

ABSTRACT BOOK

ICONGEET

4th International Conference on Green
Environmental Engineering and Technology

ICongETECH 2022

INTERNATIONAL CONFERENCE ON
GREEN ENGINEERING & TECHNOLOGY

17-18 NOVEMBER 2022

Seoul, South Korea

Organized By



UNIVERSITI
MALAYSIA
PERLIS



UTM
UNIVERSITI TEKNOLOGI MALAYSIA



APPLIED
INDUSTRIAL
ANALYTICS



UNIVERSITATEA
LUCIAN BLAGA
DIN SIBIU



PREFACE

The 4th International Conference on Green Environmental Engineering and Technology (IConGEET2022) and 4th International Conference on Green Engineering & Technology (IConGETech 2022) are the premier forum for the presentation of new advances and research results in the fields of Green Environmental and Technology, Engineering Design and Green Technology. The joint conference which will bring together leading researchers, engineers and scientists in the domain of interest from all around the world. The primary goal of the conference is to provide the opportunities for academicians, professionals, practitioners and policy makers in the engineering fields to share their thoughts and empirical works both to those involved in their field or those interested in the subject being researched.

The objectives of this conference are:

1. To provide a forum for researchers, educators, students and industries to share and exchange ideas and research findings in both fields of researches.
2. To give an opportunity to both academia and industries to communicate on problems faced in current research and the industries.
3. To create networks and stimulate potential collaborations between researchers in the same field of research.

CONFERENCE PROGRAM BOOK

Table of Contents

- Part I Welcoming Speech by Director, Center of Excellence Geopolymer and Green Technology (CEGeoGTech)**
- Part II Conference Schedule**
- Part III Technical Committee**
- Part IV General Information**
- Part V List of Abstracts**

Part I

WELCOMING REMARKS

Leader of CEGeoGTech & The Chairman IConGETech 2022

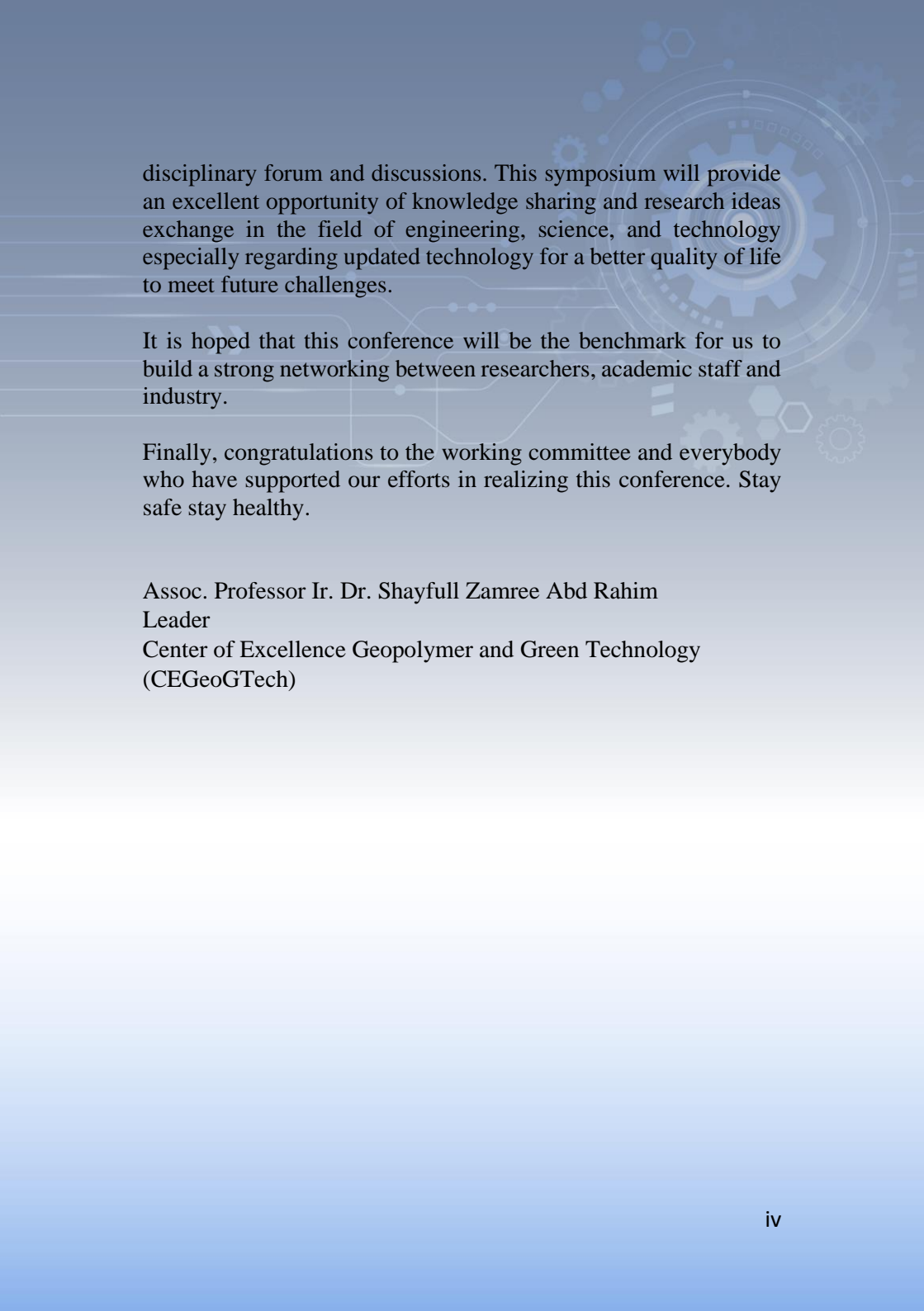


Bismillahirrahmanirrahim

Assalamualaikum Warahamatullahi Wabarakatuh

I would like to extend a warm welcome to all guests, speakers and participants to the 4th International Conference on Green Environmental Engineering and Technology (IConGEET) 2022 and 4th International Conference on Green Engineering & Technology (IConGETech) 2022 which organized by Center of Excellence Geopolymer and Green Technology (CEGeoGTech), Universiti Malaysia Perlis (UniMAP).

IConGEET 2022 and IConGETech 2022 aims to bring together technologist, researchers and professionals from the academic, industrial and public sectors in the context of multi and inter-

The background of the page features a light blue gradient with a complex graphic of overlapping gears, hexagons, and circuit-like lines in a darker blue shade, primarily concentrated in the upper right quadrant.

disciplinary forum and discussions. This symposium will provide an excellent opportunity of knowledge sharing and research ideas exchange in the field of engineering, science, and technology especially regarding updated technology for a better quality of life to meet future challenges.

It is hoped that this conference will be the benchmark for us to build a strong networking between researchers, academic staff and industry.

Finally, congratulations to the working committee and everybody who have supported our efforts in realizing this conference. Stay safe stay healthy.

Assoc. Professor Ir. Dr. Shayfull Zamree Abd Rahim
Leader
Center of Excellence Geopolymer and Green Technology
(CEGeoGTech)

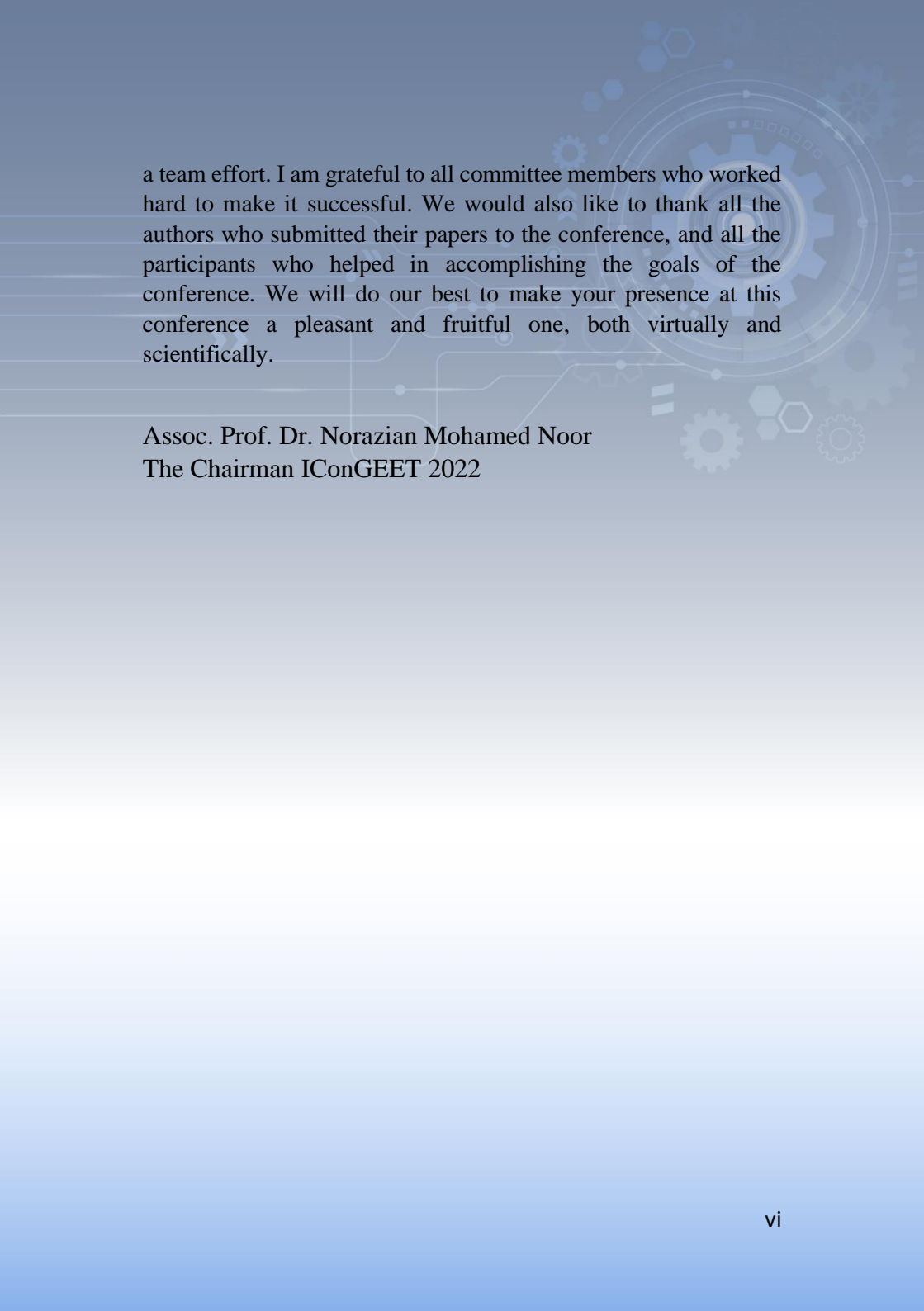
The Chairman IConGEET 2022



Bismillahirrahmanirrahim

Assalamualaikum Warahamatullahi Wabarakatuh

On behalf of the organizing committee, I would like to extend a warm welcome to all participants of 4th International Conference on Green Environmental Engineering and Technology (IConGEET) 2022. The aim of this conference is to provide a platform for knowledge sharing and interchange among researchers, academicians and industrial expertise in the furtherance of environmental engineering and technologies. As this year theme “Enhancing Sustainable Environment for Humanity: Challenges and Opportunities in the Post-Covid Era” I hope that the researchers and academician will be working together to help and support the government in ensuring a rapid recovery from the COVID-19 crisis and building resilience to future outbreaks. Putting together, the success of the conference is

The background of the page is a light blue gradient. In the upper right quadrant, there is a decorative graphic consisting of several interlocking gears of different sizes and colors (light blue, white, and grey). Overlaid on these gears are white lines representing a circuit board or network, with small circles at the nodes. The overall aesthetic is technical and modern.

a team effort. I am grateful to all committee members who worked hard to make it successful. We would also like to thank all the authors who submitted their papers to the conference, and all the participants who helped in accomplishing the goals of the conference. We will do our best to make your presence at this conference a pleasant and fruitful one, both virtually and scientifically.

Assoc. Prof. Dr. Norazian Mohamed Noor
The Chairman IConGEET 2022

Part II

Conference Schedule

17th November 2022 (Thursday) – Online Mode

TIME (MYT)	PARALLEL SESSION		
09:00 - 12:40	<p>Session 1: Green Technology</p> <p>Chairperson: Dr. Nurliza Rahim</p> <p>Link: https://meet.google.com/jqj-rirr-txu</p>	<p>Session 2: Environmental Sustainability and Development</p> <p>Chairperson: Ts Dr. Norlia Mohamad Ibrahim</p> <p>Link: https://meet.google.com/syy-udrc-zpa</p>	<p>Session 3: Water & Wastewater</p> <p>Chairperson: Assoc. Prof. Ts. Dr. Sam Sung Ting</p> <p>Link: https://meet.google.com/eaw-djhx-snh</p>
13:00	Lunch Break		
14:30 - 16:10	<p>Session 4: Environmental Management and Protection</p> <p>Chairperson: Dr. Norazrin Ramli</p> <p>Link: https://meet.google.com/zrt-nauv-jhf</p>	<p>Session 5: Air Pollution and Climate Change</p> <p>Chairperson: Associate Professor Ts Dr. Sara Yasina Yusuf</p> <p>Link: https://meet.google.com/byr-nuco-awg</p>	<p>Session 6: IConGETech</p> <p>Chairperson: Dr. Norshah Afizi Shuaib</p> <p>Link: https://meet.google.com/xhp-irpr-txf?hs=224</p>
16:15	End of Day 1		

