

BOOK OF ABSTRACTS



International = 2020 e-Conference



"Current Status and Future of Renewable Energy"

2 h

Organized by Universiti Putra Malaysia Bintulu Sarawak Campus

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THE INTERNATIONAL E-CONFERENCE ON GREEN & RENEWABLE ENERGY 2020 (GREEN 2020) 18-19 August 2020

Universiti Putra Malaysia Bintulu Campus Sarawak (UPMKB)

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The International e-Conference on Green and Renewable Energy (2020: Sarawak)

BOOK OF ABSTRACTS

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Universiti Putra Malaysia Bintulu Sarawak Campus, 2020

Foreword by the Campus Director



Green and renewable energy are the significant attributes for Malaysia in reducing the global carbon emission to the environment. In-line with the United Nations Sustainable Development (SD) Goal no. 13 which highlights the needs of developing countries to both adapt to climate change and invest in low-carbon development, green and renewable energy not only promotes cleaner environment but also improves public health by reducing air and water pollution emitted by non-green energy resources.

This conference serves as a good platform for experienced as well as young researchers to share and explore related research work and innovations particularly in the field of green and renewable energy. The main focus of this conference is on four key areas of renewable energy, ranging from biomass, biogas and solid waste energy, solar and wind energy, hydro energy as well as alternative fuel (biodiesel and hydrogen). The well-diversified topics display that the theme of the conference "**Current Status and Future of Renewable Energy**" is very much reflected. The sharing session by keynote speakers renowned in their respective field, is yet another hallmark of this conference.

I would like to take this opportunity to congratulate the Organizing Committee of Green 2020 for their tremendous efforts in bring this international event to new heights. The fruitful engagement, debate and collaboration among the Government, NGOs, Industries, Universities and Research Institutes during the entire conference session is certainly an important element for promoting green and renewable energy both in Malaysia as well as in the international arena.

I wish you a very successful conference.

Thank you.

Professor Dr Bujang B. K. Huat Campus Director Universiti Putra Malaysia Bintulu Sarawak Campus (UPMKB)

Foreword by the Conference Chair

Dear Authors and esteemed readers,

On the behalf of the organising committee, it gives me great pleasure to extend a warm welcome to all presenters and participants to the Green International Conference Webinar, August 18 - 19, 2020.

Due to the overwhelming response GREEN conference is extended to two days with presenters from England, Iraq, Japan, Nigeria, the Philippines, Singapore and our comrades from Peninsular Malaysia as well as Sabah and



Sarawak; to spend two precious days on enlightening latest updates on green and renewable energy. Topics covered are Biomass and Solid Waste Energy, Solar and Wind Energy, Hydro and Tidal Energy, Alternative Fuel (Biodiesel and Hydrogen) and Policy and Social Needs.

The committee is also honoured to present four prominent keynote speakers namely Prof. Dato' Dr. Mohd Ali Hassan (Universiti Putra Malaysia) who speaks about current status and prospects of biomass, Mr. James Ung (CEO Sarawak Energy) who presents renewable hydropower-Catalyst for Growth, Dr. Ng Sing Muk (General Manager Research and Development Sarawak Energy) to share overview on renewables for distributed power solution and Prof. Ir. Dr. Nor Mariah Adam (Universiti Putra Malaysia) to share the potential of gas turbine using sheep fat biodiesel enhanced with plasmatron and fuel atomization using sonic waves atomiser.

We thank all authors and participants for their contributions.

Professor Ir. Dr. Nor Mariah Adam Conference Chair

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KEYNOTE SPEAKERS



Prof. Dato' Dr. Mohd Ali Hassan Head of Project, Biomass Technology Centre Ph.D., Okayama University, Japan Expertise: Bioprocess Engineering; Environment Biotechnology; Management and Waste Management

Title: Current Status and Prospects of Biomass



Mr. James Ung CEO of SEB Power Sarawak Energy

Title: Renewable Hydropower - Catalyst for Growth



Dr. Ng Sing Muk General Manager for Research and Development Sarawak Energy

Title: An Overview on Renewables for Distributed Power Solution



Professor Ir. Dr. Nor Mariah Adam Universiti Putra Malaysia Bintulu Sarawak Campus Expertise: Thermofluids and Energy; Emergency Response and Planning.

Title: Potential of Gas Turbine using Sheep Fat Biodiesel Enhanced with Plasmatron and Fuel Atomization Using Sonic Waves

Table of Contents

Theme	1:	Biomass.	Biogas	and	Solid	Waste	Energy
					~ • • • •		

ID	Title	Page No.
AA05BM	Development and valuation of thermodynamic models for predicting cold flow properties of biodiesel <i>L. Seniorita, E. Minami, and H. Kawamoto</i>	1
AA06BM	Biodiesel production from crude karanja oil using heterogenous catalyst from seashells <i>A.A. Saleh, H. Dewi and H. Sinin</i>	2
AA16BM	Characteristics and properties of biofilms made from pure carrageenan powder and whole seaweed (Kappaphycus sp.) <i>E.L. Hanry and N. Surugau</i>	3
AA26BM	Preparation and characterization of metal oxide biochar catalyst for efficient oxidative desulfurization <i>Izzaidah Riman, Mohd Lokman Bin Ibrahim, Wan Nur Aini Wan</i> <i>Mokhtar and Raja Razuan Raja Deris</i>	4
AA27BM	Dual solutions for an unsteady hybrid nanofluid thin film second-grade flow with heat transfer analysis over permeable stretching sheet Nur Ilyana Kamis, Md Faisal Md Basir, Nurul Aini Jaafar, Sharidan Shafie, Taufiq Khairi Ahmad Khairuddin and Kohilavani Naganthran	5
AA28BM	In-situ ketonization and decarboxylation of fatty acid over a series of transition metal oxide supported zirconia oxide catalyst S. A. Aleem, N. Asikin-Mijan, S. Sivasangar, A.S. Hussain, C.H. Voon and Y.H. Taufiq-Yap	6
PA02BM	Development of PSA technology for CO₂ capturing from biogas Nurjehan Ezzatul A., Maizirwan M., Yusilawati M.N. and Mohammed Kheireddine A.	7
PA04BM	Utilisation of waste glycerine for biohydrogen production using engineered escherichia coli BW25113 <i>Mohd Zulkhairi Mohd Yusoff, Fatin Sakinah Rosman and Todhinari</i> <i>Maeda</i> ²	8
AA37BM	Self-propagating combustion method for sulfonated SnO2catalyst for esterification of low-cost PFAD feedstock intobiodieselM. S. Mastuli and N. Nabihah-Fauzi	9

Theme 2: Solar and Wind Energy

ID	Title	Page
		No.
AA01SW2	Designing and fabricating a cost-effective solar water distiller for	10
	palm oil mill effluent treatment	
	S.N.A.B. Syed Mustaffa, A. N. Darus and J.L.V. Rasamani	

AA02SW2	Optimum truncation level of heat pipe based compound parabolic collector	11
	B. Abdullahi, R.K. AL-Dadah and S. Mahmoud	
AA10SW	An affordable calibrated hot box suitable for thermal	12
	performance measurement of an insulation panel	
	Hasila Jarimi and Yixin Wang	
AA13SW	Photocatalysis degradation of organic pollutant wastewater	13
	under LED light by ZnO/CdS	
	S.I.S. Mashuri, M.L. Ibrahim, M.F. Kasim and S.A.M.F.D. Chan	
AA24SW	Potential of cellulose nanofiber from banana pseudostem for	14
	solar cell application: a preliminary study	
	Mohammad Sobri Bin Merais	
AA31SW	Numerical analysis for solar panel subjected to an external	15
	force to overcome adhesive force in desert areas	
	Nor Mariah Adam, Osam H. Attia, Ali O. Al-Sulttani, Hussein A.	
A A 200711	Mahmood, Azizan As' arry and Khairil Anas Md Rezali	16
AA38SW	Potential of steam recovery from excess steam in sterilizer at	16
	paim oil mill Ve a su sélene. De la visa de su de New Manish, A daw	
DAO2SW	Toganainan Palanianay ana Nor Marian Aaam	17
PAUSSW	Avanong lood pack using green technology Mohim Mojikon	1 /
A A 20SW	Bioges power plant	10
AAS9SW	Nou Wang Koat	10
A A 40SW	Proliminary experimental study of passive solar air heating	10
AA405 W	system in drying shill in the Melaysian climate	19
	Abdalla Abdur Rahman Shahhal and Khai Mun Na	
ΔΔΔ2SW	Propect evaluation of a wind farm project for a smart compute in	20
	the Federal University of Kashere Gombe State	20
	Michael C. Ohakwere-Eze Righteous Ombu Udo A. A. and Mela S.	
	Shimo	
	Michael C. Ohakwere-Eze, Righteous Ombu, Udo A. A. and Mela S. Shimo	

Theme 3: Hydro and Tidal Energy

ID	Title	Page No.
AA04HT	ANSYS simulation study to generate pressure from various water-wind flow conditions to calculate electricity using piezoelectric cells Rhitankar Saha Roy, Lim Chong Lye, Lim Chin Guan and Nor Mariah Adam	21
AA07HT	Analysis of optimum thickness of glass wool roof thermal insulation performance <i>M.W. Muhieldeen, C.L. Lim and N.M. Adam</i>	22
AA08HT	Mechanical and morphological properties of different natural fibre reinforced polylactic acid composites: a review <i>S.F.K. Sherwani, S.M. Sapuan, Z. Leman, E.S. Zainuddin and A.</i> <i>Khalina</i>	23
AA23HT	A review on green cleaning during and post COVID-19 pandemic	24

