Abdul Jalil	Master	Full Time	Assoc. Prof. Dr. Al-Khalid bin Haji Othman	Dr. Thelaha bin Haji Masri / Dr. Hushairi bin Zen	Design of River Flow Water Energy Data Logger for the Measurement of Kinetic Energy from River Stream (Wanergy Meter)
Michelle Lu	Master	Full Time	Dr. Wan Azlan bin Wan Zainal Abidin	Cik Kasumawati binti Lias	The Modernization of the Transmission Grid: Smart Grid
Lee Tain Sang	Master	Part Time	Dr. Wan Azlan bin Wan Zainal Abidin	Assoc. Prof. Dr. Azhaili bin Baharun / Puan Ade Syaheda Wani binti Marzuki	Development of Small Wind Energy System for Rural Electrification in Sarawak
Elizabeth Kho Ching Tee	PhD	Part Time	Dr. Wan Azlan bin Wan Zainal Abidin	Encik Ng Liang Yew / Dr. Alexander Hoelke	Design of Super Junction Devices

Civil Engineering

Name	Level	Type	Supervisor	Co-Supervisor(s)	Title
Wong Kien Kuok	PhD	Full Time	Prof. Ir Dr. Law Puong Ling	Prof. Dr. Ng Chee Khoon	Development and Optimization of a Treatment System for Metalworking Fluids
Ooi Koon Beng	PhD	Full Time	Assoc. Prof. Dr. Azhaili bin Baharun	Dr. Siti Halipah binti Ibrahim / Assoc. Prof. Dr. Haji Mohd. Omar bin Abdullah	Modeling a Building Zone for Energy Efficiency without Sacrificing the Comfort of the Occupants in Tropical as well as Temperate Climates
Lim Bak Chai	Master	Part Time	Assoc. Prof. Dr. Mohd. Ibrahim Safawi bin Mohd. Zain	Dr. Hajah Siti Noor Linda binti Haji Taib	The Practicality of Using Foamed Concrete as Foundation on Peat Soil
Yeo Pui Hee	Master	Part Time	Assoc. Prof. Dr. Mohd. Ibrahim Safawi bin Mohd. Zain	Puan Azida binti Rashidi	A Study on Determination of the Optimum Mix Proportion for Foamed Concrete Used as Road Base
Lim Su Boon	Master	Full Time	Prof. Ir Dr. Law Puong Ling	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit	A Novel Separator for Palm Oil Kernel Shell Cracked Mixture
Muhammad Abdul Syahid bin Saari	Master	Full Time	Assoc. Prof. Dr. Mohd. Ibrahim Safawi bin Mohd. Zain	.	The Roles of Constituent in Achieving Self-Compactability Criteria for Self-Compacting Concrete
Ting Sie Yew	Master	Full Time	Prof. Ir Dr. FJ Putuhena	.	Securing Instream Flow for Sarawak River Basin Development
Nur Afnie Faryisha binti Mohamad Hamzah	Master	Full Time	Puan Rosmina binti Ahmad Bustami	Prof. Salim bin Said	Design of Long Storage for Excess Water and Development of Hydrological Framework in Sungai Sarawak Kanan Sub-Basin
Zait Azma Yuincy binti Yacub	Master	Part Time	Prof. Salim bin Said	Dr. Onni Suhaiza binti Selaman	Extreme Rainfall Frequency Analysis for Sarawak
Joan Dolly Chung Zie Wei	PhD	Full Time	Prof. Ir Dr. Law Puong Ling	Prof. Ir Dr. FJ Putuhena	Trickling Filter for Domestic Wastewaters
Tay Chiaw Teck	Master	Part Time	Prof. Dr. Wan Hashim bin Wan Ibrahim	.	Analyzing Two-Way Two-Lane Highways Based on Malaysian Road Condition
Zamhuri Drahman	Master	Part Time	Prof. Dr. Wan Hashim bin Wan Ibrahim	.	Malaysia Airports Pavement Management System
Oi Lee Eng	Master	Full Time	Prof. Ir Dr. Law Puong Ling	.	Characterization of Municipal Solid Waste and Feasibility Analysis on Implementation of Material Recovery Facilities (Mrf) with Composting