18th November 2022 (Friday) – Face-to-Face Mode

Location: Hall Hotel Prince, 130 Toegye-ro, Jung-gu, Seoul, South Korea

Time (KST)	Session
0730	Arrival of guest and registration
	Opening Salutation by Director of CEGeoGTech, Universiti Malaysia Perlis
0800	Keynote 1: Associate Professor Ir Ts. Gs Dr. Chow Ming Fai School of Engineering, Monash University Malaysia, MALAYSIA. <i>Title: An efficient strategy for predicting dissolved oxygen concentration in reservoir: application of artificial neural network model</i>
0820	Invited Speaker 1: Dr György Deák and Dr. Monica Matei National Institute for Research and Development in Environmental Protection INCDPM, Splaiul Independentei Bucharest, ROMANIA. <i>Title: Measurements and statistical analysis of CO₂ efflux and related parameters from crop and forested lands</i>
0835	Invited Speaker 2: Dr Orathai Boondamnoen Department of Materials Science, Faculty of Science, Chulalongkorn University, Bangkok, THAILAND. <i>Title: Enhancement of surface hydrophobicity of natural rubber and fabric for oil removal</i>
0850	Invited Speaker 3: Dr. Madalina Boboc National Institute for Research and Development in Environmental Protection INCDPM, Splaiul Independentei Bucharest, ROMANIA. <i>Title: Development and implementation of a methodology for National Wastewater Surveillance System of SARS-CoV-2 in Romania</i>
0905	Invited Speaker 4: Ir. Ts. Dr. Nor Hasrul Akhmal Bin Ngadiman Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru, Johor, Malaysia <i>Title: Corrosion Inhibition of Musa Acuminata and its Synergism Effect of Halide Ions on Mild Steel in Acidic Environment</i>
0920	Invited Speaker 5: Dr. Elena Holban National Institute for Research and Development in Environmental Protection INCDPM, Splaiul Independentei Bucharest, ROMANIA. <i>Title: Captive growth analysis of Siberian sturgeon juveniles (Acipenser baerii J. F. Brandt, 1869) fed on a commercial fodder and its importance to a sustainable development of the aquaculture sector</i>
0935	Award giving ceremony and photograph session
1010	Parallel Session
1315	Keynote 2: Professor Dr. Aurel Mihail Țițu Department of Industrial Engineering and Management, Faculty of Engineering, "Lucian Blaga" University of Sibiu (ULBS), 10 Victoriei Street, 550024 Sibiu, Romania. <i>Title: The Implication of Artificial Intelligence in The Safety and Security (Cyber Security) Of Railway Transport</i>
13.45	End of Day 2

Part III

Technical Committee

ICongEET 2022 Technical Committees

Patron

Dato Prof. Ts. Dr. Zaliman Sauli

Advisor

Assoc. Prof. Ir. Dr. Shayfull Zamree Abd. Rahim

Chairman

Assoc. Prof. Ts. Dr. Norazian Mohamed Noor

Technical Committees

Prof. Ts. Dr. Ahmad Zia Ul-Saufie Bin Mohamad Japeri

Prof. Ts. Dr. Aeslina Abdul Kadir

Assoc. Prof. Ts. Dr. Norazian Mohamed Noor

Assoc. Prof. Ts. Dr. Irnis Azura Zakarya

Assoc. Prof. Ts. Dr. Ragunathan Santiagoo

Assoc. Prof. Dr. Sam Sung Ting

Ts. Dr. Norlia Mohamad Ibrahim

Ts. Dr. Sara Yasina Yusuf

Dr. Tengku Nuraiti Tengku Izhar

Dr. Nur Liza Rahim

Mrs. Roshazita Che Amat

ICongETech 2022 Technical Committees

Patron

Prof. Ts. Dr. Zaliman Sauli

Advisor:

Professor Ts Dr Mohd Mustafa Al Bakri Abdullah

Chairman:

Assoc. Prof. Ir. Dr. Shayfull Zamree Abd Rahim

Co-Chairman:

Ir. Dr. Irfan Abd Rahim

Ir. Mohd. Nasir Mat Saad

Technical Committees

Ir. Ts. Dr. Nor Hasrul Akhmal Bin Ngadiman (UTM, Malaysia)

Professor Aurel Mihail Titu (Lucian Blaga University of Sibiu, Romania)

Ir. Dr. Mohd Rashidi Bin Maarof (UMP, Malaysia)

Prof. Dr. Abdul Mutalib Bin Leman (UTHM, Malaysia)

Prof. Dr. Abdallah El-Hadj Abdallah (University of Medea, Algeria)

Dr. Mouloud Boumahdi (University of Medea, Algeria)

Professor Dr. Che Mohd Ruzaidi Ghazali (UMT, Terengganu)

Professor Dr hab. Marcin Nabiałek, Prof. PCz, (Politechnika Częstochowska, Poland)

Professor Dr hab. Katarzyna Bolch, Prof. PCz, (Politechnika Częstochowska, Poland)

Professor Dr hab. inż. Jerzy Wyslocki, (Politechnika Częstochowska, Poland)

Assoc. Professor Dr. Andrei Victor Sandu (TUIASI, Romania)

Assoc. Prof. Drs. Subaer, M.Phil., Ph.D (UNM, Indonesia)

Assoc. Professor Dr. Noorhafiza Muhammad (UniMAP, Malaysia)

Assoc. Professor Dr. Azlin Fazlina Osman (UniMAP, Malaysia)

Assoc. Professor Dr. Abdul Mutalib Leman (UTHM, Malaysia)

Assoc. Professor Ir. Dr. Mohd Arif Anuar Mohd Salleh (UniMAP, Malaysia)

Ts. Dr. Norazian Mohamed Noor (UniMAP, Malaysia)

Ts. Dr. Luqman Musa (UniMAP, Malaysia)

Dr. Rafiza Abdul Razak (UniMAP, Malaysia)

Muhammad Faheem Mohd Tahir (UniMAP, Malaysia)

Nurul Aida Mohd Mortar (UniMAP, Malaysia)

Mohamad Faisol Mohd Nor (UniMAP, Malaysia)

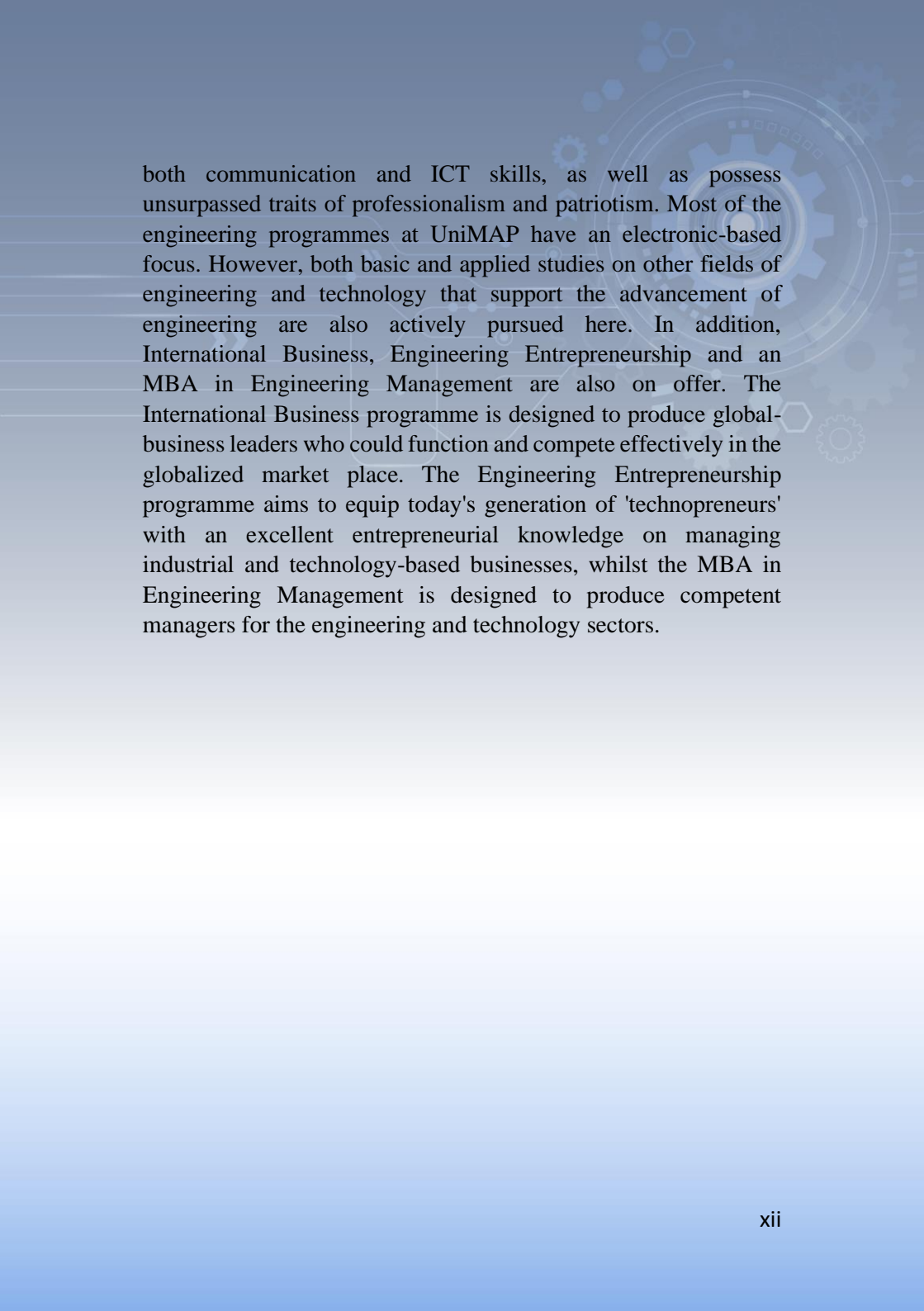
Part IV

General Information



About UniMAP

Universiti Malaysia Perlis (UniMAP) is Malaysia's 17th public institution of higher learning. It was approved by the Malaysian Cabinet on May 2001. Originally known as Kolej Universiti Kejuruteraan Utara Malaysia (KUKUM), or Northern Malaysia University College of Engineering, it was renamed as Universiti Malaysia Perlis (UniMAP) in February 2007. The first intake consisted of 116 engineering students who started classes on June 2002. Currently, UniMAP has approximately 11,000 students and a workforce of more than 1,700 academic and non-academic staff members. It offers 21 undergraduate programmes that lead to Bachelor in Engineering, one undergraduate programmes that leads to an Engineering Technology degree and two undergraduate programmes that lead to a Bachelor in Business. We also offers six Diploma in Engineering programmes and 13 postgraduate programmes that lead to Master of Science in Engineering and PhD degrees. UniMAP graduates are nurtured to become competent practitioners in their area of specialization and to have the confidence to explore entrepreneurial possibilities upon graduation. They are expected to not only exhibit excellence in the knowledge and skills that are directly related to their specialized fields of study, but also to demonstrate outstanding proficiency in

The background of the page features a light blue gradient. On the right side, there is a decorative graphic consisting of several interlocking gears of different sizes and colors (light blue and white). A large, faint circular graphic with a gear-like border is also visible, partially overlapping the text area.

both communication and ICT skills, as well as possess unsurpassed traits of professionalism and patriotism. Most of the engineering programmes at UniMAP have an electronic-based focus. However, both basic and applied studies on other fields of engineering and technology that support the advancement of engineering are also actively pursued here. In addition, International Business, Engineering Entrepreneurship and an MBA in Engineering Management are also on offer. The International Business programme is designed to produce global-business leaders who could function and compete effectively in the globalized market place. The Engineering Entrepreneurship programme aims to equip today's generation of 'technopreneurs' with an excellent entrepreneurial knowledge on managing industrial and technology-based businesses, whilst the MBA in Engineering Management is designed to produce competent managers for the engineering and technology sectors.

The background features a light blue gradient with a complex technical illustration. It includes several interlocking gears of various sizes, some with teeth and others as simple outlines. A network of thin white lines, resembling a circuit board or data paths, crisscrosses the page. Some lines terminate in arrowheads pointing right. There are also small hexagonal shapes and dots scattered throughout the design.

PART V

List of Abstract

**4TH INTERNATIONAL CONFERENCE ON GREEN
ENVIRONMENTAL ENGINEERING AND
TECHNOLOGY (IConGEET2022)**

And

**4TH INTERNATIONAL CONFERENCE ON GREEN
ENGINEERING & TECHNOLOGY
(IConGETech 2022)**

Air Pollution and Climate Change

Comparative Analysis of Machine Learning Techniques for SO₂ Prediction Modelling

W. N. Shaziayani^{1,*}, N. M. Noor², S. Azan³ and A. Z. UI-Saufie⁴

¹Faculty of Science Computer and Mathematics, Universiti Teknologi MARA, Cawangan Pulau Pinang, Malaysia.

²School of Environmental Engineering, Universiti Malaysia Perlis (UniMAP), 02600 Arau, Perlis, Malaysia

³Faculty of Science Computer and Mathematics, Kolej MARA Kulim, Kedah, Malaysia.

⁴Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, 40450 Shah Alam, Malaysia.

*shaziayani@uitm.edu.my

Abstract. Sulphur dioxide (SO₂) is produced both naturally and by human activity. The primary natural resource is derived from volcanoes. The burning of fossil fuels is the primary anthropogenic source (especially coal and diesel). Therefore, a reliable and accurate predicting method is essential for an early warning system for SO₂ atmospheric concentration. There are still limited studies in Malaysia that use machine learning methods to predict SO₂ concentrations. With the aid of machine learning, this study seeks to develop and predict future SO₂ concentrations for the next day using the maximum daily data from Klang, Selangor. RapidMiner Studio is the data mining tool used for this research work. Based on the results, it showed that the SVM model was the best guide to be used compared with the other five models (GLM, DL, DT, GBT, and RF). The performance indicators showed that the SVM model was adequate for the next day's prediction (R² = 0.77, SE = 8.26, REL = 18.69%, AE = 1.46, and RMSE = 2.82). The developed model in this research can be used by Malaysian authorities as a public health protection measure to give Malaysians an early warning about the problem of air pollution. The goal of predictive modelling is to make a reasonable prediction of the variable of interest, and frequently, to determine how much the independent variable contributed to the dependent variable. The results also showed that the previous SO₂ concentrations were one of the most influential parameters used to predict the future SO₂ concentrations.