	A. Kamaruddin, N.N Zainol and M. A. Sulaiman	
AA30HT	Growth of marine microalgae and their potential application in	25
	algal biophotovoltaic (BPV) devices	
	Cheng-Han Thong, Siew-Moi Phang, Fong-Lee Ng, Kian-Ted	
	Chong, Vengadesh Periasamy, Kamran Yunus and Adrian C. Fisher	
AA41HT	Experimental estimation of water velocity in a selected	26
	unregulated river (river dindima) for micro-hydrokinetic	
	potential	
	Michael C. Ohakwere-Eze, Righteous Ombu, James Audu, James	
	Emmanuel and Henry I. Ikeri	

Theme 4: Alternative Fuel (Biodiesel and Hydrogen)

ID	Title	Page No.
AA03AF	Hydrodeoxygenation of bio oil into bio-hydrocarbon via bimetallic-based catalyst Hwei Voon Lee, Murtala M. Ambursa, Joon Ching Juan, Yun Hin Taufiq-Yap, Duangamol Tungasmita, Yu-Chuan Lin and Mochamad Zakki Fahmi	27
AA17AF	Sugarcane bagasse ash impregnated with CaO as heterogeneous catalyst in biodiesel production Aunie Afifah Abdul Mutalib, Mohd Lokman Ibrahim, Mohd Sufri Mastuli and Yun Hin Taufiq-Yap	28
AA18AF	Biodiesel production using K2CO3 catalyst support beads Al2O3 using perforated hydrophilic materials (PHM) <i>Muhammad Amirrul Hakim Lokman Nolhakim, Norshahidatul</i> <i>Akmar Mohd Shohaimi, Mohd Lokman Ibrahim and Wan Nur Aini</i> <i>Wan Mokhtar</i>	29
AA20AF	Green diesel production via pyrolytic-deoxygenation of <i>Jatropha</i> <i>curcas</i> oil over multi-wall carbon nanotube-based catalysts <i>N. Asikin-Mijan, N.A Rosman, G. AbdulKareem-Alsultan, M.S.</i> <i>Mastuli, H.V. Lee, N. Nabihah-Fauzi, I.M Lokman and Y.H. Taufiq-</i> <i>Yap</i>	30
AA21AF	Thermal catalytic cracking of waste cooking oil into green-diesel via activated carbon supported cadmium and lanthanum oxides catalyst G. Abdulkareem-Alsultan, N. Asikin-Mijan and R. Yunus	31
AA22AF	Green fuel production in solvent-free catalytic deoxygenation using bimetallic nickel based catalyst supported on activated carbon <i>Wan Nor Adira Wan Khalit, Tengku Sharifah Marliza, and Y. H. Taufiq-Yap</i>	32
AA32AF	Bio-briquette blend from newspaper-based nitrocellulose and <i>Neolamarckia cadamba</i> <i>Melissa Sharmah Gilbert Jesuet, Mohd Saiman Nabi and Shazween</i> <i>Siva Kumar</i>	33
AA36AF	Wood-based biomass of dipterocarp and non-dipterocarp trees as an alternative for biofuel D.N.S. Musa and A.A. Nuruddin	34

Theme 5: Policy and Social Needs

ID	Title	Page No.
AA09PS	Waste-energy-climate nexus perspective towards circular economy: A review N. Kamaruzaman, Z. F. Mohd Shadzalli, I. H. Abdullah and N. A. Manaf	35
AA12PS	The impact of green areas towards property values in Malaysia <i>M.A Sulaiman, N.H Hashim, N.N Zainol, M.N Alias and W.Z Wan</i> <i>Yusoff</i>	36
AA14PS	Secondary school students' awareness of green computing: a preliminary study S.M. Mohd, K. Shafinah, N.N. Zulkifli, R. Ismai, R. Alan and P. Lepun	37
AA15PS	Kitchen and food waste for biogas production: a case study in Bintulu, Sarawak Azira Sanusi, Nurul Husna Che Hamzah, Nor Shafinaz Azman and Nozieana Khairuddin	38
AA19PS	Food premises' awareness on supporting the production of biodiesel from used cooking oil in Bintulu Sarawak, Malaysia. <i>N. Shafinaz Azman, Nozieana Khairuddin and Tengku Sharifah Marliza</i>	39
AA25PS	Environmental and green energy awareness of rural and urban schools students in the Philippines <i>Christopher H. Punzalan, Cherry Mae C. Signo, Ma. Teresa C.</i> <i>Signo and Arlyne C. Marasigan</i>	40
AA29PS	Influence of green human resources management on employee engagement A. Vinothini	41
AA33PS	Level of awareness and perception of rural society related to renewable energy in Sarawak: a preliminary study Nor Mariah Adam, Marzuki, O.F., Teo, E.Y.L., Shafinah, K., Ribka, A. and Lepun, P.	42
AA34PS	Towards a better understanding of the determinants of households' intention to practise solid waste segregation-at- source: Developing a theoretical framework <i>K.W. Cheng, S. Osman, Z.M. Jusoh and J.L. Lau</i>	43
AA35PS	Exploring the relationship between determinants of households' intention to practise solid waste segregation-at-source: A conceptual paper <i>K.W. Cheng, S. Osman, Z.M. Jusoh and J.L. Lau</i>	44

Development and Evaluation of Thermodynamic Models for Predicting Cold Flow Properties of Biodiesel

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ABSTRACT

The consumption of biodiesel, especially palm oil-based methyl esters (PME), is steadily increasing in Indonesia and Malaysia as a petroleum diesel substitute. However, PME has poor cold flow properties due to the presence of saturated bound glycerols. Bound glycerols, such as monoglycerides (MAGs), diglycerides (DAGs), and triglycerides (TAGs), are impurities in biodiesel as a result of incomplete transesterification and have high melting points. These minor components often solidify even at a temperature higher than the cloud point and thus cause clogging in fuel filters. It is, therefore, essential to predict the solidification temperature for the application of biodiesel, particularly in high blending levels. This study developed and evaluated thermodynamic models based on the solid-liquid equilibrium for predicting the solidification of biodiesel. Binary and multi-component mixtures of fatty acid methyl esters (FAMEs) and bound glycerols were prepared as biodiesel models. The solidification temperature was measured by differential scanning calorimetry and the results were compared with the predicted values. We discovered that most of the binary mixtures of a FAME and a bound glycerol (MAG, DAG, or TAG) behaved as eutectic systems, in which a solid phase consists of a single component. In the case of the eutectic system, the solidification temperature could be estimated by assuming non-ideal liquid solutions, and the modified UNIFAC (Dortmund) model helped calculate the activity coefficient. However, the mixtures of MAG/MAG differed from the eutectic system, suggesting that the solid compounds of different types of MAGs were formed. Thus, we developed the compound formation model based on the reaction equilibrium. This model was successful in predicting the solidification temperatures of model biodiesel mixtures that consist of several kinds of FAMEs and MAGs.

Keywords: Biodiesel; cold flow properties; bound glycerol; monoglyceride; prediction model; solid- liquid equilibrium; differential scanning calorimetry.

Biodiesel Production from Crude Karanja Oil Using Heterogenous Catalyst from Seashells

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ABSTRACT

Gradual depletion of the world's petroleum reserves and impact of environmental pollution caused by combustion of fossil fuel, the search for substantial alternative energy resources such as biodiesel has gained importance. Biodiesel is a green energy resource, compromises mono alkyl ester of long fatty acids derived from biologically produced oils or fats including vegetable oils, animal fats and microalgae oils. In this study active calcium oxide catalyst was synthesized from Meretrix Lyrata (M.Lyrata) following calcination-hydration-dehydration technique. The catalytic feasibility of synthesized CaO was investigated in production of Karanja methyl ester (KME) from crude Karanja oil (CKO). KME was synthesized through esterification using H_2SO_4 followed by transesterification utilizing CaO in a two-step reaction process of CKO and methanol. The M.Lyrata shells were calcined at 900°C and the catalyst samples were characterized by using FTIR, SEM, PSA, and BET-BJH spectrographic techniques. A maximum FAME conversion of 97.3% was obtained at optimum reaction conditions include methanol to oil ratio of 12:1, catalyst concentration of 2%wt, reaction temperature of 58 °C and reaction time of 2 h. In comparative study with the commercial CaO, M.Lyrata showed a higher catalytic activity. The catalyst reusability experiments ascertain reusability of CaO up to four reuse cycles hsd shown good efficiency. The economic comparative study confirms that CaO derived from M.Lyrata can be used as an alternative and feasible catalyst for the biodiesel production. The KME fuel properties complies to EN-14214 biodiesel fuel standards.

Keywords: Seashells; heterogenous catalyst; transesterification; Karanja biodiesel; Spectroscopy.

Characteristics and Properties of Biofilms Made from Pure Carrageenan Powder and Whole Seaweed (*Kappaphycus* sp.)