Name	Level	Type	Supervisor	Co-Supervisor(s)	Title
Ho Lee Lee	Master	Full Time	Prof. Ir Dr. Law Puong Ling	Ir Ting Sim Nee	Cost Reduction and Environmental Performance Improvement in a Manufacturing Facility Through Implementation of Environmental Management System (EMS)
Ting Huong Siong	Master	Full Time	Prof. Ir Dr. Law Puong Ling	Cik Nor Azalina binti Rosli	Characterization of Municipal Solid Waste Generated from Kuching, Sarawak
Jacqueline Lam Wan Hwa	Master	Full Time	Dr. Hajah Siti Noor Linda binti Haji Taib	Assoc. Prof. Dr. Prabir Kumar Kolay / Prof. Dr. K.G.H.C Nimal Seneviratne	The Characteristics of Drained and Undrained Triaxial Compression Tests in Sarawak
Md. Habibur Rahman Sobuz	Master	Full Time	Assoc. Prof. Dr. Ehsan Ahmed	Puan Norsuzailina binti Mohamed Sutan	Time Dependent Deflection and Debonding of FRP Sheet Strengthened Reinforcement Concrete Beam
Sii Hee Yew	Master	Full Time	Dr. Hajah Siti Noor Linda binti Haji Taib	Assoc. Prof. Dr. Prabir Kumar Kolay / Prof. Dr. K.G.H.C Nimal Seneviratne	A Study on Geotechnical Behavior of Stabilized Peat Soil with Finite Element Modeling
Wilson Jih Ren Chang	Master	Part Time	Prof. Ir Dr. FJ Putuhena	Assoc. Prof. Dr. Prabir Kumar Kolay / Dr. Hajah Siti Noor Linda binti Haji Taib	Peat Soil Improvement for Better Abode in Sibul, a Geotechnical and Hydraulic Perspective
Oon Yin Wee	PhD	Full Time	Prof. Ir Dr. Law Puong Ling	Prof. Dr. Ng Chee Khoon	A Novel Oil and Grease (O&G) Removal Apparatus with Curved Coalescence Frustums and Triangular Surface Restraints
Ling Ing Hock	Master	Full Time	Dr. Delsye Teo Ching Lee	Puan Norsuzailina binti Mohamed Sutan	Properties of Polystyrene Concrete Bricks Containing Rice Husk Ash (RHA)
Jee Tze Ling	Master	Full Time	Dr. Tay Kai Meng	Prof. Dr. Ng Chee Khoon	Development of an Intelligent Failure Analysis Tool with Case Studies Relating to Manufacturing and or Structural Engineering
Chong Kok Hing	PhD	Full Time	Prof. Ir Dr. Law Puong Ling	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit / Dr. Rubiyah binti Haji Baini	Biomass-to-Heat Energy Converter for Drying Purpose in the Production of Paper Egg Trays
Quay Wei Kwang	Master	Full Time	Ir. Ting Sim Nee	Prof. Ir Dr. Law Puong Ling	Amelioration of Occupational Safety and Health (OSH) Practices in Malaysia
Kueh Kim Meow	Master	Part Time	Ir Ting Sim Nee	-	Improving the System and Guideline for Value Management Practice using the Value Practice using the Value Engineering Processes for Construction Management Projects in Malaysia
Kabiru Musa Ayagi	Master	Full Time	Dr. Siti Halipah binti Ibrahim	Assoc. Prof. Dr. Azhaili bin Baharun	An Investigation Analysis of the Effectiveness of Site Management Functions in Nigeria Case Study of the Kano State Construction Industry