Modified Linear Regression for Predicting Ambient Particulate Pollutants (PM₁₀) During High Particulate Event

I. A. M. Jafri^{1,2}, N. M. Noor^{1,2,*}, N. A. A. A. Rahim^{1,2}, S. E. Baidrulhisham¹, N. Ramli^{1,2}, A. Z. Ul-Saufie^{2,3} and G. Deak^{2,4}

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi
02600, Perlis, Malaysia

²Sustainable Environment Research Group (SERG), Centre of Excellence
Geopolymer and Green Technology (CEGeoGTech), Universiti Malaysia Perlis, Jejawi
02600, Perlis, Malaysia

³Faculty of Computer and Mathematical Sciences, Universiti Teknologi Mara (UiTM),
Shah Alam 40450, Selangor, Malaysia

⁴National Institute for Research and Development in Environmental Protection
INCDPM, Splaiul Independentei 294, 060031 Bucharest, Romania

*norazian@unimap.edu.my

Abstract. Particulate Matter (PM₁₀) is one of the most significant contributors towards haze or high particulate event (HPE) that occurs in Malaysia. HPE can severely affect human health, environment and economic so it is important to create a reliable prediction model in predicting future PM₁₀ concentration especially during HPE. Therefore, the aim of this study is to investigate the performance of modified linear regression models in predicting the next-day Particulate Matter (PM₁₀₊₂₄) concentration at two areas in the peninsular Malaysia namely, Bukit Rambai and Nilai. Hourly air quality dataset during historic HPE in 1997, 2005, 2013 and 2015 were used for analysis. Pearson correlation was used to select the input of the PM₁₀ prediction model where only parameters with moderate ($0.6 > r > 0.3$) and strong ($r > 0.6$) correlation with PM₁₀ concentration were selected as independent variables input in creating the multiple linear regression (MLR) model. The performance of modified linear regression model was evaluated by using several performance indicator which is Prediction Accuracy (PA), Index of Agreement (d_2), Root Mean Squared Error (RMSE) and Mean Absolute Error (MAE). The results show that the modified MLR (parameter with $r > 0.6$ included as input) gave the best prediction model for the next-day PM₁₀ concentration in both Bukit Rambai and Nilai.

Predicting Particulate Matter (PM₁₀) During High Particulate Event (HPE) using Quantile Regression in Klang Valley, Malaysia

N. A. A. Rahim^{1,2}, N. M. Noor^{1,2,*}, I. A. M. Jafri^{1,2}, N. Ramli^{1,2}, M. A. Kamaruddin³ and G. Deák^{2,4}

¹Faculty of Civil Engineering Technology, Universiti Malaysia Perlis, Kompleks Pengajian Jejawi 3, 02600 Arau, Perlis, Malaysia

²Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technologies (CEGeoGTech), Universiti Malaysia Perlis, Kompleks Pengajian Jejawi 2, 02600 Arau, Perlis, Malaysia

³School of Industrial Technology, Universiti Sains Malaysia, 11800 Pulau Pinang, Malaysia

⁴National Institute for Research and Development in Environmental Protection Bucharest (INCDPM), 294 Splaiul Independentei Street, 6th District, 060031 Bucharest, Romania

*norazian@unimap.edu.my

Abstract. Particulate matter (PM₁₀) is the key indicator of air quality index (API) during high particulate event (HPE). The presence of PM₁₀ is believed to have an adverse effect on human health and environment. Therefore, the prediction of future PM₁₀ concentration is very important because it can aid the local authorities to implement precautionary measures to limit the impact of air pollution. This study aims to compare the performances of two predictive models namely Multiple Linear Regression (MLR) and Quantile Regression (QR) in predicting the next-day PM₁₀ concentration during HPE. The hourly dataset of PM₁₀ concentration with other trace gases and weather parameters at Kelang and Petaling Jaya from the year of historic haze event in Malaysia (1997, 2005, 2013 and 2015) were obtained from Department of Environment (DOE) Malaysia. Three performance measures namely Mean Absolute Error (MAE), Normalised Absolute Error (NAE) and Root Mean Squared Error (RMSE) were calculated to evaluate the performances of the predictive models. From the results, QR model at quantile 0.3 and 0.6 was chosen as the best predictive tools for predicting the next day PM₁₀ concentration during haze event in Kelang and Petaling Jaya, respectively. showed better performance for the prediction of next-day PM₁₀ concentration in Kelang. These results indicate that QR can be used as one of predictive tool to forecast air pollution concentration especially during unusual condition of air quality.

Early Warning Landslide Detection System Using the Wireless Sensor Network Based on IoT

S. Ganesan¹, M. N. Mansor^{1,*}, R. M. Kawi¹, M. R.
Manan¹, H. Mokhtaruddin¹ and I. S. A. Mahyudin¹

¹Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis, UniCITI Alam
Campus, Sungai Chuchuh, 02100 Padang Besar, Perlis, Malaysia.

*naufal@unimap.edu.my

Abstract. A landslide is one of the natural disasters that occur because of the movement of rock and downslope of soil. The landslide monitoring system will be most recommended and main key for prevention of landslide disaster. So, the landslide monitoring system could help to save people whom living at hilltop. It will be helpful to prevent the loss of fatal and assets. This project suggested to develop the same design but for the better early warning landslide detection system using the wireless sensor network based on IoT. Here, this landslide monitoring system implementing by the soil moisture sensor, temperature and humidity sensor and vibration sensor. These three sensors will keep monitor the movement of soil for every 1 second. Furthermore, all the sensors will connect to Arduino Mega 2560. When changes occur in movement of soil, the Arduino Mega 2560 will transmit the data reading of sensors wirelessly via WIFI to Blynk application. So that, the ESP8266 WIFI module perform as a communication between Arduino Mega 2560 to Blynk application to send reading data of all sensors via WIFI. The Blynk application will generate early warning notification for every 1 second such as soil moisture increased or decreased, vibration detected or no detected and the temperature and humidity reading. In additional, the Arduino Mega also connected with liquid crystal display (LCD), light emitting diode (LED) and buzzer. The liquid crystal display (LCD), light emitting diode (LED) and buzzer will produce the output according to the parameters sensors has been set. The advantage of this project is the early warning will be sign in two ways of output. Even though, the Blynk application helps to produce early warning notification, at the same time the LCD, LED and buzzer will also make early warning signing people near to the landslide disaster by listening sound from buzzer or viewing from the condition or color type of LED obtain.

Kosi-Ganga-River-Creek 35 years' Additive Time Series and Seasonal Analysis using Remote Sensing Data

Tiyasha^{1,*}, S. K. Bhagat¹, B. O. Emmanuel¹ and K. Ramaswamy²

¹Faculty of Civil Engineering, Ton Duc Thang University, Ho Chi Minh City, Viet Nam

²Centre for Excellence-Indigenous Knowledge, Innovative Technology Transfer and Entrepreneurship, Dambi Dollo University, Ethiopia

*tiyasha.st@tdtu.edu.vn

Abstract. Climate change effect can be observed around the globe but the most devastation is faced by economically weak and farmers in India. Kosi-Ganga-River-Creek area has witnessed frequent flood and heavy rainfall over the years. The study area is the creek where Kosi and Ganga river joins together in the Katihar district of Bihar, India. The Kosi River is 720 km long and drains over an area of about 74,500 km² (28,800 sq mi) in Tibet, Nepal and Bihar. Two variables, total daily precipitation (P_{Tot}) and max daily air temperature (T_{max}) (remote sensing data) was fetched from ERA5 dataset using Google Earth Engine Coder to assess the climate change in the study area. The changes in T_{max} over the 30-year time period shows significant variability in temperature. T_{max} has peaked during the year of 1990, 95, 1998, 2004, 2008, 2012 and 2014 whereas a drop in T_{max} before and after such rise was observed in the series pattern. The exponential increase in the seasonal monthly P_{tot} also correlates with the temperature increase. However, the increase is more during non-monsoon seasons like January, February and march. Although significant reduction in P_{tot} can be observed during May, June, July, August and September. The changes in P_{tot} and T_{max} has caused severe damage to the agriculture and economy of the area. Thus it essential to study climate change and forecast the probable changes in future along with other climatological conditions to mitigate the extreme weather effect. Without proper study, monitoring, assessment and management policies in Bihar is most likely will continue to suffer due to agricultural losses, lively hood, life, economic losses and infrastructure. Moreover, Kosi River will be the sorrow for Bihar.

Measurements and statistical analysis of CO₂ efflux and related parameters from crop and forested lands

L. Laslo¹, M. Matei¹, M. Boboc¹, G. Deák¹, L. Cătuneanu¹ and N. Enache^{1,*}

¹National Institute for Research and Development in Environmental Protection,
 Bucharest, Romania

*natalia_andreea92@yahoo.com

Abstract. The LULUCF sector (land use, land use change and forestry) can act as a carbon dioxide (CO₂) sink, either by increasing the removals of greenhouse gasses from the atmosphere or by reducing their current emissions. This paper intends to analyse results of the CO₂ monitoring methodology by camber method in order to estimate the effect of different land use cover and management techniques. Thus, proper measures can be selected and implemented to increase the efficiency of GHGs storage in different types of land cover. For this purpose, seasonal CO₂ efflux field measurements were conducted along two types of ecosystems (forested land and wheat crop) located in the adjacent area of Bucharest. CO₂ efflux was analysed for each land cover in relation with physical characteristics of the soil, respectively soil temperatures and humidity, but also together with the main weather parameters. For the evaluation and comparison, the measurements were performed simultaneously in both land covers at relevant time intervals. Even the difference of measured values between the two ecosystems is recorded, the results of the statistical analysis showed a lack of differences by the correlation between the CO₂ efflux values measured during the beginning of the vegetation season in the two study areas. This indicates that the CO₂ efflux can be affected by particular elements of the environment spatial distribution which facilitates differences in soil temperature and humidity in the same weather conditions.

Analysis of the Results from the Applied Technologies for Carbon Dioxide Sampling in Aquatic Ecosystems

N. Enache¹, L. Laslo¹, M. Matei¹, M. Boboc^{1,*}, L. Cătuneanu¹ and G. Deák¹

¹National Institute for Research and Development in Environmental Protection,
Bucharest, Romania

*mada91mada@yahoo.com

Abstract. Globally, streams and rivers contain important stocks of carbon dioxide and release 1.8 ± 0.25 Pg of carbon each year. The literature review demonstrates unequivocally that wetlands carbon sequestration capacity and effluxes are not homogenous. Considering those differences, it is crucial to comprehend how these effluxes vary depending on the characteristics of open water plots and areas with vegetation along river basins and how different weather conditions affect the variation of CO₂ efflux. The purpose of this study was to analyse the various plots along Dambovita river's watercourse in order to better understand the fluctuation of the CO₂ efflux at the water-atmosphere interface and its dependent parameters. Here we describe CO₂ efflux data sets by applying two complementary methods using close chambers: dynamic by respiration chamber and static by injection kit. The efflux monitoring was carried out during the vegetation season, when the parameters of the recorded temperatures were increasing. Thus, we measured simultaneously with the CO₂ efflux the weather parameters (air temperature, precipitation, wind speed), but also the water quality parameters. In addition, the analysis performed contributes to a better understanding of how spatial and temporal variability of river characteristics impacts CO₂ effluxes.

Study of the Influence of Road Traffic Emissions on Air Quality in Sensitive Areas of the Bucharest City, using *Breeze Aermod* Software

G. Deak¹, M. Raischi^{1,*}, L. Lumînrăoiu¹, E. Holban¹, G. Tudor¹, N. Raischi¹ and R. Matache¹

¹National Institute for Research and Development in Environmental Protection,
 Bucharest, Romania

*raischimarius@yahoo.com

Abstract. Road traffic is one of the main causes of pollution in big cities due to a large number of vehicles and crowded intersections. Also, the lack of green spaces and the topography of the land can cause the accumulation of pollutants at the local level. Considering the increasing concern of the World Health Organization (WHO) regarding the negative impact of air pollution on the health of the inhabitants of large cities [1], the present paper aims to investigate the level of pollution in the areas of two educational units located near some crowded boulevards in the city of Bucharest. To carry out the work, the air quality was analysed by *in-situ* monitoring of the CO, PM10, and NO₂, indicators of atmospheric pollution that could come from road traffic. Also were estimate the contribution of the nearest pollution sources to the total concentrations of pollutants measured by air quality monitoring equipment.

Investigation of Indoor Air Quality by Incorporating Sewage Sludge Waste into Fired Clay Brick

N. S. A. Salim¹ and A. A. Kadir^{1,2,3,*}

¹Faculty of Civil Engineering and Built Environment, Universiti Tun Hussein Onn
Malaysia (UTHM), Parit Raja, Batu Pahat 86400, Johor, Malaysia

²Malaysia Center of Excellence Micro Pollutant Research Centre (MPRC), Universiti
Tun Hussein Onn Malaysia (UTHM), Parit Raja, Batu Pahat 86400, Johor, Malaysia

³Center of Excellence Geopolymer and Green Technology (CEGeoGTech), Universiti
Malaysia Perlis (UniMAP), Arau 02600, Perlis, Malaysia.

*aeslina@uthm.edu.my

Abstract. Generally, the production of sewage sludge waste has increased due to rapid growth of the population. Due to that, the disposal method has become crucial issues nowadays. Therefore, this research focuses on the investigation of indoor air quality of fired clay brick incorporating with sewage sludge. The bricks were incorporated with 0% and 5% of two type of sewage sludge and fired at 1050°C with heating rates 1°C/min. The experiment of Indoor Air Quality was obtained by measuring gases emissions of total volatile organic compound (TVOC), carbon dioxide (CO₂), carbon monoxide (CO), ozone (O₃), formaldehyde (HCHO) and particulate matter (PM₁₀) and were compared with Industry Code of Practice on Indoor Air Quality requirement standard. From the result shows that by incorporation of 5% of sewage sludge into fired clay brick complied with the standard requirement for building material usage with no negative effect to the environment. As the conclusions, the use of sewage sludge as clay replacement reduces the waste disposal in landfills and produce the low-cost building materials.

Environmental Management and Protection

Awareness Level and Challenges of Personal Protective Equipment Compliance by Malaysian Construction Workers

D. I. H. M. Roshidi¹, Z. A. Zawawi^{1,*}, M. K. A. Khalid¹, H. Aksah² and E. D. Ismail²

¹Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA, Perak Branch, 32610 Seri Iskandar, Perak, Malaysia

²Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

*zurahana@uitm.edu.my

Abstract. Construction industry is always known as an economic engine in every nation where it really plays a major and vital role in generating income and directly increase the job opportunities to the citizens. It also known as the most dangerous and hazardous workplace. There are many accidents that occur at the construction site due to the negligence of the workers in not implementing the Personal Protective Equipment (PPE) at the construction site. PPE is the equipment to protect the construction worker from any injuries, accidents, and fatalities. Implementation of PPE is very important for any person and should be choose wisely. Therefore, the aim of this research is to analyse the awareness level of PPE compliance by Malaysian construction workers. The objectives of this research are to evaluate the awareness level of workers regarding the PPE practice at construction site, and to identify the challenges of PPE practice at construction site. A quantitative method was applied by conducted questionnaire survey form and distributed to the person who have been working in construction sites at various level of position. The questionnaire had been responded by 64 number of respondents and the data is evaluated to achieve the objectives of the research.