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ABSTRACT

Plastics are produced in large amounts due to customer demand due to their low cost and vast variety of uses. Hence efforts to replace the conventional plastics with biofilms from renewable resources for its "green" properties are now trending. In this study, the properties of biofilm made from pure carrageenan (PC) and whole seaweed (WS) (Kappaphycus sp.) were investigated based on their appearance, physical and mechanical properties, solubility, and biodegradability. Also, the effects of the amount of glycerol as plasticizer (1 to 5%, v/v) on both sets were studied. As results, for colour difference, ΔE , and transparency, WS 1% showed higher ΔE at 17.09 ± 0.85 with highest opacity at 0.547 and least ΔE was at 2.73 ± 0.13 for PC 5% with opacity at 0.057 second lowest to WS 2% at 0.050. For mechanical properties, PC 1% has the highest tensile strength with elastic modulus at 26.63 ± 2.18 MPa and 253.53 ± 19.43 MPa respectively, with lowest at 0.71 ± 0.15 MPa and 2.47 ± 0.44 MPa for WS 5%. For solubility, highest rate for hot, distilled and tap water was of WS 5% at 160.62 \pm 13.70 mm³/min, 19.84 \pm 2.13 mm³/min and 8.87 \pm 0.61 mm³/min, respectively while PC 1% have the lowest solubility rate at $48.45 \pm 4.12 \text{ mm}^3/\text{min}$, $2.39 \pm 0.12 \text{ mm}^3/\text{min}$ and $2.30 \pm 0.20 \text{ mm}^3/\text{min}$, respectively. As for biodegradability, it resulted that by the first week WS 5% loss 80% of its weight and PC 1% only lost 3%. Overall, glycerol affects most of the properties except for mechanical properties for WS and solubility of both. Meanwhile, CC biofilms showed better quality in terms of mechanical and physical properties but WS biofilms were better in environmental properties such as biodegradability and solubility. This study suggests that PC may be a better base material for stronger biofilms but WS are a better choice from environmental and cost aspects.

Keywords: Ecofriendly; red algae; kappa carrageenan; biodegradable; biopolymer.

Preparation and Characterization of Metal Oxide Biochar Catalyst for Efficient Oxidative Desulfurization

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ABSTRACT

One of the major contributors of environmental pollution are emissions from commercial fuel. Hence, the government has enforced the regulation of allowed maximum sulphur contained in the fuel. In order to achieve low sulphur fuel, extensive studies are funded to develop the most effective methods of desulfurization that utilizes low cost and simple processes. Two step desulfurization oxidative-extractive desulfurization methods operate at low temperature and pressure without involving hydrogen gas. In the present study, KOH treated empty fruit bunch (EFB) as the activated carbon (AC) and 5%, 10%,15% and 20% molybdenum oxide MoO₃ was successfully prepared and impregnated in. The sulphur removal catalyst was subjected to characterizations by using Brunauer-Emmett-Teller (BET), field emission-scanning electron microscopy (FESEM), X-ray fluorescence (XRF), X-ray diffraction (XRD) and energy dispersive X-ray (EDX). Desulfurization was performed by catalytic oxidative-extractive desulfurization (Cat-OEDS) method. Using oxidant TBHP and DMF as an extractant, optimization was done on parameters such as reaction time, reaction temperature, oxidant to sulphur ratio, amount of catalyst and metal oxide impregnated and the highest sulphur removal efficiency was above 80%. It was concluded that the EFB derived AC/MoO₃ have potential as an effective metal oxide catalyst for Cat-OEDS in producing cleaner fuel.

Keywords: Activated carbon; empty fruit bunch; molybdenum oxide; heterogeneous catalyst; desulfurization; oxidative-extractive desulfurization.

Dual Solutions for an Unsteady Hybrid Nanofluid Thin Film Second-Grade Flow with Heat Transfer Analysis Over Permeable Stretching Sheet

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ABSTRACT

Heat transfer and fluid flow of second-grade hybrid nanofluids over a permeable stretching sheet have been analyzed. The suction and injection of fluid have also been considered. Sodium Carboxymethyl Cellulose-based hybrid nanofluids like $Al_2O_3/TiO_2 - SCMC$ were cross-examined under the consideration of thin film. By transforming similarities from partial differential equations into a set of ordinary differential equations, the governing equations of flow and heat transfer are reduced. The bvp4c function available in MATLAB software was applied to solve the simplified systems numerically. The empirical findings demonstrated that the values of local skin friction and heat transfer can be measured for different values of η . As a consequence, the dual solutions for unsteadiness and different concentrations of hybrid nanofluids against flow was obtained graphically.

Keywords: Heat transfer; hybrid nanofluids; stretching sheet; bvp4c; local skin friction.

In-Situ Ketonization and Decarboxylation of Fatty Acid Over a Series of Transition Metal Oxide Supported Zirconia Oxide Catalyst

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ABSTRACT

The ketonization and decarboxylation of palmitic acid in the presence of many metal oxides deposited on the surface of ZrO_2 leads to the production of 16-hentriacontanone and pentadecane as the major products. This paper employs ten different simple oxides (ZrO_2 , Fe_2O_3 / ZrO_2 , NiO/ ZrO_2 , Mn₂O₃/ ZrO_2 Ce₂O₃/ ZrO_2 CuO/ ZrO_2 CoO/ ZrO_2 Cr₂O₃/ ZrO_2 La₂O₃/ ZrO_2 and ZnO/ZrO_2) studied under the same reaction conditions and feed in order to understand the activities of various metal oxide catalysts under the same circumstances and aid in determining the most active metals or metal oxides that promotes ketonization activity. The present study indicated that the maximum yield of ketones was achieved under Mn>Co>La>Ce with Mn having 27% yield of ketones whereas the highest pentadecane yield was under Ni at 49%. Further to this, the Mn₂O₃/ ZrO_2 catalysts was also tested for the effect of reaction time on ketonization with findings that at 350°C and 5% catalyst, reaction time of 1h was comparable to 3h suggesting that a shorter residence time is more feasible for high yields of ketone.

Keywords: Ketonization; decarboxylation; palmitic acid; manganese; zirconia.

Development of PSA Technology for CO₂ Capturing from Biogas

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ABSTRACT

The increase in global carbon dioxide emission has raised concerns about climate change. This has caused nations to consider different carbon dioxide mitigation pathways to reduce emissions. Production of biogas contributes 35 vol.% of CO₂ in biogas itself towards the CO₂ direct emission in the industrial sector. In order to mitigate the negative effects of global warming and to reduce emissions, many technologies have been developed in the last decades to separate and recover carbon dioxide at different capture scenarios. Breakthrough technologies such as carbon capture and storage (CCS) is an alternative and attractive solution. A laboratory scale pressure swing adsorption (PSA) unit is introduced in this paper. The PSA system developed and composed only a main vessel made up of 316 stainless steel components. It was then operated up to 8 bars pressure at ambient temperatures and gas flows at a rate from 0 to 15 L/min. The unit will be tested with a biogas containing 65 vol.% of CH₄ and 35 vol.% of CO₂. Use of physical adsorbents, carbon molecular sieves and activated carbon will consume the gaseous impurities such as CO₂. Product gas was collected into a storage tank and analysed using gas analyser to validate the CO₂ and CH₄ composition. The development of PSA will greatly help to reduce CO₂ emitted to the atmosphere from the anaerobic co-digestion of biogas to produce high energy content bio-methane fuel.

Keywords: PSA technology; CO₂ capturing; biogas.

Utilisation of Waste Glycerine for Biohydrogen Production Using Engineered Escherichia Coli BW25113

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ABSTRACT

Biohydrogen production has become a pivotal topic being discussed due to their eco-friendly and renewable resources. Escherichia coli, one of the utmost strains that have been used in metabolic engineering study for the production of biohydrogen. Metabolic engineering and molecular biotechnology approaches have been extensively studied in order to improve the ability of the specific strain. The biohydrogen production from glycerol as carbon source could be an advantage since the availability of glycerol and its low global price. The glycerol is an attractive carbon source for biofuel production since it is cheap and abundant due to the increasing demand for renewable and clean energy sources, which includes the production of biodiesel. It is estimated, approximately 10 m3 of crude glycerol is generated for every 90 m3 of biodiesel produced. The feasibility of biohydrogen production by an engineered strain of Escherichia coli BW25113 was evaluated using pure glycerol and waste glycerine as carbon sources under anaerobic condition. A wild-type strain was used as control throughout the experiment. After fermentation process, the biohydrogen production by engineered strain BW25113 was 2.3-fold higher than the wild-type strain. Meanwhile, the engineered strain BW25113 produced biohydrogen 1.3-fold higher than wild-type strain in waste glycerine. Slower cell growth was observed during both the fermentation process. The presence of impurities especially methanol in the waste glycerine was assumed as an inhibitor to the growth of E. coli BW25113.

Keywords: Biohydrogen; renewable resource, waste.

Self-Propagating Combustion Method for Sulfonated SnO₂ Catalyst for Esterification of Low-Cost PFAD Feedstock into Biodiesel

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ABSTRACT

Palm fatty acid distillate (PFAD) based biodiesel is possible through esterification catalysed by sulfonated tin oxide (HSO³⁻/SnO₂) as the superacid solid catalyst. In this work, the SnO₂ was synthesised via the self-propagating combustion (SPC) method followed by chemical activation using chlorosulfonic acid (HSO₃Cl). The SPC method able to produce nano-sized particles with homogenous size and shape that can be anchored with many HSO³⁻ ions, which enhanced the acid properties of the catalyst, thus, the HSO³⁻/SnO₂ catalyst was esterified the PFAD feedstock effectively into fatty acid methyl ester (FAME; which also known as biodiesel). At an optimised condition of 9:1 (methanol-to-PFAD molar ratio), 4 wt.% (catalyst loading), 100 °C (reaction temperature) and 3 h (reaction time), the FFA conversion and FAME yield were 98.9% and 94.1%, respectively. Besides, the sulfonated SnO2-spc catalyst can be reused up to five consecutive cycles with an acceptable esterification performance and minimal sulfur leaching. The PFAD biodiesel (B10, B30 and B100) was satisfied with the biodiesel quality as given by ASTM D6751 specification. It is worth to mention that the used SPC method is greener and a simpler technique to obtain the nano-sized catalyst with a larger surface area. Overall, the production of FAME from low value, cheaper and abundance of non-edible PFAD feedstock that is catalysed with non-transition metal oxide of sulfonated SnO₂ catalyst, could reduce the cost of biodiesel production.