Name	Level	Type	Supervisor	Co-Supervisor(s)	Title
Lai Sze Ying	Master	Part Time	Ir Ting Sim Nee	Prof. Ir Dr. Law Puong Ling	A Critical Analysis of Construction Contract Form - CIDB Standard Form of Contract for Building Work 2000
Norsuzailina binti Mohamed Sutan	PhD	Part Time	Prof. Dr. Sinin Hamdan	Assoc. Prof. Dr. Azhaili bin Baharun	Effects of Modified Cement Systems on Efflorescence
Freddy Kho Wee Liang	PhD	Full Time	Prof. Ir Dr. Law Puong Ling	Assoc. Prof. Ir Dr. Andrew Ragai Henry Rigit	Carbon Monoxide Levels Along Roadway
Wennie Blantaw anak Enggu	Master	Part Time	Prof. Dr. Wan Hashim bin Wan Ibrahim	-	Investigating the Performance of Signalized Intersection Along an Arterial Road in Sibul
Bong Chien Chai	Master	Full Time	Assoc. Prof. Dr. Azhaili bin Baharun	Encik Abdul Azim bin Abdullah / Puan Rosmina binti Ahmad Bustami	Turbine Float System and Anchorage Design
Franklin Simon	Master	Full Time	Encik Ron Aldrino Chan @ Ron Buning	Puan Ir Ting Sim Nee / Dr. Tay Kai Meng	The Use of Fuzzy Inference System for Risk Assessment and Decision Making for Sarawak River Transport
Arkin Kong Chung King	PhD	Full Time	Assoc. Prof. Dr. Azhaili bin Baharun	Puan Ir Ting Sim Nee	An In Depth Study on Supply Chain Management (SCM) in the Construction Industry in Sarawak
Lau See Hung	PhD	Full Time	Prof. Dr. Ng Chee Khoo	Dr. Tay Kai Meng	Development of a Data Driven Fuzzy System for Evaluating Ultimate Tendon Stress and Flexural Strength of Externally Prestressed Beams

Chemical Engineering and Energy Sustainability

Name	Level	Type	Supervisor	Co-Supervisor(s)	Title
Tracy Yeo Hui Cheng	Master	Full Time	Dr. Ivy Tan Ai Wei	Assoc. Prof. Dr. Haji Mohd. Omar bin Abdullah	Formulation of Novel Adsorbent for Application in Chemical Driven Air-Conditioning System Powered by Waste Heat
Nazeri Abd Rahman	PhD	Part Time	Dr. Rubiyah binti Haji Bani	Assoc. Prof. Dr. Haji Mohd. Omar bin Abdullah	Sustainable Utilisation of Pelletised Plantation Biomass Wastes in Sarawak for Power Generation

5th Engineering Conference

Call For Abstracts - First Call



Engineering Towards Change - Empowering Green Solutions

Conference Dates

Conference Session
10 -12 July 2012

**Technical Trip /
Post-conference Workshop**
12 July 2012

Important Dates

Abstract submission deadline
30 November 2011

Notification of abstract acceptance
31 December 2011

Full paper submission
31 January 2012

Notification of full paper
30 March 2012

Early bird registration
16 April 2012

Registration deadline
7 May 2012

Venue

Kuching, Sarawak

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Introduction

Engineering Conference (ENCON) is the flagship conference for Faculty of Engineering Universiti Malaysia Sarawak. Currently, the issues of green technologies and sustainable development have been the key focus in the engineering field. Therefore, the theme for ENCON 2012 is **Engineering Towards Change - Empowering Green Solutions**.

The main objective of this conference is to provide a platform for researchers, academicians, engineers, industrial professionals and also postgraduate students to promote cooperation and technological research progress in Green engineering.

Topics

Following topics of interest are included but not limited to:

- | | |
|---|---|
| Advanced Manufacturing Technology | (xi) Pollution and Control |
| Clean Technologies | (xii) Renewable Energy |
| Climate Change | (xiii) Soil Decontamination |
| Energy Efficiency | (xiv) Sustainable Waste and Water Management |
| Energy Policies | (xv) Sustainable Building/Infrastructure/Structures/Systems |
| Environmental Impact Assessment | (xvi) Transport Systems |
| Environmental Sustainability | (xvii) Urban Planning and Development |
| Green Buildings and Materials | (xviii) Waste Recycling |
| Geotechnical and Geoenvironmental Engineering | (xix) Water Resources Engineering |
| (x) Impact, Risk and Life Cycle Assessment | |

Conference Fees

Student : RM 850
Early Bird : RM 850
Regular Fee : RM 1000
Conference and technical visit / : to be announced
Post-conference workshop

Contacts

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94300, Kota Samarahan, Sarawak, Malaysia

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