Evaluation of the Ecological Risk and the Development of Antimicrobial Resistance Due to the Presence of the Macrolide Antibiotics Azithromycin and Clarithromycin in Romanian Aquatic Environment

M. Ilie¹, F. Marinescu¹, G. Ghita^{1,*}, I. Savin¹, G. Tudor¹, L. Luminariu¹, P. Gheorghe¹ and G. Dumitrescu¹

¹National Institute for Research and Development in Environmental Protection, 294 Splaiul Independentei, District 6, Postal Code 060031, Bucharest, Romania

*ginaghita@yahoo.com

Abstract. The presence of antibiotics in the aquatic environment can result in the emergence of antibiotic-resistant pathogens. In this paper, our aim was to identify, quantify and distribute macrolide antibiotics in the aquatic environment in the river basins of Arges-Vedea, Buzau-Ialomita and Dobrogea-Litoral and of the Danube River. In the Arges-Vedea river basin area, clarithromycin was detected most frequently, i.e. 58.62%, in the Buzau-Ialomita river basin area with a frequency of 92.31% azithromycin was detected, and in the Dobrogea - Litoral river basin area clarithromycin was detected with a frequency of 35.48%. The highest concentration of azithromycin, 559 ng/L and of clarithromycin 502 ng/L was recorded in the Buzau-Ialomita river basin. The ecotoxicological RQ_{ecotox} risk was also estimated, as well as the risk of developing antibiotic resistance of RQ_{AMR} pathogens, by the ratio of Measured Environmental Concentration (MEC) and Predicted No Effect Concentrations (PNEC). The study also aimed to investigate the prevalence of antibiotic resistance in potentially pathogenic bacteria isolated from aquatic environments. Thus, for β -lactam antibiotics, *E. coli* strains isolated from Danube River exhibited a very high level of resistance to ampicillin (51%) and high level to azithromycin (43%), cefazolin (38%), amoxicillin+clavulanic acid (36%) and cefoxitin (26%). Low and respectively, low level resistance was noticed for aztreonam (6%) and imipenem (4%).

Morphological Changes Analysis using 3D Bathymetric Surveys in Chilia Branch - Bystroe Channel Bifurcation Area

G. Tudor¹, G. Deák¹, M. Raischi^{1,*}, M. Arsene¹ and E. Holban¹

¹National Institute for Research and Development in Environmental Protection
 Bucharest, 294 Splaiul Independentei Blv, 060031, Bucharest, Romania

*raischimarius@yahoo.com

Abstract. The Bystroe Channel project with transboundary environmental impact in the Danube Delta, area of great ecological significance that has already a strong anthropic footprint, requires close monitoring of water quality parameters in order to determine their tendencies and their impact on the ecosystem components. Riverbed bathymetry surveys using multibeam echosounders are of high interest due to the data resolution and coverage capabilities that surpass the single-beam methods. Two riverbed elevation datasets, recorded in consecutive years, have been used to carry out morphological comparative analysis for the area where Chilia branch bifurcates in Bystroe Channel and Old Stambul. The analysis has been performed both on the bathymetry grids as a whole and on 3 longitudinal and 9 transversal river sections, showing the bifurcation influence on the erosion/deposition processes results.

Determination of the Hybridization Rate of *Acipenser stellatus* and *Huso huso* Based on Microsatellite Analysis

R. Matache¹, E. Holban^{1,*}, G. Deák¹, R. Prangate¹, M. Raischi¹, M. Matei¹, M. Boboc¹ and R. Popescu¹

¹National Institute for Research and Development in Environmental Protection
Bucharest, 294 Splaiul Independentei Blv, 060031, Bucharest, Romania

*holban.elena@yahoo.com

Abstract. On the basis of the *in situ* analysis of the sturgeon condition within the Lower Danube River, the aim was to carry out a research that would complement the results obtained from the monitoring and ultrasonic tagging methods. Thus, DNA samples were taken selectively from each ultrasonically tagged specimen in order to determine whether or not there is a possibility of hybridization between the species *Acipenser stellatus* and *Huso huso*. Thus, the microsatellite loci were investigated and certain parameters used to determine the degree of hybridism were determined.

Risk of Contamination of Sturgeon Species Along the Lower Danube with AcIV-E Virus from Sturgeons Raised in Aquaculture Systems

G. Deák¹, R. Matache^{1,*}, R. Prangate¹, G. Dumitrescu¹,
E. Holban¹, L. Lupea¹

¹National Research and Development Institute for Environmental Protection, Splaiul
Independenței 294, 060031 Bucharest, Romania.

*matache.razvan@incdpm.ro

Abstract. It is considered that most infections caused by pathogen agents in fish species raised in the closed medium like fishing farms originate from the natural environment, thus there are few information on virus transmission from species raised in aquaculture programs to the wild ones. This issue is important taking into account that the wild sturgeon populations are critically endangerment, and regarding to the IUCN Red List, two of these are already declared extinct. Within Danube Basin, environmental and anthropic factors series (reproduction habitats lost, hydrotechnical works) have caused the sturgeon distribution area to be restricted mainly in the lower segment of the river. In addition, intensive fishing or the introduction of invasive species have produced negative effects and hence the decrease in the population effectiveness. As result, from six native sturgeon species within Danube Basin, in our days, only four are still found. This review shall include an analysis of the status of knowledge, regarding the possible influence which the transmission of some viruses within sNCLDV from aquaculture species to the wild ones, also it shall propose an assessment of the risk of infection within Danube ichthyofaunal.

Assessing the Self Healings Properties of Nano -Ca(OH)₂ – TiO₂ – ZnO Materials used in Monuments Conservation Works

M. M. Andreea¹, G. Deák^{1,*}, G. F. Diana¹, G. Ionut¹ and M. Raischi¹

¹National Institute for Research and Development in Environmental Protection, 294 Splaiul Independentei, District 6, 060031, Bucharest, Romania

*dkrcontrol@yahoo.com

Abstract. Consolidants based on Ca(OH)₂ have been prepared as macro- and/or nanoparticles dispersed in different alcohols, regardless of the precursor nature. Their efficiency is related to the small dimensions of the particles and the dispersion media, which allows their penetration into the deteriorated material substrates, as well as to an increased reactivity towards CO₂. Besides the consolidating effect there is a strong need for the newly developed materials to also tackle other properties like self cleaning and antimicrobial activity, especially with regards to white monuments. In this context the present work highlights the effect of treating with stable alcoholic suspension containing nano - Ca(OH)₂ – TiO₂ – ZnO the physical support models consisting of mortar cubic samples from hydraulic / aerial lime, a commonly used materials in consolidation works.

Environmental Sustainability and Development

Reusability of Oil Palm Empty Fruit Bunches (EFB) Waste with Tapioca Starch for Polymer-Based Agriculture Application: A Preliminary Study

N. H. K. Rassman¹, S. H. M. K. Basha^{1,*}, R. M. S. R. Mohamed¹ and A. A. S. A. Algheethi¹

¹Faculty of Civil Engineering and Built Environment,
 Universiti Tun Hussein Onn Malaysia, Batu Pahat, 86400, Malaysia.

*maya@uthm.edu.my

Abstract. The existence of oil palm wastes has caused a significant disposal challenge, and it contains high fibre that is hard to disintegrate. Empty fruit bunches (EFB) contributes approximately 24 weights (wt.) % of solid waste in oil palm industries and has a high cellulose content. This study aims to find the best combination ratio of EFB fine fibre (EFBF) and tapioca starch for polymer production (EFBT) and its characterisation. The oil palm EFB waste was collected from Southern Malay Palm Oil Mill at Simpang Renggam, Johor, and shredded using an industrial fibre grinder. The EFBF and tapioca starch (TS) was combined using water and microwave heating according to the ratio generated using Response Surface Methodology (RSM), and the end homogenous pellet obtained was then analysed using Scanning Electron Microscopy (SEM) while the raw EFB fine fibre was analysed using Field Emission Scanning Electron Microscopy - Energy Dispersive Spectroscopy (FESEM-EDS). SEM analysis shows that the increasing homogenous interaction with less void was represented by respective EFBF to TS ratios 1:9, 1:5, 5:9, 5:5, 9:5, 5:1 and 9:1. The highest water contact angle recorded was 88.53° using ratio 1:9 followed by 40.35° using ratio 1:5, and no water contact angle obtained for 9:5, 5:5, 5:1, 5:9 and 9:1 ratios. The fastest rate of disintegration was recorded by 5:1 with 2712.000 g/day, while the slowest rate of disintegration was recorded by 9:1 with 1.206 g/day. The ANOVA analysis for water contact angle was significant as the p-values were <0.05, while for disintegration rate was not significant as the p-value was >0.05. However, although both models are unable to project optimised values for further testing, this study did provide a baseline for range selection for future study using RSM for optimisation of EFBF and TS.

Strength and Acoustics Properties of Lightweight Foamed Concrete Incorporating of Bio-based Aggregate

*M. K. Yew¹, X. W. Sieng¹, J. H. Beh¹, M. C. Yew¹, F. W.
 Lee¹ and Z. C. Yong¹

¹Lee Kong Chian Faculty of Engineering and Science, Universiti Tunku Abdul
 Rahman, Cheras, Kajang 43000, Malaysia.

*yewmk@utar.edu.my

Abstract. This paper investigates the incorporation of bio-based aggregate in lightweight foam concrete (LWFC). The aim of this research is to determine the strength and acoustics properties of lightweight foamed concrete incorporating 5% bio-based aggregate (LWFC-OPS5). A targeted density of 1100 +/- 100 kg/m³ of LWFC-OPS5 is produced and achieved compressive strength of 3 MPa. The effect of LWFC-CTR and LWFC-OPS5 is analysed in terms of the fire resistance test. A total of six mixes containing w/c ratios 0.52, 0.56 and 0.60 under 0% and 5% of OPS replacement were designed. From the result, LWFC-OPS5-0.52 showed the highest strength properties at 28 days, which are recorded at 3.59 MPa, 0.71 MPa and 1.75 MPa respectively. It also showed the highest density among the LWFC-OPS5 mix design which is 1180 kg/m³ under fresh density conditions. LWFC-OPS5-0.56 showed the most significant increase in compressive strength, splitting tensile strength and flexural strength at 28 days, which have an increment of 30 - 40% from 7 days' results. On the other hand, LWFC-OPS5-0.60 has increased about 36.81%, 32.73% and 63.83% of 28 days strength compared to LWFC-CTR. All cube specimens had achieved 3 MPa of compressive strength except LWFC-OPS5-0.60 due to its lowest fresh density. From the acoustics properties test results, LWFC-OPS5-0.56 had showed the most significant result and maximum sound absorption coefficient. Thus, this research proved that LWFC-OPS5 can be used for different applications such as wall panels, roof tiles, sound barriers and etc.

The Effect of Chemically Treated on Spent Mushroom Substrate (SMS)

*T. N.T. Izhar^{1,2}, M. R. M. Adi¹,
 N. M. Ibrahim^{1,2}, N. A. Aziz³ and H. Hadiyanto⁴

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis (UniMAP), Arau 01000, Perlis, Malaysia

²Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technology (CEGeoGTech), Universiti Malaysia Perlis (UniMAP), Arau 01000, Perlis, Malaysia

³Faculty of Chemical Engineering & Technology, Universiti Malaysia Perlis (UniMAP), Arau 01000, Perlis, Malaysia

⁴Center of Biomass and Renewable Energy (C-BIORE), Department of Chemical Engineering, Diponegoro University, Jln. Prof. H. Soedarto, SH, Tembalang, Semarang, Indonesia

*nuraiti@unimap.edu.my

Abstract. Spent mushroom substrate (SMS) is a by-product of the mushroom industry that is mostly composed of lignocellulosic agricultural leftovers. SMS is rich in nutrients and contains cellulose (38–46.6%), lignin (25–34.5%), hemicellulose (19–27.7%). The main aim of this research covered the characterization of SMS, analysis of lignocellulosic content before and after pre-treatment, analysis effect of different NaOH concentration with difference molarity 1.0 to 5.0 Molar and analysis of surface morphological using Scanning Electron Microscope (SEM). The result that comparison between untreated and treated sample The result for untreated are contain high amount of lignin from 23.85% to 27.39% and for treated are amount reduce from 20.6% to 23.85%. The difference of NaOH concentration from 1.0 to 5.0 Molar, so the best pre-treatment is alkaline pre-treatment from 1.0 to 3.0 M are the best concentration to treat SMS sample from alkaline pre-treatment and proved sodium hydroxide pre-treatment as an effective method to reduce the hemicellulose and lignin contents. The images clearly demonstrated that the pre-treatment could change the biomass structure and distorted the expected to increase the available surface area for the enzymatic attack. The surface of the pretreated SMS showed many irregular cracks and pores. The results of the study showed that SMS from the species *P. sajor-caju* has the potential to assist as a new glucose feedstock for the manufacture of bioethanol.

Solid Waste Characterization for Identifying Recyclable Materials at Peruvian Military Headquarters

J. Balbuena^{1,2}, H. Segura¹, G. Rojas¹ and J. Sosa¹

¹Science and Technology Direction, Ejercito del Peru, San Borja - Lima 15037, Peru

²Engineering Department, Pontificia Universidad Catolica del Peru, San Miguel - Lima 15088, Peru

*jsosao@ejercito.mil.pe

Abstract. In Peru the solid waste management is an important task for the government, which have been increasing over the years; however some activities of the solid waste management are not performed. Most of the solid waste ends incinerated or in the landfill, in consequence recyclable material are not recuperated and reused. According to the Peruvian Ministry of Environment only 1.9% of the usable materials were recycled, and public institutions are not unrelated to this recycling issue. The Peruvian Military Headquarter is a public institution focused mainly in all the administrative work of the Peruvian army, so most of the solid waste is office material with high potential to be recycled. In this article, a solid waste segregation and characterization process was included in the former solid waste management of the Peruvian Army Headquarters with the purpose of identifying potential recyclable materials. The results of the characterization and segregation process allowed to recognize three (03) classes of recyclable solid waste, in addition, it was estimated that an approximate of 798 kg of usable material is produced per week at the military facilities.