Keywords: *Biodiesel; FAME; esterification; PFAD; heterogeneous catalyst; nano.*

Designing and Fabricating a Cost-Effective Solar Water Distiller or Palm Oil Mill Effluent Treatment

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ABSTRACT

This paper presents an experimental investigation on developing a cost-effective solar water distiller for palm oil mill effluent treatment. The quantity of distillate water from a solar still depends on various parameters. The evaporative surface area and glass cover temperature are the most effective parameters. Higher distilled output can be obtained by increasing the surface area or decreasing the cover temperature. In this work, a rough matte black concave type solar still with four glass cover surfaces is studied experimentally by solar distillation and collecting the distillate of the palm oil mill effluent. The main advantage of using a four-sided pyramid glass cover surface is to increase the amount of solar radiation falling on the evaporative surface. Mostly during the day time, there is a temperature difference between the four still glass sides and the evaporative surface in order to allow more vapour to condensate on the lower glass cover surface. In this study, the basin water depth is also taken in consideration. The basin water depth has a significant effect on productivity of the solar still. Decrease in water depth increases the productivity during the day time is approximately with a system efficiency of 0.41 at solar noon when the initial water depth in the basin is the lowest. It is higher than the conventional type of solar still.

Keywords: Palm oil mill effluent; biosolids separation; solar still efficiency; solar water distiller.

Optimum Truncation Level of Heat Pipe Based Compound Parabolic Collector

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ABSTRACT

Radiation available, collector design and its orientation are the key parameters that affect the performance of any solar collector. The concentrator of Compound Parabolic Collector tends to be long especially at low concentration and most of the top parts do not contribute to the radiation collection. Truncating those parts is found to increase the optical efficiency at the expense of the concentration ratio (Rabl 1985, Abdullahi et al. 2013). This work presents simulation and experiment on the effects of truncation level of heat pipe based compound parabolic collector (HPCPC) on its optical performance using solar radiation in Kano, Nigeria (12.05°N). It is aimed at the determination of the effects of truncation at different levels, so that the best level could be determined. Two computer programs were developed for geometric characterization of symmetric low concentration compound parabolic collectors and studying the effects of truncating its concentrator. Results showed that as the truncation levels increases the collector height, aperture width, concentration ratio and average number of reflections decrease while the acceptance angle increases. The effect of truncation was also studied using a validated advanced ray tracing technique. Results showed that truncation increases the optical efficiency of the HPCPC but decreases its concentration ratio. From the graph of optical efficiency and concentration ratio against truncation level, results have showed that the HPCPC with acceptance angle of 60° and receiver radius of 12.5 (i.e. HPCPC60R12.5), HPCPC40R12.5 and HPCPC30R12.5 can be truncated respectively by 62%, 55% and 43% to achieve optical efficiencies/concentration ratios of 84%/1.65, 71%/2.55 and 55%/3.5 respectively

Keywords: Heat pipe; compound parabolic collector; solar radiation.

An Affordable Calibrated Hot Box Suitable for Thermal Performance Measurement of an Insulation Panel

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ABSTRACT

This paper presents a small affordable calibrated hot box built at the Department of Architecture and Built Environment, the University of Nottingham. Whilst no specific European Standards are available for the small calibrated hot box, at a cost of approximately GBP 10,000 the design, development and utilization of the hot box were performed by taking into account almost all the requirements outlined in the ISO 8990 standards. The hot box comprises of three components namely; the metering box, the specimen panel and the cold box. The box is designed by taking into account the minimum requirement for the metering area according ISO 8990 (1m x 1m). In order to ensure uniform air circulation at the specified air speed requirement, a baffle with a series of 12 Vdc fans was installed in each of the cold and hot area. Additionally, the minimum number of temperature sensors per unit area in measuring the thermal transmittance of the testing specimen have also been considered. The thermal transmittance value of the tested specimen was measured using a heat flux sensor. Innovative heating and cooling elements were introduced in the design of the hot box using two separate units of thermoelectric (TEC) air to air heat pump, capable to achieve 3° C to 45° C in the cold and hot enclosure respectively. The TEC heat pump is controlled by a proportional-integral-derivative controller (PID controller) connected to a PC with a user interface. Meanwhile the speed of the installed fans were controlled via Pulse Width Modulation (PWM) controller. To calibrate the hot box, the thermal conductivity of four different materials measured using the heat flux sensor in the hot box, were compared with the thermal conductivity measured using a calibrated guarded heat flow meter of Thermtest HFM-100. From the analysis, the values measured by the hot box and the guarded heat flow meter are found to be in good agreement with the average standard deviation of the measured k-value by the hot box from the guarded heat flow meter is below 10%. This paper serves as a guidance document that outline the methodology in the design, and development, in the specimen testing using heat flux sensor in a calibrated hot box.

Keywords: Thermal performance; affordable; small; hot box.

Photocatalysis Degradation of Organic Pollutant Wastewater Under LED Light by ZnO/CdS

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ABSTRACT

Implementation of technology based on renewable energy is crucial to maintain environmental sustainability. In this work, ZnO/CdS photocatalyst that works in visible light range to simulate sunlight energy for degradation of organic pollutants has been synthesized. The ZnO was prepared using the solid state method and doped with CdS via wet-impregnation process. The characterization was carried out using scanning electron microscope (SEM), x-ray diffraction (XRD), ultraviolet-double resonance (UV-DRS) analyses and surface characteristics using Brunauer-Emmett-Teller (BET) and Barrett-Joyner-Halenda (BJH) methods. Furthermore, the photocatalytic degradation test of methylene blue solution was studied using 23 W LED visible lamp as a source of light energy. Besides, the composition of ZnO to CdS ratio (wt.%) was also investigated. The photocatalytic reaction was carried in 10 mg/L of methylene blue as a sample solution using 3:1 wt.% ZnO/CdS. As a result, the nearest complete degradation by 99.00% was recorded within 120 min. Based on these findings, it can be concluded that the ZnO/CdS photocatalyst has high potential for degradation of organic pollutant especially methylene blue in low visible light energy.

Keywords: *ZnO/CdS; LED light; visible light photodegradation; photocatalysis; organic pollutant.*

Potential of Cellulose Nanofiber from Banana Pseudostem for Solar Cell Application: A Preliminary Study

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ABSTRACT

Banana pseudo stems are unwanted parts of banana tree, and are one of the most promising sources in obtaining nano-sized cellulose fiber for solar cell (small component in solar panels) production. The most efficient solar cell as yet still only converts 46% of the available sunlight to electricity. This research paper focusses on the potential of cellulose nanofiber (CNF) from banana pseudostem to become an organic substrate in solar cells which can help to improve the solar absorption and power conversion efficiency due to the high transparency and optical haze properties of CNF films. To obtain a nano-structured fiber, the banana pseudostem need to go through several processes namely grinding, sieving, pretreatment, bleaching, and acid hydrolysis process. The yield of product weighed 62% less than the initial raw material because of the removal of a large portion of hemicellulose and lignin throughout the said processes. The morphology of banana CNF was observed using Transmission Electron Microscopy (TEM). The results showed that the average fiber size decreasing from average of 180 µm to 80.3 nm with standard error of 21.3 nm. The nano-scale size of banana pseudo stem CNF is a suitable material as a film coating and bio composite in a solar cell. This biodegradable organic device has attracted the manufacturers since its properties are suitable for electronic applications specifically in a renewable solar energy production. To summarize, the potential of CNF from banana pseudo stems is studied due to the good qualities of CNF film as an organic substrate in solar cells.

Keywords: Cellulose; nanofiber; solar cell.

Numerical Analysis for Solar Panel Subjected with an External Force to Overcome Adhesive Force in Desert Areas

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ABSTRACT

Dust accumulation is an undesirable phenomenon in a solar plant environment. The dust removing procedures using traditional techniques have led for more loss in power especially in desert areas. Additionally, most of cleaning techniques are designed according to the concept of vanquishing the adhesive force of dust particles by adding a harmonic excitation force. This force may produce damages for the solar panel. Therefore, the main objective of current study is to simulate a traditional solar panel model BSP32-10 with ANSYS software throw an additional external force (2, 4, 6, 10 and 15 newton) throw six mode shapes and verified experimentally. Deformation value increases for solar panel surface with an increase in excitation force and does not exceed natural frequency deformation, with average values from 0.07 to 1.5 mm, while 94% of these results are closed to experimental work during verification action. The middle position of the solar panel for excitation force on solar panel in dust removal concept is the best position.

Keywords: Solar panel; external force; adhesive force; deformation; dust.

Potential of Steam Recovery from Excess Steam in Sterilizer at Palm Oil Mill

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ABSTRACT

Energy saving is something that being focus deeply either larger or smaller industry in this current era especially steam and electricity. In a crude palm oil mill, tonnes of fibre and wood are used in the burning process as a boiler fuel to generate steam. As steam is a good heat transfer medium, a product or material can be heated by direct heating or batch heating to raise the temperature in order to change its characteristic. It is not surprising that the excess steam after the sterilizing process almost 60% of the supplied steam is released into the atmosphere as an energy waste. In reference to this issue, the cost of replacing consumable boiler fuel has increased tremendously. This paper reviews and critically discusses the waste of steam energy and steam recovery method from the excess steam in sterilizers. In several area and amount of steam excess after the heating process also been critically reviewed. This research will focus on the developing the excess steam for the heating process to reduce the energy consumption that will minimize the massive expenses for boiler fuel and as well as benefit palm oil industry. Computer aided tools and creative tools will be use as reference to identify the change in steam characteristic and data collection.