Effects of Physical and Mechanical Properties of Soft Soil on Subgrades Performances in Lubuk Bayas Village, Serdang Bedagai Regency

*N. Juliana^{1,2}, N. F. Bawadi²

¹Department of Civil Engineering, Politeknik Negeri Medan, Indonesia

²Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Perlis Malaysia

*nova7uliana@gmail.com

Abstract. Generally, the existence of soft soil in Indonesia will be a problem in the construction of highway construction. One factor that influences and needs to be known in road construction is the characteristics of the subgrade where the pavement construction will be placed on it. Poor soil characteristics can cause bumpy road surfaces, cracks, or other road damage. Therefore, before carrying out a soil improvement, it is necessary to know its characteristics through the physical and mechanical properties of the subgrade. This research was conducted in Lubuk Bayas Village, Serdang Bedagai Regency, North Sumatra Province. Tests of physical properties in this study include sieve analysis, water content, specific gravity, plasticity limit test, and liquid limit test. The soil shear strength test and California Bearing Ratio (CBR) test were carried out to test the mechanical properties using a Dynamic Cone Penetrometer (DCP). From the results of testing the physical properties of the soil, it was found that Samples 1, 2, and 3 were fine-grained soils with the percentage of soil passing the No.200 sieve greater than 50%. The USCS classification system shows that samples 1 and 2 of the soil are in the Lean Clay (CL) group, while sample 3 is in the Fat Clay (CH) group. Samples 1, 2, and 3 include soils with high plasticity because the PI value is >17. The results of testing the mechanical properties of the soil Sample 1 obtained the value of $c = 0.1299 \text{ kg/cm}^2$ and $\phi = 13.2^\circ$, in Sample 2 obtained the value of $c = 0.1075 \text{ kg/cm}^2$ and the value of $\phi = 11.2^\circ$ and in Sample 3 obtained the value of $c = 0.1275 \text{ kg/cm}^2$ and the value of $\phi = 11.9^\circ$. DCP testing on samples 1, 2 and 3 obtained CBR values of 5.35%, 4.73% and 3.15%. From the CBR results, it can be seen that the soil in this location has a low soil bearing capacity, so if it is to be used as a subgrade layer, it will be necessary to repair the soil first so that structural damage does not occur in the future. Soil improvement can be made by stabilizing the soil using natural materials to maintain environmental sustainability. Natural materials that can be used include sand with certain gradations, stone ash, palm shell ash, and various other natural materials.

Experimental Comparison Between Soil Used in Lahd and Shiq Method In Explosive Pressing Test

A. R. Othman^{1,*}, A. H. Hilmi¹ and M. S. Zakaria¹

¹Faculty of Mechanical Engineering Technology, Universiti Malaysia Perlis, Kampus Tetap Pauh Putra, 02600 Arau, Perlis, Malaysia

*rashidothman@studentmail.unimap.edu.my

Abstract. Explosive pressing of specimen was done by two different method which are Shiq method and Lahd method. Shiq and Lahd is the name for two types of Muslim burial method. Shiq method refers to the shallow trench being dug at the center bottom of burial ground while Lahd refer to a recess be dug at the side soil wall. During blast test, a hole was dug and the specimen is place at the center trench of the hole just like Shiq method. Shiq method is adopted because to take effect of confined explosion and also making the specimen fix at their position. Usually, the hole was dug about 1 meters depth and area 1.5m x 1.5 m. The specimen was buried with same soil being dug before. Thus, the soil are loose soil. However, occasionally, when the explosive used was large, the specimen and apparatus was thrown to the surface. Sometimes some parts are missing. To overcome this problem, Lahd method was used. Explosive and apparatus was inserted into the Lahd. During explosion, the hard soil from the original hole can sustain the blast and also saves the apparatus from being thrown. This paper shows the comparison between both methods in terms of simulation and procedure of work. During explosive pressing test, explosive is place at the top center of apparatus to make sure specimen get the impact from energy generated by the explosive which is transferred through the apparatus. To compare both method, AUTODYN software will be used to simulate pressure impact from the explosive energy. The experiment explosion process will be carried out by using type of explosive Emulex 180 with velocity of detonation 4500m/s to 5700m/s, Explosive energy 4.17 MJ/kg, density 1.13 g/cc to 1.21 g/cc and initiation were used are No. 8 Detonator.

Differential Display Reverse Transcription Polymerase Chain Reaction (DDRT-PCR) for Grey Oyster Mushroom Samples Grown with Acoustic Sound Treatment

T. K. Song¹, N. E. M. Zamri¹, R. Ibrahim¹, J. A. Mohtar¹,
H. Abbas² and A. M. A. Rahman^{1,*}

¹Faculty of Chemical Engineering and Technology, Universiti Malaysia Perlis,
Kompleks Pusat Pengajian Jejawi 3, 02600 Arau, Perlis, Malaysia.

²School of Economics, Finance and Banking, UUM College of Business, Universiti
Utara Malaysia, 06010 UUM Sintok, Kedah Darul Aman, Malaysia.

*mukhlis@unimap.edu.my

Abstract. Grey oyster mushroom is the most often farmed and marketed type of mushroom for household consumption in Malaysia. The mushroom cultivation takes a long time due to its complicated mycelium growth. Several treatments were introduced such as acoustic sound treatment to increase the growth rate and quality of the crop, but there is no in-depth study regarding the genetic expression of the genes affected. This study aims to evaluate the Differential Display Reverse Transcriptase-Polymerase Chain Reaction (DDRT-PCR) for grey oyster mushroom samples grown with acoustic sound treatment. The mushroom was subjected to the treatment and the RNA was extracted from the mushroom samples and converted into cDNA before undergoing DDRT-PCR. Ten Differential Expressed Transcripts (DETs) that were successfully identified based on the differences between the intensity and absence of amplicons were sent for gene sequencing and BLAST through the NCBI database to obtain relevant results regarding the possible gene annotation. Seven out of ten DETs hit potential genes encoding for housekeeping and structural and development functions. The results showed that acoustic sound treatment did affect the expression of certain genes differently as captured by DDRT-PCR analyses and offers new ideas for the development of ecological agriculture.

Eco-friendly Concrete Prepared With Low Energy-treated Sugarcane Bagasse Ash: A Study of Compressive Strength and Porosity

*D. H. Le¹, Y. N. Sheen² and M. T. Tran¹

¹Sustainable Developments in Civil Engineering Research Group, Faculty of Civil Engineering, Ton Duc Thang University, Ho Chi Minh City, Vietnam.

²Department of Civil Engineering, National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan, ROC.

*leduchien@tdtu.edu.vn

Abstract. In sugar industries, sugarcane bagasse (SBA) ash is discharged as a by-product, growingly dumped in opened lands, and causing environmental pollution. The agricultural ash can be beneficially used as advanced cementitious material due to containing of significant amount of pozzolanic oxides like silica, alumina, etc. The present study addresses to enhance suitability of SBA as cement replacement (5%, 10%, 15%, 20%, by mass) in concrete production. For this purpose, SBA was first treated by sieving through the No. 100 sieve and burning at 700 oC for 1 h before use. Physical and chemical characteristics of the resulting ash was characterized. Three SBA-blended cementing concrete series with different in water-binder ratios ($w/b= 0.3, 0.4, 0.5$) are developed; and properties of the concrete containing SBA in fresh and hardened states have been evaluated. The testing results show that, Portland cement replacement by SBA at 10% or greater causes a drop in slump of blended concrete. Mix series with the w/b of 0.3 performs a fast strength development, reaching mostly the 28-day strength after 7 days of curing only. Moreover, incorporating SBA at 20% leads to a strength loss of 25–27% relative to the respective control, determined at 91-day age. The strength results are confirmed by the measurement of the void ratios within concrete matrix, using optical microscope technique; the logarithmic function could be a good fit for compressive strength –porosity correlation.

Precipitation Variations in the Central Vietnam to Forecast using Holt-Winters Seasonal 1 Additive Forecasting Method for 1990 to 2019 Trend

S. K. Bhagat^{1,*}, Tiyasha¹ and K. Ramaswamy²

¹Faculty of Civil Engineering, Ton Duc Thang University, Ho Chi Minh City, Viet Nam.

²Centre for Excellence-Indigenous Knowledge, Innovative Technology Transfer and 7 Entrepreneurship, Dambi Dollo University, Ethiopia.

*bhagatsurajkumar.st@tdt.edu.vn

Abstract. Precipitation played a vital role in the landslide events, water cycle, irrigation management, agriculture yield. The major factor is the extreme weather such as temperature played a vital role in it. The highest Precipitation i.e. 260.83 and 112.96 mm in the month of September and November for Danang and Pleiku, respectively; and total sum of 66550.51 and 34118.38 mm over the period for Danang and Pleiku, respectively. Danang is with higher Precipitation in lesser number of events, and Pleiku is with lower Precipitation though more number of events. Holt-Winters Seasonal Additive Forecasting method revealed the potential forecasting method for the different statistical characteristics data set. Lag plot showed the higher positive as well as the negative lag quartile. Residual error plot present to support the applied model feasibility. Weakness of the study and the future objective of the study drafted.

Optimum Binder Content of Asphaltic Concrete (ACW14) Mixture Incorporating Limestone

S. A. Mohammed^{1,2,*}, A. G. Ahmad¹, R. Santiagoo^{1,3}, V. Vijejan⁴, W. A. A. W. Ahmad^{1,2}, R. Ahmad^{1,2} and S. K. Lim¹

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

²Water Research Group (WAREG), Universiti Malaysia Perlis (UniMAP), 02600 Arau, Perlis, Malaysia

³Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technologies (CEGeoGTech), Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

⁴Faculty of Electronic Engineering Technology, Universiti Malaysia Perlis, Kampus Induk Pauh Putra, Pauh, Perlis

*syakirahafiza@unimap.edu.my

Abstract. Due to the high demand for natural aggregates in pavement construction, researchers have been looking for alternative materials to replace natural aggregate. In this research study, the optimum binder content of asphalt mixture incorporate limestones was investigated. the optimum binder content of asphalt mixture was tested according to Marshall method. About 20 % of limestone was used as aggregate replacement in asphaltic concrete mixture. To determine the stability, volumetric properties, and bitumen binder content, three percentage of asphalt binder content, namely 4.0%, 5.0% and 6.0% was prepared. From analysis, it indicated that stability and volumetric properties of asphalt mixture incorporate limestone meet the requirement set by JKR. From the result obtained, the optimum binder content of the control sample is 5.0% and optimum binder content of limestone mixture is 5.2%. The slightly different in optimum binder content value indicate that the optimum binder content of limestone mixture was comparable with control mixture.

Insights of *Derjaguin Landau Verwey Overbeek* (DLVO) theory in Microplastics' Coagulation-flocculation Colloidal Dispersion Behaviour: A Brief Review

A. A. F. Yap¹, N. N. J. Basha¹ and M. S. Osman^{1,*}

¹EMZI-UiTM Nanoparticles Colloids & Interface Industrial Research Laboratory (NANO-CORE), Centre for Chemical Engineering Studies, Universiti Teknologi MARA, Cawangan Pulau Pinang, Permatang Pauh Campus, 13500 Pulau Pinang, Malaysia.

*syazwan.osman@uitm.edu.my

Abstract. For the past decades, the studies on microplastics have rose dramatically since their adverse impacts and omnipresence on human health and environment has become the major concern. One of the techniques utilized to remove microplastic efficiently is coagulation-flocculation process. This brief review highlighted on determination of critical coagulation concentration (CCC) in by employing Derjaguin Landau Verwey Overbeek (DLVO) theory. The data obtained from experiment will be supported with DLVO Theory to provide insights to two critical informations in coagulation-flocculation of microplastics, namely to determine the optimal parameter of coagulant to remove microplastic from aqueous and predict the critical coagulation condition for microplastic removal based on DLVO Theory. In summary, the critical coagulation concentration (CCC) parameter is vital in determining design process for an efficient microplastic removal in water using coagulation-flocculation process.

Recent Advances on the Adsorption Mechanism Between Microplastics and Emerging contaminants: A Mini review

M. I. Nizam¹, S. N. A. S. M. Shukri¹ and M. S. Osman^{1,*}

¹EMZI-UiTM Nanoparticles Colloids & Interface Industrial Research Laboratory (NANO-CORE), Centre for Chemical Engineering Studies, Universiti Teknologi MARA, Cawangan Pulau Pinang, Permatang Pauh Campus, 13500 Pulau Pinang, Malaysia.

*syazwan.osman@uitm.edu.my.

Abstract. Pharmaceuticals and microplastics have long been identified as water pollutants. Pollutants, including pharmaceutical compounds, have been shown to be transported by microplastics (MPs). In this mini-review, adsorption mechanism between microplastics and emerging contaminants were highlighted. Polyethylene is a non-polar, semi-cystalline microplastic with a density of 240 to 244 kg/m³. Besides, Ibuprofen adsorption onto Microplastics is pH dependent. Non-polar or neutral compounds that are homogeneous and extremely hydrophobic in nature interact with non-polar and weakly polar plastics such as Polypropylene and Polyethylene. Furthermore, Molecular dynamic (MD) simulation can be employed to investigate the mechanism of interaction between MPs and contaminants. As a result, some studies show a complex interaction between PE and certain contaminants, with no significant differences in adsorption energies, but sulfamethazine molecules effectively adsorbed on the MPs surface. In summary, this mini review shed lights on the insights of adsorption mechanism between these compounds.

Captive Growth Analysis of Siberian Sturgeon Juveniles (*Acipenser baerii* J. F. Brandt, 1869) Fed on A Commercial Fodder and Its Importance to A Sustainable Development of the Aquaculture Sector

G. Deák¹, L. Burlacu¹, L. Lumânăroiu¹, A. Jawdhari², I. Petrache¹, M. Raischi¹ and H. Elena¹

¹National Institute for Research & Development in Environmental Protection, 060031 Bucharest, Romania

²Department of Anatomy, Animal Physiology and Biophysics, Faculty of Biology, University of Bucharest, Bucharest, Romania

*holban.elena@yahoo.com

Abstract. Sturgeon aquaculture is an important continuously developing sector within freshwater aquaculture and its sustainability is one of the most pressing matters nowadays. Thus, the urge to apprehend the mechanics of sturgeon growth in captivity as well as in nature is of immediate importance, considering the increase in customers' requests for captive-grown sturgeon meat, caviar, and adjacent by-products. The present study evaluates several canonical growth indices in a controlled, indoor environment that included fluctuations in temperature, dissolved oxygen saturation, and ponderal density (g/L), known to affect sturgeon growth performance. Over the 91 days of evaluation, no significant correlation was found between the weight gain and the ponderal density, dissolved oxygen values, and temperature, among the 4 tanks used in the experiment setup, indicating, along with the lack of significant variance for the RCI per tank, that the growth observed is correlated only with the fodder fed to the fish.

Car Dependency of Perlis Residents

N. A. S. Nordin¹, *S. A. Mohammed^{1,2}, R. Santiagoo^{1,3},
V. Vijean⁴, W. A. A. W. Ahmad^{1,2}, R. Ahmad^{1,2} and A. G.
Ahmad¹

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

²Water Research Group (WAREG), Universiti Malaysia Perlis (UniMAP), 02600 Arau, Perlis, Malaysia

³Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technologies (CEGeoGTech), Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

⁴Faculty of Electronic Engineering Technology, Universiti Malaysia Perlis, Kampus Induk Pauh Putra, Pauh, Perlis

*syakirahafiza@unimap.edu.my

Abstract. The number of Malaysians who rely on motorized vehicle is growing over time. Cars accounted for 47.3 percent of the 33.3 million registered vehicles. Aside from contributing to traffic congestion, an increase in registered motorised vehicles has a negative impact on environmental sustainability due to increased fuel consumption and emissions of air pollution and greenhouse gases. This study was conducted to demonstrates Perlis residents' reliance on car as their primary mode of transportation in daily life. Data was collected through a survey and has been distributed around Perlis. Around 100 residents in Perlis were randomly selected as respondent in this research. The objective in this study is to determine the car-dependency of Perlis residents and the factors that contributed to it. The findings shows that time, distance, weather, and emotion influence the car usage among Perlis residents. The findings also shows that the Perlis resident are not willing to change the mode of transport from car as motorised vehicle to non- motorised vehicles.

Removal of Chromium (VI) in Aqueous Solution by Char Adsorbent Derived Plastic Waste

N. R. Othman¹, N. W. A. Z. Najib^{1,2,*} and A. N. Kamarudzaman^{1,2}

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi, 02600 Arau, Perlis, Malaysia.

²Centre of Excellence, Water Research and Environmental Sustainability Growth (WAREG), Universiti Malaysia Perlis, 02600 Arau, Perlis, Malaysia

*norwahidatul@unimap.edu.my

Abstract. This study was carried out to evaluate the environmental application of char and activated char derived from polyethylene terephthalate (PET) through the experiment removal of chromium hexavalent, Cr (VI) ion from aqueous solution. The aim was to find the optimal condition of Cr (VI) removal from aqueous solution under different treatment conditions namely pH, contact time, agitation speed, adsorbent dosage, and initial concentration. The diameter of the charcoal produced was 600 µm. The results showed that, 80 % and 90 % of Cr (VI) removal was achieved using char and activated char, respectively, at pH 5, 150 rpm, 60 min. of contact time, 0.5 g of dosage adsorbent and 0.1 mg/L of initial concentration. The removal of Cr (VI) was mainly affected by optimal condition and physical and chemical properties of the charcoal. Adsorption isotherms (Langmuir v Freundlich) were used to model the adsorption behaviour and to calculate the adsorption capacity of the adsorbents. The adsorption isotherms plots were well fitted with Langmuir model.

Co-combustion Waste to Concrete Material: Potential Study of Chemical Characterization of Coal Fly and Bottom Ash

N. L. Rahim^{1,2,*}, S. A. Mohammed¹, R. C. Amat^{1,2}, N.
 M. Ibrahim^{1,2}, M. A. A. Uzair¹, N. A. Mison³,
 N. Hamzah⁴, S. Salehuddin¹ and R. Fikri⁵

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600
 Arau, Perlis, Malaysia.

²Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green
 Technologies (CEGeoGTech), Universiti Malaysia Perlis, Jejawi, 02600 Arau, Perlis, Malaysia.

³Department of Civil Engineering, Faculty of Engineering, Universiti Pertahanan
 Nasional Malaysia, Kem Sungai Besi, Sungai Besi, Kuala Lumpur, 57000, Malaysia.

⁴School of Civil Engineering, College of Engineering, Universiti Teknologi MARA,
 Selangor, Shah Alam, 40450, Malaysia.

⁵Department of Civil Engineering, Kullyyah of Engineering, International Islamic
 University Malaysia, 50728, Kuala Lumpur, Malaysia.

*nurliza@unimap.edu.my

Abstract. This research focuses on the chemical properties of coal fly ash (CFA) and coal bottom ash (CBA) obtained from Sultan Salahuddin Abdul Aziz Shah Power Plant Station and compares them with the characteristics of Ordinary Portland Cement (OPC). In Malaysia, coal has been identified as an important source of fuel, where it is widely used in the production of electricity, steel and cement manufacturing. There are various types of coal ash that are produced from coal combustion during the electricity generation process such as fly ash, bottom ash, boiler slag and clinker. However, the major coal ash waste products that have been produced are fly and bottom ash. Therefore, several tests have been conducted in order to determine the chemical properties of fly and bottom ash such as Energy Disperse X-Ray (EDX), Mineralogy (XRD) and X-Ray Fluorescence (XRF) in the effort to produce sustainable concrete material from waste. SEM image shows that fly ash has a spherical and regular shape and smaller particles compared to bottom ash and cement. Energy Dispersive X-Ray (EDX) analysis shows that fly and bottom ash from Sultan Azlan Shah power station contains several elements such as Silicon (Si), Aluminium(Al), Oxygen (O), Calcium (Ca), Titanium (Ti), Iron (Fe), Magnesium (Mg), Potassium (K), Carbon (C) and Sodium (Na). X-ray Diffraction (XRD) results indicate that the fly ash is mainly an amorphous material with the presents of crystalline phase of quartz (SiO₂) at 24.3% and bottom ash at 31.1%. For the mullite phase (3AlO₃.2SiO₂), fly and bottom ash show results of 24.9% and 14.5%, respectively. X-ray fluorescence (XRF) analysis showed that fly and bottom ash is mostly composed of Silica, Iron, and Alumina. A high percentage sum of SiO₂, Al₂O₃ and Fe₂O₃ in fly ash shows that it is a Class F. OPC has a high value of CaO. In conclusion, CFA and CBA from Sultan Salahuddin Abdul Aziz Shah Power Plant Station can be utilized as cement replacement with suitable composition and material preparation.

Potential Study on the Co-combustion Waste of Coal Fly Ash as a Concrete Material

N. L. Rahim^{1,2,*}, N. M. Ibrahim^{1,2}, R. C. Amat^{1,2}, S. A. Mohammed¹, M. A. A. Uzair¹, N. M. Noor^{1,2} and N. A. Misnon³

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

²Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technologies (CEGeoGTech), Universiti Malaysia Perlis, Jejawi, 02600 Arau, Perlis, Malaysia.

³Department of Civil Engineering, Faculty of Engineering, Universiti Pertahanan Nasional Malaysia, Kem Sungai Besi, Sungai Besi, Kuala Lumpur, 57000, Malaysia.

*nurliza@unimap.edu.my

Abstract. About 8.5 million tonnes of bottom ash and fly ash are produced as coal ash waste in Malaysia. Reusing this waste rather than having it landfilled is a sustainable choice. The main objective of this research study was to assess their use in the process of replacing cement with fly ash. This research focuses on the chemical, physical and mechanical properties of coal fly ash (CFA) obtained from Sultan Azlan Shah Power Plant, Manjung Perak. Fly ash was substituted for 5%, 10%, and 15% of the mass of regular Portland cement to produce concrete specimens. The qualities of the experimental specimens were identified in both their fresh and hardened states. From the SEM result, fly ash has smaller particles and a spherical, uniform shape than bottom ash and cement. According to an X-ray fluorescence (XRF) investigation, the main constituents of fly ash are silica, iron, and alumina. Fly ash is classified as Class F because it has a high concentration of SiO₂, Al₂O₃, and Fe₂O₃. For mechanical properties, concrete samples from both the experimental and control groups considerably increased in compressive strength after 28 days of curing. From the result, concrete that contains more fly ash has more compressive strength. The experimental mix containing 15% fly ash outperformed the control sample in terms of flexural and splitting tensile strengths. According to the results of the slantshear test, fly ash can improve a material's bonding strength when it is added to concrete. It has been determined that those experimental concrete mixtures can be employed in a variety of constructions, including foundations, sub-bases, pavements, etc., greatly reducing cost, energy, and environmental issues.

Effect of Incorporating Coal Bottom Ash on The Properties of Concrete

R. C. Amat^{1,2,*}, N. L. Rahim^{1,2}, S. A. Mohamed^{1,3}, N. M. Ibrahim^{1,2}, A. B. H. Matagi¹, N. Muhamad¹ and M. Bahatin¹

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

²Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technologies (CEGeoGTech), Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

³Water Research Group (WAREG), Universiti Malaysia Perlis, Komplek Pusat Pengajian Jejawi 2, 02600 Arau, Perlis, Malaysia.

*roshazita@unimap.edu.my

Abstract. Industrial waste without proper control may lead to contamination and seriously cause environmental pollution. Transform the waste such as coal bottom ash (CBA) waste into a sustainable construction material is so much help in reducing the waste in the surroundings and is also environmentally friendly. In this research, cement was replaced with CBA in the concrete to analyse the effect on concrete performance. Consequently, this project focuses on the physical and mechanical properties of concrete before and after using CBA. In the design stage for concrete mixing, the ratio for raw materials was selected as 1:1.35:3.2 for Cement, sand, and aggregates, respectively (grade 25). Two different major categories of concrete were made and compared. The first category is ordinary concrete with normal concrete mix (NCM), while the second category is concrete which uses 5%, 10%, 15%, 20%, 25% and 30% of CBA partial replacement in the volume of cement in the concrete mix. The samples we used in this research were cube 100 mm x 100 mm x 100 mm prepared for the water absorption, density, and compressive test. The workability of concrete containing CBA with fixed water quantity was lower corresponding to that of control mix. The density and water absorption in hardened concrete reduces the concrete density and increased the water absorption with increased amount of ground CBA. The results for the compressive test of control samples are 22.940 N/mm at 28 days of curing, and the largest percentage was 10% CBA which is 28.28 MPa. Since the strengths of the concrete with CBA are increasing so, the modified concretes can be considered to use in construction.

A Preliminary Study of Physical Properties of Co-combustion Waste

S. A. Mohammed^{1,2,*}, R. C. Amat^{1,3}, N. M. Ibrahim^{1,3}, N. L. Rahim^{1,3} and A. Rizal¹

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

²Water Research Group (WAREG), Universiti Malaysia Perlis (UniMAP), 02600 Arau, Perlis, Malaysia

³Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technologies (CEGeoGTech), Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia..

*syakirahafiza@unimap.edu.my

Abstract. Due to the industrialization, the amount of coal power plant waste has increased dramatically. For coal combustion-generated electricity to be sustainable, by-products such as bottom ash and fly ash must be reused. By reducing energy and raw material consumption, reusing coal bottom ash and fly ash as Portland cement constituents will contribute to more sustainable cement production. Coal bottom ash and fly ash used in this research was collected from Janamanjung Power Plant. Coal fly and bottom ashes are produced in the same boiler, but their size and shape are very different, necessitating research into their physical properties. The physical properties of coal bottom ash and fly ash, such as water absorption and specific gravity, were determined in this study. The morphology of both ashes also was investigated. The findings show that the water absorption and specific gravity of fly ash is higher than coal bottom ash. However, the water absorption and specific gravity of both ashes are lower when compared to cement. The morphology image shows that the fly ash is rounded, and bottom ash is angular in shape.

Viability Study on Fly Ash and Bottom Ash from Combustion Waste

Norlia Mohamad Ibrahim^{1,2,*}, Syakirah Afizah Mohamed¹,
 Roshazita Che Amat^{1,2}, Nur Liza Rahim^{1,2}, Mustaqqim
 Abdul Rahim¹, Warid Wazien Ahmad Zailani³

¹Faculty of Civil Engineering Technology, Universiti Malaysia Perlis, Kompleks Pusat Pengajian Jejawi 3, 02600 Arau, Perlis, Malaysia

²Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technology (CEGeoGTech), Universiti Malaysia Perlis, Kompleks Pusat Pengajian Jejawi 3, 02600 Arau, Perlis, Malaysia

³School of Civil Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

*norlia@unimap.edu.my

Abstract. The substitution or addition of new supplementary cementitious materials (SCM) in the production of variety of construction materials has gained much interest. One of the examples of SCM is incineration ash which consist of fly ash (FA) and bottom ash (BA) which are the residues from the ignition of biomass and can brings applicable ecological advantages. However, the properties of this new materials need to be investigated to ensure its full potential can be developed. Therefore, this study is initiated to identify the characteristics of incineration ash from local source in Malaysia. To identify the elemental components of ashes, most widely method was adopted which is using X-Ray Fluorescence (XRF). The quantity of unburned carbon in fly ash is measured by loss on ignition, which has a major influence on the product's characteristics. In addition, specific gravity and density were also determined and comparison has been made with cement. In this study it was found out that XRF results shows that both FA and BA consist of the same mineral composition with OPC majorly in silica, aluminium, calcium, and iron which makes is suitable to be used in the concrete. For LOI, the value for BA is much higher compared with FA due to the amount of unburnt carbon in its original compositions and the incomplete burning due to insufficient contact time in the furnace. As expected, for the specific gravity and density, FA having the lowest specific gravity and density. Overall, the use of incineration ash can be fully investigated by exploring other parameter that influence the performance of construction materials.

Green Technology

Lightweight Flame-retardant Material Reinforced with *Hevea Brasiliensis* Ash Intumescent Agent

J. H. Beh^{1,*} and M. K. Yew²

¹Lee Kong Chian Faculty of Engineering and Science, Department of Architecture and Sustainable Design, Universiti Tunku Abdul Rahman, Sungai Long, Malaysia.

²Lee Kong Chian Faculty of Engineering and Science, Department of Civil Engineering, Universiti Tunku Abdul Rahman, Sungai Long, Malaysia.