Keywords: Steam recovery; sterilizer; excess steam; steam ejector; fuel cost.

Avanong Food Pack Using Green Technology

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ABSTRACT

Avanong Food Pack is a water-activated exothermic chemical heater included with ready-to-eat meals and are used to heat the food. This is a premium brand of outdoor food which is also used for backpacking. A modern food manufacturer and keen to bring new energy to the food industry in supporting the green concept. This product has advanced, and innovative features based on the original product. The creation of this product is based on the investigation of the problems faced by outdoor enthusiasts who often crave for hot foods that can provide enough energy when they engage in challenging outdoor activities. This product will help consumers to prepare meals easily for their own heating. Additionally, this product specialises in traditional and local foods from Sabah Now consumers are able to heat their foods approximately about 7-10 minutes without a fire and they can do more important activities while waiting, Avanong Food Pack dishes can be heated anywhere, anytime and consumers can enjoy hot and delicious meals.

Keywords: Food pack; water-activated exothermic chemical heater; green technology.

Biogas Power Plant

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ABSTRACT

FutureNRG Sdn Bhd under its subsidiary FBG has successfully build, own and operate a 2 Megawatt Biogas Power Plant in Kuala Ketil, Kedah. The biogas project was initiated and received the approval from the Sustainable Energy Development Authority Malaysia on 24 February 2015 which allows the sale of renewable electricity to the national grid for a period of 16 years. Palm Oil Mill Effluent (POME) is a major concern for all the millers. It is non-toxic but it is highly polluting due to the high BOD and COD value. As the organic content of POME breaks down in conventional ponding system, it releases biogas to the atmosphere. Biogas mainly comprises of methane (55%-60% by volume) which is a potent greenhouse gas 21 times more harmful than CO2. The biogas plant utilizes POME as the feedstock and comprises of 5 epoxy coated steel digester tanks, a gas holder, a biological H₂S scrubber and a flare. The digesters collect the biogas generated via anaerobic digestion and the biogas is then scrubbed to reduce the H₂S content to below 100ppm. Chillers will remove the moisture content of the wet biogas before it is suitable for use in the biogas engine generators. The optimum condition for the anaerobic digestion has been identified with pH 6.5 to 7.5 and temperature range from 35°C to 45°C. The tank system provides a sturdier structure and better control on the parameters. The process is able to reduce the BOD and COD value by 90%. For every tonne of POME processed, 25 to 30 m³ of biogas is produced for the biogas generators usage. FBG biogas plant has been successfully commissioned and connected to the national grid on 14 December 2017 and received pioneer status.

Keyword: Biogas; renewable energy.

Preliminary Experimental Study of Passive Solar Air Heating System in Drying Chilli in the Malaysian Climate

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ABSTRACT

In this paper, a preliminary experimental investigation of a passive solar air heating system in drying an agricultural product, chilli, under the Malaysian climates was presented. 10 days outdoor experimental works were conducted, in which the recorded parameters were solar irradiance, mass of chilli, temperature around the system and thermal mapping of the system. Results showed that the maximum average temperature attained by the solar absorber was recorded at about 80°C. The temperature on the bottom tray of the system was found to be higher than the temperature on its upper tray. Outcome indicated that the developed passive solar air heating system could enhance the drying rate as compared to the conventional direct sun drying method. It showed that the percentage of moisture removal was about 74% when using the passive solar air heating unit, meanwhile it was recorded at about 54% when applying the direct sun drying method, indicating that the passive solar air heater has outperformed the direct sun drying method, with approximately 20% better drying rate. A linear correlation has been developed that the absorber temperature could be predicted at a moderate accuracy by knowing the solar radiation data with $R^2 = 0.6881$.

Keywords: Passive solar air heating system; malaysian climate, chilli.

Prospect Evaluation of a Wind Farm Project for a Smart Campus in the Federal University of Kashere, Gombe State

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ABSTRACT

Energy, every now and then forms the basis of every nation's economy. Among other adverse effects are socio-economic, environmental, health and welfare impacts. The sources of energy we use in our day-day activities contributes significantly to the alarming global warming which the world is currently experiencing. A technical solution to the menace of an environmental friendly, sustainable and reliable energy is the peak of this study. 2014-2017 years' wind speed data were analyzed using the Weibull's distribution method. The mean wind speed for the rainy season in the results show that all through the studied years and seasons, the wind speed distribution showed significant stability as seen from K-values. However, the dry season has the highest K-value of 2.08 signifying more stable winds during the season. The monthly averages, computed for height of 2 m and 60 m above ground level ranges between 2.15 m/s and 6.42 m/s with the maximum wind speed in June (Winter season) while the minimum wind speed occurred in September. The results showed that wind velocity of the study area tends to be lower during the end of the rainy season. Nevertheless, the deviation in the mean wind speed was not significant, as such wind energy can serve as a reliable energy source for the campus.

Keyword: Wind farm; wind energy; renewable energy.

ANSYS Simulation Study to Generate Pressure from Various Water-Wind Flow Conditions to Calculate Electricity Using Piezoelectric Cells

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ABSTRACT

This paper presents a theoretical rooftop model that has been subjected to a mix of wind-water fluid simulate conditions of a rainy weather and the test data were recorded. ANSYS analysis has been performed with the fluid velocity being set at 20 m/s, 30 m/s, 40 m/s and 50 m/s which strikes the roof of a building kept at 0°, 45° and 60°. The objectives of this paper is to find the amount of voltage that can be generated from pressure developed by the fuid striking the model surface. The pressure values, obtained from ANSYS simulation, were then taken to check if it is viable enough to be applied on piezoelectric cells to generate electricity from rain and wind and hence the study can be used to develop a sustainable model using rain as a renewable source of energy.

Keywords: Piezoelectric; ANSYS; electricity; generator; rain; renewable; energy.

Analysis of Optimum Thickness of Glass Wool Roof Thermal Insulation Performance

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ABSTRACT

Countries in south east Asia experience monsoon tropical or equatorial climate conditions. Therefore, the use of the air conditioning has been increased to reduce the tension and achieve thermal comfort inside the buildings. In order to reduce the energy consumption, thermal insulation has been introduced to lower down the indoor temperature. The main objective of this study is to determine the optimum thickness of the glass wool insulation. To conduct the study, a wooden room model is built based on the classroom that located at one of the Singaporean universities. The thickness of the glass wool insulation used in the experiment is 25 mm (one layer), 50 mm (two layers) and 75 mm (three layers). According to the results, the maximum temperature reduction for one layer of insulation is 1.0°C. Two layers of insulation reduces the indoor temperature by 1.3°C followed by the reduction of 1.5°C after applying three layers of insulation. The convection coefficient outside and inside is determined to calculate the heat flux of the roof with different insulation thickness. The heat flux gained by the roof reaches the highest value at 1 p.m. which is 0.648 W/m² without insulation. The heat flux has been reduced to 0.629 W/m² after applying one layer of glass wool insulation. The heat flux gained by the roof is further reduced to 0.573 W/m^2 and 0.518 W/m^2 when two and three layers of insulation are applied, respectively. Throughout the experiment, the temperature inside the room is reduced with the increase of the insulation thickness. Two layers of glass wool insulation has been selected as the optimum insulation thickness which is validated after performing calculation using the polynomial function as well as the cost analysis. Two layers of glass wool insulation yields a 27.40% of ROI per annum.

Keywords: *Optimum insulation; energy savings; tropical climate; glass wool insulation.*

Mechanical and Morphological Properties of Different Natural FibreReinforced Polylactic Acid Composites: A review

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ABSTRACT

The determination of mechanical and morphological properties of polylactic acid (PLA) reinforced with different natural fibre were studied in this paper. Tensile, impact, percentage elongation, flexural properties were found out of various composite material like Nettle fibre reinforced PLA, Grewia optiva fibre reinforced PLA, sisal fibre reinforced PLA, composite foams of PLA/bagasse fibre, PLA/flax composites, PLA/ cellulosic natural fibres, Wood fibre reinforced PLA composites. The value of tensile strength was found to be enhanced when compared neat PLA with natural fibre blend PLA. Since PLA is brittle, it's nature also changes when natural fibre is applied and the percentage elongations increases as well. Up to 30% improvement in impact strength also noted in previous experiment on different PLA composites. Morphological analysis reveals strong adhesion rates between natural fibre and matrix PLA.

Keywords: Polylactic acid; natural fiber reinforced; mechanical properties; lifecycle of PLA.

A Review on Green Cleaning During and Post COVID-19 Pandemic

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ABSTRACT

The virus that causes COVID-19 spreads primarily through droplets generated when an infected person coughs, sneezes, or speaks. Someone can also be infected by touching a contaminated surface, then touching their eyes, nose, or mouth before washing their hands. People are advised to clean hands regularly and thoroughly, and avoid touching eyes, mouth, and nose to keep safe from the virus. Cleaning has never been a greater concern than it is today since the COVID-19 pandemic has spread throughout the world. However, methanol, ethanol, and bleach chlorines are often used in cleaning and disinfecting products to kill the virus on surfaces. These chemicals called volatile organic compounds (VOCs) which are found in commonly used conventional products. The excessive usage of these products will cause indoor air pollution and other numerous health implications which are very harmful to the building occupants and especially for the clean workers and the people with health conditions – the patients. How do we reduce the risk for everyone while maintaining a clean hospital building? Therefore, it is important to implement a green cleaning programme to reduce the issue of environmental health impact. The aim is to draw understanding and to identify areas that are yet to be considered or needs more attention. Thus, this paper aims to discuss how to maintain cleanliness in a green way and without damaging health. This paper is anticipated to be significantly beneficial and can be further used as a piece of information specifying on hospital buildings.

Keywords: Green cleaning; Hospital building; COVID-19.

Growth of Marine Microalgae and their Potential Application in Algal Biophotovoltaic (BPV) Devices

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ABSTRACT

Renewable energy is widely studied as part of collective efforts to decelerate global warming by suppressing global temperature rise through minimized dependence on fossil fuels. As one of the attempts to improve the reliability of renewable energy sources in providing energy for long term use, biological matters including microalgae have also been utilized to provide energy. Microalgae have drawn interests in the renewable energy field due to their extensive application potential as a carbon negative energy provider. Bioelectricity is generated from algal biophotovoltaic (BPV) platforms by harvesting electrons produced from splitting of water molecules during algal photosynthesis. Direct contact between algal cells and the anodic surface of the algal BPV devices enables electron transfer from the cells to the external circuit. In this study, we review the feasibility of utilizing marine microalgae in algal BPV devices for bioelectricity generation in saline condition by loading three local marine algal strains from the University of Malaya Culture Collection (UMACC) into our prototype devices. These devices were illuminated by LED white light at a fixed irradiance level of 90 µmol photons m⁻²s⁻¹ for 12 days. Bioelectricity generation has been shown in our algal BPV devices that were originally constructed for freshwater microalgae, with the production of a maximum power density of 0.629 mWm⁻² from the local marine Chlorella vulgaris UMACC 253.

Keywords: Bioelectricity; marine microalgae; biophotovoltaics; carbon fixation; renewable energ

Experimental Estimation of Water Velocity in a Selected Unregulated River (River Dindima) for Micro-hydrokinetic Potential

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ABSTRACT

Micro-hydrokinetic river (MHR) system is one of the promising technologies to be used for remote rural electrification. It simply requires the flow of water instead of elevation or head, leading to expensive civil works. It also demonstrates an economic benefit offered by a MHR system when compared to the commonly used systems such as solar, wind and diesel generator (DG) at the selected study site. A novel technique of estimating the daily average water velocity data in unregulated rivers is proposed. The modelling of regression equation for water velocity estimation was performed and two regression model equations were generated to estimate both water level and water velocity on-site and proven to be valid as the coefficient of determination values (R 2) had been 81.7% and 81.4% respectively. The daily average water level from river Dindima River was measured concurrently for two months (94 samples) as training data. Both datasets were analysed using the regression analysis method. Eight regression models were selected and analysed. The quadratic model equation was however chosen due to its significant of correlation (P) less than 0.01 as well as collinearity. The river showed that the rising water level at downstream is linearly proportional to the rise in water levels at the upstream of the river. Nevertheless, the relationship between water level and water velocity at the project site is proven to be non-linear when a quadratic curve was applied. The combination of both regression model equations can be used to estimate long-term time series water velocity data for unregulated river in remote areas.

Keywords: *Hydrokinetic; energy assessment; unregulated river; water velocity; regression, analysis; modelling.*

Hydrodeoxygenation of Bio Oil into Bio-Hydrocarbon Via Bimetallic-based Catalyst

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ABSTRACT

An efficient valorisation process of biomass to high-value products and fuels has received significant research attention. This is because biomass shows various unique characteristics, such as high abundance, superior renewability, and remarkable sustainability, thus its effectiveness in biomass upgrading could provide potential solutions to overcome the negative impacts of the fossil fuels. However, the bio oil derived from biomass are comprised of various oxygenated molecules that come from cellulose, hemicellulose and lignin, which limit the desired physicochemical that further apply as fuel and chemicals. It has been demonstrated that the hydrodeoxygenation (HDO) process using appropriate catalyst systems can efficiently remove the chemically bonded oxygen from biomass-derived bio oil. This study investigates the synthesis, characterization and the catalytic application of bimetallic Cu-Ni/Ti-MCM-41 catalyst for the valorization of biomass compounds (i.e. guaiacol) into hydrocarbon-based biofuels via hydrodeoxygenation route (HDO). Catalysts characterization indicated that the Ti species are well-dispersed within the MCM-41 framework by a tetrahedral coordination. In additional, incorporation of Ti into the MCM-41 framework generates large amounts of acidic sites as well as enhances the dispersion of CuO and NiO species on the surface of Ti-MCM-41 support. The CuNi/Ti-MCM-41 catalyst shows excellent reducible properties due to the co-operative effects of CuO and NiO with the Ti-MCM-41 support. The catalytic experiments revealed that the CuNi/Ti-MCM-41 catalyst exhibits a higher guaiacol conversion and superior selectivity to cyclohexane.



Keywords: Renewable energy; biomass; deoxygenation; biofuel; mesoporous catalyst.

Sugarcane Bagasse Ash Impregnated with CaO as Heterogeneous Catalyst in Biodiesel Production

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ABSTRACT

In the present study, low-cost agricultural waste such as sugarcane bagasse ash was prepared as catalyst's support for heterogeneous catalyst. The alkali metal such as calcium oxide, CaO which is known to have high basicity and high catalytic activity, however, often associated with deactivation issue due to the leaching and poisoning problem. Thus, this study aims to enhance the reusability and stability of CaO by introducing sugarcane bagasse ash as a support medium. The chemical and physical properties of the prepared catalyst was subjected to different characterization methods which includes, thermogravimetric analysis (TGA), scanning electron microscope (SEM), energy dispersive spectrometer (EDS), Fourier –transform infrared spectroscopy, X-ray diffraction (XRD), N₂ adsorption/desorption and also Brunaeur-Emmett-Teller (BET) for surface characteristics analysis. The catalytic evaluation of the prepared catalyst was analyzed by transesterification of palm oil at various operating parameters such as catalyst loading, methanol-to-oil molar ratio, reaction time and temperature. It was found that, the catalyst showed high performance at the optimum reaction conditions and possess good reusability when compared to unsupported CaO which believed to be contributed by the Ca-O-Si bond between catalyst's support and active site, CaO.

Keywords: Calcium oxide catalyst; sugarcane bagasse ash; biodiesel; transesterification; characterization

Biodiesel Production Using K₂CO₃ Catalyst Support Beads Al₂O₃ Using Perforated Hydrophilic Materials (PHM)

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ABSTRACT

Catalytic bio-diesel production from waste cooking oil (WCO) and ethanol using K₂CO₃/Al₂O₃ in different configuration has been studied. Catalyst is prepared by incipient wetness impregnation method (IWI) with aid of different percentage of K₂CO₃ concentration (5-30%) immobilized on the supports for study the contrast. The optimum parameters for transesterification reaction was 3 hours reaction time using 5 wt% of the catalyst loading, oil:methanol ratio of 1:12 and 65oC reaction temperatures. The catalyst were investigated by TGA, BET, XRD, SEM-EDX and TPD while for fatty acids methyl ester (FAME) were tested using GC-MS by adding methyl heptadecanoate (C18:0) as control standard. The best biodisel conversion found to be 10% catalyst concentration by 97% showing their potential as a promising alternative to conventional homogeneous catalytic systems used for biodiesel production at industrial scale.

Keywords: Biodiesel; heterogeneous catalyst; perforated hydrophilic material; renewable energy; transesterification.

Green Diesel Production Via Pyrolytic-Deoxygenation of *Jatropha Curcas* Oil Over Multi-Wall Carbon Nanotube-Based Catalysts

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ABSTRACT

Deoxygenation of *jatropha curcas* oil over NiO–Fe₂O₃ and NiO–ZnO catalysts supported on multiwall carbon nanotubes (MWCNTs) under H₂-free conditions was successfully performed. Diesel fractions consisting of n-(C₁₅+C₁₇) predominated. High Fe and Zn dosages were ineffective in deoxygenation; the greatest activity was observed on NiO₍₂₀₎ Fe₂O₃₍₅₎/MWCNT catalyst. Structure-activity correlations revealed that low metal loading, large density of weak+medium acidic sites and strong basic sites play key role in enhancing the catalytic activities and n-(C₁₅+C₁₇) selectivity. NiO–Fe₂O₃ is an outstanding binary metal promoter for various of carbon supports (MWCNTs, activated carbon (AC) derived from walnut shell (AC_{walnut}) and commercial AC (AC_{commercial}). The lowest amount of oxygenated content with high heating value liquid product was obtained over the MWCNT-supported catalyst, thereby, it confirming the importance of carbon nanostructure as the catalyst support in improving the diesel quality. The high stability and reusability of the NiO–Fe₂O₃/MWCNT catalyst offers high sustainability for industrial use.

Keywords: Carbon; deoxygenation; iron, multiwall carbon nanotube; nickel.