*behjh@utar.edu.my

Abstract. Flame retardant materials play an important role in many building construction components. The ability of building components to resist fire is crucial to the safety and well-being of the occupants. This research examines a lightweight flame-retardant material- Vermiculite (V) reinforced with a renewable *Hevea Brasiliensis* Biomass Ash Intumescent Agent (HBAIA) in different compositions. Four specimens of vermiculite reinforced with HBAIA (V/HBAIA) with standard size 200 mm x 200 mm x 10 mm (W x Lx H) were fabricated for investigations. All V/HBAIA specimens were assessed in terms of their density, fire-resistant, fire endurance and smoke, char surface morphology, and flexural toughness. Data disclosed V/HBAIA-2 with the composition of 90% vermiculite reinforced with 10% HBAIA obtained the most prominent outcomes in overall. V/HBAIA-2 attained the lightest density of 37.5 kg/m³ (0.20 kg) with lowest end temperature of 122 °C after exposure to one-hour of 1000 °C fire. This indicated the best fire-resistant performance in V/HBAIA-2. No structural deformation and only mild smoke and odor were observed in V/HBAIA-2 during the fire endurance examination. V/HBAIA-2 was able to resist the maximum loading force of 67.4 N before and 52.5 N after the fire resistant, with the higher flexural toughness value of 1.47 MPa. Scanning electron microscopy revealed a more uniform, denser, closely connected air cavities char cell quality in V/HBAIA-2 explained its superior outcomes in fire-resistant and flexural toughness as compared to the rest of specimens.

IoT Based Monitoring System for Maintaining the Safety and Hygiene of the Food

N. I. A. A. Sidek¹, M. N. Mansor^{1,*}, R. M. Kawi¹, M. R. Manan¹, H. H. Mokhtaruddin¹, I. S. A. Mahyudin¹

¹Faculty of Electrical Engineering Technology, Universiti Malaysia Perlis, UniCITI Alam Campus, Sungai Chuchuh, 02100 Padang Besar, Perlis, Malaysia.

*naufal@unimap.edu.my

Abstract. In this era of globalization, the Internet of Things (IoT) based food monitoring system has many benefits for the industry in this world. To enhance and facilitate human, economic and social needs, a safe, high quality and nutritious food supply is required. There are some limitations that relate which the first main problem is that conventional food inspection technology limited to inspection of weight, volume, colour and aspect results in poor quality of the food produced. This is due to improper monitoring of stored food and the inability to provide a more proactive system. Various traditional storage methods are time-consuming and inefficient. Based on the limitations that have been highlighted previously, this project aims to develop a food monitoring system that maintains the safety and hygiene of the food. Accordingly, it utilized a sensor appropriate for checking the quality and safety of food items by recording the development of parameters such as the quantity of temperature, humidity and gas to achieve this goal. It is built based on the concept of IoT and is capable of creating a network of interconnected devices. NodeMCU is the main microcontroller used in IoT systems. By using this approach, it can combine actuators and sensing devices also providing information over effective platforms. At the end of this project, this output of the parameters is automatically monitored and managed via device with ThingSpeak to rate of decomposition for the quality food. The decomposition of each fruit and vegetable can be observed for 5 days in this project. As a result, the highest average results for banana are 29.70°C, 79.80% humidity, and 178.55ppm for methane gas. Blueberries had the highest temperature at 29.40°C, the highest humidity is 79.20%, and the highest methane gas concentration is 36.66ppm. Furthermore, the highest temperature for tomatoes was 29.66 °C, humidity was 79.80%, and methane gas was 40.28ppm. Finally, the temperature of onion is 29.84°C, the humidity is 79.60%, and the highest concentration of methane gas is 14.75ppm. The use of the IoT is being projected as the viable way headlong to implement food safety.

Copper-Graphene Composite: A Studies on Its Characteristics of Mechanical and Physical Properties

N. H. Jamadon^{1,*}, N. I. M. Rasid¹, M. A. Ahmad², M. Lutfi³, S. Adzila⁴, N. A. Jamal⁵ and N. Muhamad¹

¹Centre for Materials Engineering and Smart Manufacturing (MERCU), Department of Mechanical and Manufacturing, Faculty of Engineering and Built Environment, Univeristi Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia.

²Faculty of Health Sciences, MAHSA University, Bandar Saujana Putra, 42610 Jenjarom, Selangor, Malaysia.

³Faculty of Engineering, Built Environment & Information Technology, MAHSA University, Jalan SP2, Bandar Saujana Putra, 42610, Jenjarom, Selangor, Malaysia

⁴Department of Manufacturing Engineering, Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia (UTHM), 86400 Parit Raja, Batu Pahat, Johor, Malaysia.

⁵Manufacturing and Materials Engineering (MME) Department, Kulliyah of Engineering, International Islamic University Malaysia, P.O. Box 10, 50728, Kuala Lumpur, Malaysia

*nashrahani@ukm.edu.my

Abstract. Graphene is a single thin layer (mono layer) of a hexagon-bound carbon atom and is an allotropic carbon in the form of a hybrid atomic plane, with a molecular bond length of 0.142 nm. Graphene is the thinnest and lightest material with 0.77 mg square meters, which exhibited excellent electricity and heat conductor. However, the perfect uniform microstructure, strength and optimum thermal properties of copper-graphene composites cannot be achieved because the amount of graphene does not reach the optimum level. In order to solve this problem, copper-graphene composites were produced by metal injection molding method (MIM) with various percentage of graphene, specifically 0.5%, 1.0% and 1.5% in the composite, to compare the physical and mechanical properties of these samples. MIM process involves the preparation of feed materials, pre-mixing process, mixing process, mold injection process, binding process and sintering processes. Feeding materials were used are copper and graphene, which have the powder loading of 62% with a mix of binder comprising 73% polyethylene glycol (PEG), 25% polymethyl methacrylate (PMMA), and 2% stearic acid (SA). Densification and tensile test were conducted to determine the mechanical properties. Scanning electron microstructure (SEM) was performed to obtain the microstructure of the composites. From the research, the result revealed that the 0.5% graphene content had the optimum parameter, which the hardness and tensile stress values were at 94.2 HRL and 205.22 MPa.

The Effect of Fly Ash to Alkaline Activator Ratio to The Mechanical Properties of Geopolymerized Soil for Slope Stability

M. M. Ahmad^{1,*}, K. Muhamad¹, R. A. Razak^{1,2}, N. H. Hashim¹ and N. A. F. Othman¹

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

²Centre of Excellence Geopolymer and Green Technologies (CEGeoGTech), Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

*munsif@unimap.edu.my

Abstract. Slope failure is one of the main disaster faced by our nation, Malaysia. One of the major landslide was Highland Towers tragedy in 1993 which killed 48 people. The tragedy happened due to pipes that burst, allow the empty land near the site to be washed away. This research aim is to increase the shear strength of the slope. If the shear strength of slope can be increased, the angle of slope can be lowered, the stability of slope increased and also the area for building development increase. This research has been conducted to investigate the geopolymerized soil shear strength and to determine the optimum ratio of fly ash to alkaline activator for geopolymerized soil. There were four type of tests conducted in this study which were sieve and hydrometer analysis, Atterberg limit test, Standard Proctor Compaction test and unconfined compression test. The first three tests conducted to find out the properties of soil used in this study. Then, six samples were prepared for 24 hours and 3 days according the mix design of soil with 20% of geopolymer with different ratios of fly ash to alkaline activator which were 0, 1.0, 1.5, 2.5 and 3.0. 20% geopolymer also included the ratios of sodium silicate to sodium hydroxide which was 2.0 and the concentration of sodium hydroxide, 15 Molar. The samples with additional 20% geopolymer were tested with Atterberg limit test and unconfined compression test. From the test, when the ratio of fly ash to alkaline activator was 2.5, the result showed the highest value of shear strength which was 258.1 kPa and 4250 kPa when curing for 24 hours and 3 days at room temperature respectively. The fly ash was used in this study and the fly ash is quite environmental friendly. The fly ash reduced the emission of carbon dioxide from cement when a partial of cement composition was replaced.

Performance of a Microbial Fuel Cell Using *Pseudomonas aeruginosa* PR3 and Bamboo Hydrolysate

A. P. Nguyen^{1,*}, N. H. Dai² and T. D. Nguyen¹

¹Faculty of Biology and Biotechnology, University of Science – Vietnam National University, Ho Chi Minh city, Vietnam.

²Faculty of Chemistry, University of Science – Vietnam National University, Ho Chi Minh city, Vietnam.

*hoanganhngph5x2x000@gmail.com

Abstract. This study investigated the power generation of a dual-chamber microbial fuel cell (MFC) using *Pseudomonas aeruginosa* PR3 and hydrolysates from the acid pretreatment of *Bambusa stenostachya* Hack.. MFCs were inoculated with PR3, acclimated with glucose then operated with bamboo hydrolysates containing different total reducing sugars as the anolytes. Electrochemical analyses showed that MFC with 9.0 g/L sugars from bamboo hydrolysates had better performance, with the maximum open-circuit voltage of 620 mV, current density of 1092.08 mA/m² and power density of 91.16 mW/m². Total sugar consumption of the MFCs varied from 76.25 to 96.30% after 48 hours of operation in bamboo hydrolysates. Anode surface characterization displayed thick biofilm structures and dense bacterial populations. Microbial communities in these MFCs could effectively recover electricity from up to 9.0 g/L reducing sugars in bamboo hydrolysates, preliminarily illustrating the applicability in energy recovery and the treatment of bamboo-processing wastes by the MFC technology.

Building Information Modelling (BIM) Application as Risk Mitigation Strategies in Building Refurbishment Project Life Cycle

N. Ishak^{1,2,3,*}, M. A. Azizan^{1,2,3}, F. A. Ibrahim¹, N. S. A. Rahim^{1,2}, N. Romeli^{1,2}, E. M. A. Zawawi⁴, N. H. K. Anuar¹ and N. S. Shohime¹

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

²Centre of Excellence Unmanned Aerial System (COEUAS), Universiti Malaysia Perlis, Blok E, Pusat Perniagaan Pengkalan Jaya, Jalan Kangar – Alor Setar, 01000 Kangar, Perlis, Malaysia.

³Centre of Excellence Water Research and Environmental Sustainability Growth (WAREG), Universiti Malaysia Perlis, Kompleks Pusat Pengajian Jejawi 3, 02600 Jejawi, Perlis, Malaysia.

⁴Center of Studies for Construction, College of Built Environment, Universiti Teknologi MARA (UiTM), 40450 Shah Alam, Selangor, Malaysia.

*nurfadzillah@unimap.edu.my

Abstract. Towards the implementation of inclusive sustainable cities development as one of the Sustainable Development Goals, the imbalance ratio of existing buildings to new construction became overwhelming challenges. Therefore, refurbishment of existing buildings is considered the possible solution to minimize the environmental impact and upgrading the performance of an existing building to meet new requirements. However, building refurbishment is well-known as a project that comprehends riskier compared to new building projects which lead to limited applicability in current risk management implementation. Thus, in line with an era of digitization construction of the fourth industrial revolution (IR 4.0), the traditional risk management needs improvement from a manual basis to magnifying efficiency using integration of Building Information Modelling (BIM) application. BIM is defined as an advanced technology that assists construction players to produce, communicate, and analyse building models by providing visual tools and a set of data. Therefore, the objective of this research is to identify the potential building refurbishment risk categories and to determine the most critical project lifecycle phase in implementing the BIM applications in order to mitigate the potential building refurbishment project risk. Also, to discover the relationship strength between these two variables. The quantitative method is applied by using a questionnaire form to the certified BIM experts. This research contributes a solid understanding and useful guideline for future practice reference and improvement within the Building Refurbishment Project.

A Novel: Low-cost Method for the Isolation of Anaerobic Hydrogen Producing Bacteria

T. N. B. Dung¹, T. D. Minh¹, P. H. Minh², K. T. Pham²,
*T. D. Nguyen²

¹Faculty of Environment and Labour Safety, Ton Duc Thang University, Ho Chi Minh City, Viet Nam.

²Faculty of Biology and Biotechnology, University of Science, Vietnam National University Ho Chi Minh city (VNU-HCMC), 227 Nguyen Van Cu, Dist. 5, Ho Chi Minh city, Vietnam.

*ndtanh@hcmus.edu.vn

Abstract. The hydrogen content of the two sludge samples namely TDS and PLS were increased after the heat shock pretreatment from 239.23 ± 10.23 mL/L to 663.87 ± 15.99 mL/L at 80°C and from 173.61 ± 17.21 mL/L to 496.74 ± 30.21 mL/L at 60°C , respectively. Polymerase chain reaction-denaturing gradient gel electrophoresis (PCR-DGGE) indicated that Enterococcus and Clostridium were the dominant bacteria in the TDS and PLS consortium. Two strains were successfully isolated from TDS and PLS using a simple method. Based on Bergey's key identification and 16S rDNA sequencing, they were identified as Clostridium butyricum strain TD and Clostridium acetobutylicum strain PL. The hydrogen content, glucose consumed yield, and hydrogen yield of C. butyricum TD and C. acetobutylicum PL were 545.24 ± 7.31 mL/L, 90 ± 0.41 %, 0.89 ± 0.01 mol H₂/mol glucose, and 729.34 ± 22.81 mL/L, 92.77 ± 1.39 %, 1.26 ± 0.05 mol H₂/mol glucose, respectively.

Solvothermal Synthesis and Characterization of UiO-66, Metal-Organic Frameworks (MOFs)

S. Ahmad¹, M. F. Omar^{1,2,*}, E. M. Mahdi³, K. A. A. Halim^{1,2}, S. Z. A. Rahim², S. S. Ting², H. M. Akild⁴ and N. Nosbie⁵

¹Faculty of Chemical Engineering Technology, Universiti Malaysia Perlis, Perlis, Malaysia.

²Geopolymer & Green Technology, Centre of Excellent (CEGeoGTech), Universiti Malaysia Perlis, Perlis, Malaysia

³Materials Technology Group, Industrial Technology Division, Malaysia Nuclear Agency, 43000, Kajang, Selangor, Malaysia

⁴School of Materials and Mineral Resources Engineering, Engineering Campus, Universiti Sains Malaysia, 14300 Nibong Tebal, Pulau Pinang, Malaysia.