Thermal Catalytic Cracking of Waste Cooking Oil into Green-Diesel Via Activated Carbon Supported Cadmium and Lanthanum Oxides Catalyst

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ABSTRACT

Optimization of deoxygenation (DOx) of waste cooking oil (WCO) into green-fuel using activated carbon supported cadmium and lanthanum oxides (CdO-La₂O₃/AC) catalyst is reported in this study. CdO-La₂O₃/AC were synthesized via impregnation of cadmium and lanthanum into activated carbon as a support. CdO-La₂O₃/AC was characterized and the results showed high surface area and acidity. Furthermore, the effect of catalyst loading, reaction time, and reaction temperature on deoxygenation of WCO were investigated. The catalyst demonstrated a superior catalytic performance in deoxygenation reaction under optimal condition (1% catalyst loading, 2 hours and 350 °C), 94% yield of WCO to green diesel was achieved. Reusability test of the catalyst was examined and results showed that the synthesized catalyst can be reused up to 5 times with maintaining green diesel yield at above 83%. These results are promising for further research toward commercialization of biofuel production.

Keywords: *Deoxygenation; heterogeneous catalyst; green-diesel; activated carbon; cadmium; lanthanum.*

Green Fuel Production in Solvent-Free Catalytic Deoxygenation Using Bimetallic Nickel Based Catalyst Supported on Activated Carbon

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ABSTRACT

This paper presents an experimental investigation on catalytic deoxygenation of waste cooking oil (WCO) over acid-base bifunctional catalysts (NiLa, NiCe, NiFe, NiMn, NiZn, and NiW) supported on activated carbon (AC). High hydrocarbon yield more than 60% with lower oxygenated species was found in the liquid product with the product selectively toward *n*-(C₁₅+C₁₇)-diesel fractions. Predominance of n-(C₁₅+C₁₇) hydrocarbons with the production of CO and CO₂, indicated that the deoxygenation pathway preceded via decarbonylation and decarboxylation mechanisms. High deoxygenation activity and n-(C₁₅+C₁₇) selectivity over NiLa/AC exposes the great synergistic interaction between La – Ni, and compatibility of acidbase sites increased the removal of oxygenated species. The effect of La on deoxygenation reactions efficiency were investigated and a high percentage of La species was found to be effective in the removal of C-O bonded species. In addition, optimum deoxygenation activity of 88% hydrocarbon yield with 75% n-(C₁₅+C₁₇) selectivity were achieved by more than 20% of La, which clearly demonstrated that La contributed to a greater increase in deoxygenation reaction. The NiLa/AC reusability study showed consistent deoxygenation reaction with 80% hydrocarbon yield and 60% n-(C₁₅+C₁₇) hydrocarbons selectivity within 6 cycles.

Keywords: Activated carbon; deoxygenation; green diesel; nickel oxide; waste cooking oil.

Bio-briquette Blend from Newspaper-based Nitrocellulose and *Neolamarckia* cadamba

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ABSTRACT

This study examines the effect of nitrocellulose and blending ratio on the physical and thermal properties of briquettes produced from newspaper-based nitrocellulose and Laran (Neolamarckia cadamba) sawdust. The materials were mixed in a nitrocellulose (NC) to Laran saw dust (SD) blending ratio of 75:25, 50:50, and 25:75 with 100% control for both NC and SD with a compaction pressure of 2.45 MPa. The briquettes were analyzed based on their physical properties such as density and structure, as well as its thermal properties which includes the calorific value, thermal analysis and burning rate. Based on the results, the physical properties showed a pattern of increased density with lower porosity as the content of nitrocellulose increases, as shown with the NC to SD briquette ratio of 75:25 to 25:75 with 0.1699 g/cm3 and 0.1571 g/cm3, respectively. As for the thermal properties, the increase of NC content increases the calorific value of the briquette, with the highest value of 138.20 J/g for the 75:25 and the lowest of 34.81 J/g for the 25:75 blend. The thermal analysis conversely shows an increase mass loss with higher NC content despite the higher energy content, as the 75:25 blend shows the highest mass loss of 90.52% compared to 89.07% of the 25:75 blend ratio at the devolatilization phase. This was further assisted with the burning analysis results with the fastest ignition coming from the 75:25 blend at 2.7 minutes and the slowest blend at 25:75 at 4.2 minutes, with a burning rate of 8.9 mg/min and 7.2 mg/min, respectively. Based on the findings, newspaper-based nitrocellulose and Neolamarckia cadamba sawdust has the potential to be used as possible alternative sources of energy in the form of solid fuel, with the NC acting as an accelerant to the burning.

Keywords: Nitrocellulose; neolamarckia cadamba; accelerant; briquette; newspaper; biomass.

Wood-based biomass of Dipterocarp and Non- Dipterocarp Trees as an Alternative for Biofuel

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ABSTRACT

Energy from the biomass is essential for trading commercial fuels, designing combustion furnaces, selecting a suitable fuel for burning apparatus and also for estimating forest potentials. Different tree parts contribute to different value of energy production and are beneficial in the future. This study aims to determine the amount of energy stored in dipterocarp species and nondipterocarp species on a selected trees species in Piah Forest Reserve, Perak. Different tree parts i.e. stem, branches and leaves of the tree were examined to obtain calorific value (cal g^{-1}) by using an Adiabatic Bomb Calorimeter. The tree parts were grinded and sieved before undergoing calorific analysis. From the analysis, leaves have the highest calorific values compared to the other parts. However, there is statistically no difference (p>0.05) between the tree parts in nondipterocarp species which range from 4305.15 ± 42.32 cal g⁻¹ to 4490.50 ± 65.84 cal g⁻¹. On the contrary, the dipterocarp species parts show that the highest parts which are leaves 4432.60±94.63 cal g-1), branches (4273.94±33.52 cal g⁻¹) and top stem (4258.86±63.35 cal g⁻¹) were significantly different (p<0.05) towards the middle stem and bottom stem with values of 4260.80 ± 47.26 cal g⁻¹ and 4294.98 ± 41.22 cal g⁻¹ respectively. The energy stored in the trees can be converted into a pellet for burning purpose. The scope of this study can be expanded into trees species flammability to help in expediting the development of biofuel industries.

Keywords: *Wood-based biomass; biofuel; calorific value.*

Waste-Energy-Climate Nexus Perspective Towards Circular Economy: A Review

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ABSTRACT

Population growth causes a high demand for vast resources, which includes energy and the consumption of goods. With this difficult situation, many developing countries - including Malaysia; need to face other associated issues such as waste generation as well as climate change. To survive this daunting scenario, a smart alternative known as Waste-to-Energy (WtE) technology has emerged as a viable solution to overcome these contemporary challenges. By implementing this technology, waste can be transformed into new energy sources that can be used to meet the needs of the standard energy requirement, whilst, solving mass pollution problems. Though it may sound like a promising solution, the availability of these resources and the longevity of this technology is relatively unknown. A critical review of the modern nexus of waste and energy with the value-added of climate change may perhaps enhance the understanding of this linkage and forecast its long-term sustainability. Additionally, this review features an innovation compares with the mainstream reviews by evaluating the nexus of these three in line with the Circular Economy framework (CER). This review encompasses a body of grey-literatures and peer-reviewed literatures from multi- disciplinary perspectives including the government, researchers, and the public. Information obtained in this study exhibits significant linkage between waste utilization, climate change, and energy security. Identified implications and effects of each provide vital insight towards the establishment of national and global CER. Apart from that, WtE technology turns out to be the best effort as part of the waste minimization strategy and serves as a key factor that can attenuate the environmental impacts concurrently meeting the growing demand of national and global energy.

Keywords: *Waste to energy; modern nexus; circular economy; climate change.*

The Impact of Green Areas Towards Property Values in Malaysia

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ABSTRACT

Green areas are any place prepared with grass, flowers, trees, benches, gardens, parks and playgrounds, or meadows or other decorative or urban furniture elements used as decoration or for public uses. It is now assumed that sustainability indicators for urban planning will provide more criteria for urban green areas, as well as indexes representing community's satisfaction and perception of their living environments. In addition to the many economic, ecological and psychological benefits, urban green areas will play a very important roles in the creation of sustainable communities. Areas that are distinguished by a rise in the green coverage rate may help people transition to a healthier lifestyle. Many people prefer to choose eco-friendly houses due to the health and well-being of the occupants. The most important method is in the reduction of operating energy and water costs from day one and for the entire life cycle of the building. Buying a house is a major decision that homebuyers will make because expenditure on homeownership has an influence on the homeowner's quality of life. This paper discusses the benefits of urban green areas based on sustainability aspects, the physical, social and economic dimensions and the impacts of green areas towards property values. The paper aims to attempt sustainable green areas evaluation criteria to examine the interaction between urban green areas and its community to get most of their benefits. This study employs an approach to distributing questionnaire to the respondents and optimizing the use of descriptive analysis. The results revealed that although green areas have many positive impacts in term of environmental, ecological and psychological and also as an important role in sustainable community development, it shows that location and accessibility are the factors that gives the most impact to property values.

Keywords: Urban green areas; community development; sustainability; property values.

Secondary School Students' Awareness of Green Computing: A Preliminary Study

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ABSTRACT

Information communication technology (ICT) is increasingly and becoming a mandatory requirement to the community since recently. However, the increased use of ICT facilities has led to higher energy consumption in all developed countries and contributes to environmental pollution. This study examines the level of awareness of green computing concept and practices among younger generation. A total of 94 secondary school students around the state of Selangor were sampled in this study. The data were collected using a set of questionnaires consisting of 20 items related to the harmful effects of using computers and communication gadgets to the environment, awareness of the concepts and practices of green computing to be used. The results show that high school students are still less aware of the concept of green computing. It is found that 54.35% of students do not know that computers and communication devices could be disposed of in an environmentally friendly way, and 61.96% do not know that computer hardware is reusable, while 75% of them do not have the experience to dispose of their computers. Interestingly, they only practice green computing in the context of reducing energy consumption in their daily life. In conclusion, students need to be educated on how to use of ICT facilities and a comprehensive green computing mechanism needs to be promoted to the younger generation for better environmental protection.

Keywords: Energy consumption, awareness, green computing, environmental pollution, secondary students.

Kitchen and Food Waste for Biogas Production: A Case Study in Bintulu, Sarawak

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ABSTRACT

Municipal solid waste (MSW) is generally known as daily trash or garbage consists of food waste, paper, glass, metal, textile, electronic devices, and used cooking oil. The non-recyclable waste materials from MSW actually can be utilized to generate renewable energy by converting them into useable heat, electricity or fuel. It is undeniable that the awareness of Malaysians towards MSW management is still at the lowest especially when dealing with kitchen and food waste in most restaurants and hotels. Therefore, a survey has been conducted among 130 owner of food premises in Bintulu, Sarawak, Malaysia which were randomly chosen regardless of gender and occupation. This survey has been conducted to determine the public awareness towards the MSW management which can be utilized for producing renewable energy in a biogas pilot plant. This paper is highlighting about the data collection related to kitchen and food waste in order to determine the potential of the waste to be used for biogas by referring to the past literatures. Food waste has become the largest portion of waste produced (46.7%) in Bintulu and most respondents prefer to dump the food waste into garbage bin (79.2%) instead of composting (6.2%). This will cause an increasing number of landfill sites that will harm the environment and human health. Other than that, this renewable energy resources are easily available from the household and residential area that will help the local communities to get extra benefit from the waste they produced such as electricity and cooking fuel.

Keywords: Food waste; municipal solid waste; renewable energy.

Food Premises' Awareness on Supporting the Production of Biodiesel from Used Cooking Oil in Bintulu Sarawak, Malaysia

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ABSTRACT

Recently, an inappropriate dumping of oil substance containing triglycerides into the water flows become huge trouble in the purification process towards waste water treatment. It leads to continuity of modification which then undergo a proper catalytic process with additional chemical formula and molecule restructure enhancing the waste to become a liquid product gasoline range named Biodiesel. function to vehicle engine as well as conventional fuel. A survey of used cooking oil (UCO) management among the food premises in Bintulu, Sarawak Malaysia was conducted in order to study their awareness on supporting the production of biodiesel. A survey questionnaire were distributed to 200 owner of variety food premises, which were randomly chosen with no regard to gender or occupation. 54.6% of the respondents were females and among them, 45.4% were males. It was found that 13.1% of the participants generates 5 L of UCO per day which shows promising frequency. The survey revealed that 8.4% of respondents discarded the UCO into dustbin while another 9.2% and 18.3% discarded the WCO onto soil and into drainage system, respectively. The remaining 48.1% sold the UCO and or consumed it completely in their cooking. In terms of health awareness, it was found that a majority of the respondents used the UCO 2-3 times before disposing it. In conclusion, our study shows that the respondents are lack-awareness about proper UCO management. Therefore, it is necessary to conduct a workshop to explain about the proper management of UCO.

Keywords: *Triglyceride; waste water treatment; catalytic process; used cooking oil (UCO); food premises; respondent.*

Environmental and Green Energy Awareness of Rural and Urban Schools Students in the Philippines

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ABSTRACT

Global advocacy on environmental sustainability strongly sheds light to solve the issue on exponential environmental degradation. Thus, educating 21st century learners with the vision of a sustainable future indeed serves as a crucial yet significant step towards the goal. This study identified the level of awareness of the urban and rural grade 8 Filipino students based on the seven environmental themes with green energy. An Environmental Awareness Questionnaire (EAQ) was deployed using a sample of 150 students from two urban private schools and 150 students from one rural public school. The descriptive statistics analysis revealed that the urban school students have high level of environmental awareness while rural school students expressed very high level of environmental awareness. However, no significant difference was identified between the students' environmental awareness using z-test statistical analysis. Students agreed that energy conservation is environment conservation and the use of indigenous energy sources help regulate the environment. Lastly, the study suggested the celebrations of the World Environment Day and Energy Conservation Week in schools.

Keywords: Green energy; environmental awareness; sustainability; environmental education.

Influence of Green Human Resources Management on Employee Engagement

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ABSTRACT

In today's era, companies are competing for talent and it is becoming a challenge for companies to attract and retain talents. Employee engagement can give positive outcomes to an organisation's overall performance. Nevertheless, due to so many variables that can influence employees' engagement; it presents a challenge to determine which factors should be given more focus and attention. Lack of understanding on the influence of employee engagement may cause decision makers in organisations to lack the ability to take appropriate actions to improve employees' engagement and performance in their organisation. Employers in Malaysia experience 70% of employee turnover mainly in SMEs. Hence, the objective of this study is to investigate the influence of green human resource management practices on employee engagement with the moderating effect of transformational leadership in SMEs in Malaysia. To achieve the research objectives, survey questionnaire will be distributed to obtain data from 138 respondents. These respondents are employees from EMS ISO 14001 certified SMEs in Malaysia from the states that has the highest percentage of SMEs such as Selangor, Wilayah Persekutuan Kuala Lumpur, Johor and Pulau Pinang. Melaka is also chosen for this study because it has already started on the route to sustainable urban development. The sampling technique employed in this study is area cluster sampling. Collected data will be analysed using SmartPLS software. A series of tests will be conducted to analyse and interpret the data. As a result, the findings from this study is expected to provide insights for managers to enhance employee engagement. On the other hand, this research is conducted to provide exposure to employers and their employees so that they will be more sensitive to the environmental issues.

Keywords: Employee engagement; green human resource management; transformational leadership.

Level of Awareness and Perception of Rural Society Related to Renewable Energy in Sarawak: A Preliminary Study

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ABSTRACT

The Sarawak Corridor of Renewable Energy (SCORE) was launched in 2008 that covers an area of 70, 709 km² with one of the objectives to improve per capita income of the citizen. Agriculture is a dominant feature of the longhouse residents in the state. Solar energy is also increasingly popular with the rural residents due to its increased accessibility. However, there is an unknown level of exposure and perception of rural society, especially in the longhouses. Hence, a survey method was conducted to assess 30 longhouse residents' level of knowledge on renewable energy. A set of questionnaires using the Likert scale was developed to understand the seven aspects of renewable energy namely, the knowledge, attitude, benefits, belief, utilization, risk and cost. The survey results at 85% confidence interval; the majority of longhouse residents are aware of solar energy as renewable energy. Moreover, they are willing to use renewable energy if it is accessible and available. Residents of the longhouse also believe that society and Malaysia would benefit significantly from renewable energy as it can reduce environmental pollution and help in the agricultural industry. In conclusion, the level of awareness of renewable energy for rural society in Sarawak is overall high although the residents have no prior experience using renewable energy, such as solar light, due to inaccessibility to the infrastructure.

Keywords: Renewable energy; longhouse; rural; perception; awareness.

Towards a Better Understanding of The Determinants of Households' Intention to Practise Solid Waste Segregation-at-Source: Developing a Theoretical Framework

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ABSTRACT

The level of the environment is gradually declining, especially with regard to the serious problem of solid waste. Solid waste segregation-at-source is seen as the most essential approach to helping the natural environment minimise the amount of waste generated before being transferred to waste disposal sites and landfills in many rapidly growing towns and cities in developing countries. However, a number of previous environmental-based research have focused only on the general scope of recycling, sustainable development, and the purchase intention for sustainable food products. This situation has led to useful and relevant information on the research scope of households' intention to segregate solid waste at source, which remains largely unanswered. The aim of this paper is, therefore, to provide a literature review to develop a novel theoretical framework with a detailed explanation of the application of the Theory of Reasoned Action, the Fietkau-Kessel Model, the Focus Theory of Normative Conduct, and the Value-Basis Theory to predict the relationship between attitude, subjective norms, environmental concerns, and environmental knowledge of households, to predict their intention to practise solid waste segregation-at-source. A better understanding of the potential mediator and moderator is needed to contribute to the body of knowledge on the causal relationship between the studied variables. In conclusion, the researchers discuss how the framework can be used to address future research implications as more evidence emerges.

Keywords: Theory of reasoned action; Fietkau-Kessel model; focus theory of normative conduct; Value-basis theory; intention; solid waste segregation-at-source.

Exploring the Relationship Between Determinants of Households' Intention to Practise Solid Waste Segregation-At-Source: A Conceptual Paper

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ABSTRACT

Previous research has reported that environmental knowledge plays an important role in enhancing general pro-environmental behaviour, as environmental knowledge appears to be the key indicator for increasing awareness of several pollution promulgations and other natural environmental issues. However, the significant role of environmental knowledge in the intention of households to practise solid waste segregation-at-source is not well understood. This research will, therefore, investigate the influence of environmental knowledge on the intention of households to engage in solid waste segregation-at-source. Further analysis will also be carried out explore the moderating effect of environmental knowledge in the relationship between the households' attitude and subjective norm (i.e. descriptive norm and injunctive norm) with the intention to practice solid waste segregation-at-source. The findings of this current research are expected to provide an essential opportunity to investigate knowledge gaps, to contribute to the enrichment of existing literature, as well as to provide important insights for local households and Malaysian government agencies to strengthen the sense of responsibility for environmental cleanliness.

Keywords: *Attitude; descriptive norm; injunctive norm; environmental knowledge; intention; solid waste segregation-at-source.*