⁵Department of Mechanical Engineering, Centre for Corrosion Research (CCR), Institute of Contaminant Management for Oil and Gas (ICM), Universiti Teknologi PETRONAS, 32610, Perak, Malaysia

*firdausomar@unimap.edu.my

Abstract. In the present work, UiO-66 has been synthesised at temperature of 120°C, 130°C and 140°C. A wide range of reaction conditions were explored in order to understand the effects of solvent and temperature. It was discovered that there is optimize temperature obtained from this work which is at temperature of 130°C, UiO-66 yielded and exhibited good crystallinity material. The effect of temperature may therefore be explained by the decrease in reaction rate with an increasing concentration of reactants. The XRD data and SEM analysis showed that both MOFs were very crystalline in the product.

Anaerobic Co-digestion of Different Types of Cow Dung with Food Waste

I. A. Zakarya^{1,2,*}, N. A. M. Hilmi¹, M. F. Samah¹, T. N. T. Izhar^{1,2} and Z. A. Aziz and M. H. Daud³

¹Faculty of Civil Engineering Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

²Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technologies (CEGeoGTech), Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

³E-Idaman Sdn.Bhd. Wisma Idaman, Alor Setar, Kedah, Malaysia.

*irnis@unimap.edu.my

Abstract. Converting animal waste to energy can increase the value of manure as a clean energy resource while minimizing the environmental impact of animal waste disposal. Anaerobic Digestion (AD) is an alternative method of energy recovery and waste treatment that produces biogas, which may be utilized to generate electricity or heat. In this study, different types of cow dung in terms of nutritional processes (grass: bran); 100 % grass, 95 % grass: 5 % bran, and 80 % grass: 20 % bran were taken for anaerobic co-digestion with food waste. This study aims to determine the biogas production and the characteristics of anaerobic co-digestion from different types of cow dung under mesophilic temperature (37°C). Biogas production was measured by the water displacement method. The pH value, Organic Matter (OM) content, C/N ratio, and Volatile Acid (VA) were recorded throughout the experiment. Samples of 100 % grass accumulated the highest biogas production (1250 ml) followed by samples of 80 % grass: 20 % bran (1080 ml) and samples of 95 % grass: 5% bran (780 ml) between the 20th and 23rd days. This shows the sample of 100 % grass-feeding has a better performance on biogas production among the samples.

Unravelling Spatial-temporal Evolution of Shoreline Changes in Pantai Mek Mas – Pantai Cahaya Bulan, Kelantan, Malaysia

M. Z. A. A. Wahid¹ and M. S. Osman^{1,*}

¹EMZI-UiTM Nanoparticles Colloids & Interface Industrial Research Laboratory (NANO-CORE), Centre for Chemical Engineering Studies, Universiti Teknologi MARA, Cawangan Pulau Pinang, Permatang Pauh Campus, 13500 Pulau Pinang, Malaysia.

*syazwan.osman@uitm.edu.my

Abstract. Kelantan is a state on Peninsular Malaysia's East Coast famed for its tropical jungle and seaside areas. Kelantan is a "flood-state" that encounters monsoons and tidal currents. Kelantan was devastated by tsunami-like floods in 2014 where it brought changes on its coastal geomorphology. Using a universal Digital Shoreline Analysis System (DSAS) technique, this study assesses shoreline changes along Kelantan's coastline between 2013 (before the catastrophic flood) and 2021. A multipronged approach incorporating DSAS via GIS and satellite imagery were used to explore the coastline changes in Kelantan. This study found that Pantai Mek Mas and Pantai Kundur were the most sedimented and the most eroded area were around Pantai Cahaya Bulan, Kota Bharu respectively. The Shoreline Change Envelope (SCE) and Net Shoreline Movement (NSM) analysis concluded that the coastal area has the highest accretion rate of 177.07m/year and the greatest negative distance via NSM of -171.53m/year. The sedimentation along Pantai Mek Mas may happen due to the transportation of sedimentation via river flows from Kelantan River estuary and the degradation of shoreline along Pantai Cahaya Bulan may cause by the concentration of anthropogenic interventions. In conclusion, can be seen that the Kelantan's coastal area shoreline does progressively proliferate over the past decade and the community vulnerability on the shoreline changes are at risk which comprehensive mitigation is needed to improve its resilience.

Synthesis of Iron Oxide Nanoparticles by Coprecipitation Method and Investigation of Its Seed Priming Potential into *Lactuca sativa* seeds

R. N. E. H. R. A. Malek¹, M. S. Osman^{1,*}, N. A. Hafiz¹

¹EMZI-UiTM Nanoparticles Colloids & Interface Industrial Research Laboratory (NANO-CORE), Centre for Chemical Engineering Studies, Universiti Teknologi MARA, Cawangan Pulau Pinang, Permatang Pauh Campus, 13500 Pulau Pinang, Malaysia.

*syazwan.osman@uitm.edu.my.

Abstract. Increasing food availability and ensuring food security have become critical issues for nations with varying levels of economic growth. The agricultural sector plays an essential role in these developments. To cater this, seed priming is a typical method for controlling the hydration of seeds ensuring that the plant can consume water and proceed to the initial stage of germination. The main objective of this research is to characterise the synthesis of chemical iron oxide nanoparticles (FeNPs) and investigate the germination performance of *Lactuca sativa* (lettuce). Iron oxide (Fe) is important for various processes in plants, such as photosynthesis. The chemical method was chosen to synthesise the nanoparticles as it can reduce the overall cost, has a high yield, and safe for the environment. In this experiment, two salt solutions were chosen as the reducing agents for the chemical method. The effect of seed priming with different concentrations of FeNPs (1, 2, 4, 6, 8, and 10 ppm) on seedling growth parameters such as germination rate and average shoot and root length varieties was studied on the fifth and eighth days of seedling development. Seed priming with FeNPs increased the germination rate more than control at all studied concentrations. As a result, among the 5 different concentrations, 1 ppm shows the increase in germination rate, average length of root of *Lactuca sativa* (lettuce) seeds and shoot better than the others. The germination rate of 1 ppm is 80%, compared to control at 70%. Seed priming with FeNPs was nontoxic in comparison to the control, but it decreased chlorophyll content and can be used sustainably to increase nonenzymatic antioxidant capacity during the early phases of *Lactuca sativa* (lettuce) seedling development. Overall, this study suggests that using FeNPs to prime the seeds of *Lactuca sativa* (lettuce) can potentially increase crop production yield and help keep the demand for food production stable.

Green Natural Rubber-based Membrane for Drug Release

W. Prathumsuk¹, A. Petchsuk², M. Opaprakasi^{1,3} and O. Boondamnoen^{1,3,*}

¹Department of Materials Science, Faculty of Science, Chulalongkorn University, Phayathai, Bangkok 10330, Thailand

²National Metal and Materials Technology Center (MTEC), National Science and Technology Development Agency (NSTDA), Pathum Thani 12120, Thailand

³Center of Excellence on Petrochemicals and Materials Technology, Chulalongkorn University, Research building, Phayathai, Bangkok 10330, Thailand

*Orathai.B@chula.ac.th

Abstract. The objective of this work is to develop drug release membrane from natural rubber (NR) based as NR is an alternative green material. NR, ENR, PVA, NR/PVA and ENR/PVA membranes were prepared by casting process. Sodium diclofenac was used as a drug in this work. The result from H1 NMR revealed that 25 mol% ENR was obtained. It was proven that there is no formation of chemical bonding between drug and matrix membrane by FTIR characterization. The swelling ratios of PVA, ENR/PVA, NR/PVA were about 165%, 120% and 100%, respectively, whereas ENR and NR were not swollen. It is probably due to the high hydrophilicity of PVA. NR and NR/PVA membrane surfaces presented some agglomeration of drug particles shown in SEM micrographs. The drug distribution in NR matrix was very poor whereas obvious agglomeration in ENR and PVA membranes was not present. The polar groups (epoxide and hydroxyl) may assist in ionic drug distribution. The result of drug release showed that neat NR membrane gave the lowest value at about 50%. Therefore, the drug was predicted to be trapped inside the NR matrix. This was similar to the case of NR/PVA membrane, whereas PVA membrane provided the highest and fastest release compared to others. However, in case of ENR, the %drug release increased gradually with the release time increased until it was constant at 7 hours onwards. It can be said that the modification of NR by adding hydrophilic group (as ENR) could enhance the %drug release. Moreover, the addition of hydrophilic part (combination of PVA) also increased the %drug release that obviously seen in ENR/PVA and NR/PVA membranes.

Utilization of Fly Ash and Bottom Ash Coal Fired Power Plant Teluk Balikpapan as Concrete

A. Ibnu Arobi^{1,*} and F. N. I. Yusriyani²

¹*Environmental PT. PLN (Persero) UPDK Balikpapan, Balikpapan, Indonesia*

²*Environmental PT. PLN (Persero) UIW Kalimantan Timur, Balikpapan, Indonesia*

*ibnurubio5@gmail.com

Abstract. Coal Fired Power Plant Teluk Balikpapan is a power plant located in the Kariangau Industrial Estate (KIK) with a capacity of 2 x 110 MW with coal consumption reaching 140 tons/hour or 3,360 tons/day. Besides generate electricity, the burning coal also produces waste in the form of fly ash (fly ash/FA) and bottom ash (basic ash/BA) with an amount of 150 tons and 18 tons, respectively. FA and BA which are waste from coal combustion from steam power plant activities from several studies state that FA and BA can be used as supporting materials or substitutes for cement. Research on FA Teluk Balikpapan to be made into concrete was carried out through a compression test in accordance with SNI 03-4433-2016 concerning Specifications for Ready-to-Use Fresh Concrete with 5 mixed compositions of Fly Ash, Cement, Aggregate and Sand. The test results show that concrete with a composition of 15% Fly Ash, 35% Aggregate, 25% Sand, 25% Cement has a quality of 20.38 Mpa. These results show that Fly Ash and Bottom Ash have good quality for concrete.

Bio-char and Bio-oil Production from Pyrolysis of Palm Kernel Shell and Polyethylene

A. F. Khalid¹, R. Ahmad^{1,2,*}, W. A. M. Wan Ahmad^{1,2},
 V. Vijean³, R. Santiago^{1,4}, Ahmad A.G¹, S. A.
 Mohammed^{1,2} and N. R. Ibrahim¹

¹Faculty of Civil Engineering Technology, Universiti Malaysia Perlis, Perlis, Malaysia

²Water Research and Environmental Sustainability Growth (WAREG), Center of Excellence (COE), Universiti Malaysia Perlis (UniMAP), Perlis, Malaysia

³Faculty of Electronic Engineering Technology, Universiti Malaysia Perlis, Pauh Putra Campus, Perlis, Malaysia

⁴Sustainable Environment Research Group (SERG), Center of Excellence Geopolymer and Green Technology, Universiti Malaysia Perlis, Perlis, Malaysia

*razi@unimap.edu.my

Abstract. This research was intended to elucidate the effects on palm kernel shell (PKS) as a solid fuel through torrefaction and production of bio-char and bio-oil by single and co-pyrolysis of PKS and polyethylene (PE). The PKS was treated through torrefaction at different temperature and holding time. The optimum parameter for torrefaction was at a temperature of 250 oC and a holding time of 60 min. Then the PKS and PE were pyrolyzed in a fixed-bed reactor at different temperatures and ratios. The product yield was analyzed for single and co-pyrolysis of PKS and PE for pyrolysis. The properties of the product composition for single and co-pyrolysis of the PKS and PE were determined by proximate analysis, fourier transform infrared (FTIR) analysis and gas chromatography-mass spectrometry (GC-MS). The optimum parameter obtained for bio-char and bio-oil production from co-pyrolysis of PKS and PE was at temperature of 500 oC with a ratio of 1:2 (PKS:PE). The ester and phenol compound were increased around 19.02 % - 23.18 %, and 32.51 % - 34.80 %, respectively, while amide and amine decreased around 4.94 % - 18.87 % and 0.63 % - 32.39 %, respectively, compared to the single pyrolysis of PKS. Therefore, the PKS and PE co-pyrolysis significantly increased the amount of phenol and ester compounds while slightly reducing the amount of the amide and amine compounds in bio-oil product.

Influence of Pretreated Coconut Shell on Gasification Product Yield

R. Ahmad^{1,2,*}, S. A. Mohammed^{1,2}, W. A. M. Wan Ahmad^{1,2}, V. Vijejan³, R. Santiagoo^{1,4}, A. G. Ahmad¹, N. R. Ibrahim¹, S. Z. Muda¹

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Perlis, Malaysia

²Water Research and Environmental Sustainability Growth (WAREG), Center of Excellence (COE), Universiti Malaysia Perlis (UniMAP), Perlis, Malaysia

³Faculty of Electronic Engineering Technology, Universiti Malaysia Perlis, Pauh Putra Campus, Perlis, Malaysia

⁴Sustainable Environment Research Group (SERG), Center of Excellence Geopolymer and Green Technology, Universiti Malaysia Perlis, Perlis, Malaysia

*razi@unimap.edu.my

Abstract. Gasification of untreated and pretreated coconut shell (CS) was carried out in a fixed-bed reactor to assess the effect of temperature (600, 650, 700, 750, and 800 °C) and holding time (30 and 40 minutes) on gases composition. The untreated CS was first torrefied in a fixed-bed reactor at different temperatures (200 – 300 °C) and holding times (30 min, 60 min and 90 min). Pretreated CS at the optimal torrefaction temperature (275 °C and 60 min) was used for gasification. Under optimal conditions of 750 °C and 30 min holding time, gasification contributed the most gas production. At this optimum condition, the gas composition of pretreated CS was 35.03 % of CH₄, 24.43 % of CO₂, and 40.54 % of H₂ + CO. Untreated CS contains 37.63 % of CH₄, 24.03 % of CO₂, and 38.34 % of H₂ + CO gases. The production of CH₄ gas was higher when untreated CS was used for gasification rather than pretreated CS. Moreover, when untreated CS was used for gasification, the amount of CO₂, H₂, and CO produced was minimal. Therefore, for high H₂ production, pretreatment prior to gasification is appropriate.

Recycled Incineration Bottom Ash and Metakaolin as Sustainable Materials for Cement Replacement in Cementitious Composites

R. C. Amat^{1,2,*}, S. A. Mohamed^{1,3}, N. M. Ibrahim^{1,2}, N. L. Rahim^{1,2}, K. R. Ahmad⁴

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

²Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technologies (CEGeoGTech), Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

³Water Research Group (WAREG), Universiti Malaysia Perlis, Komplek Pusat Pengajian Jejawi 2, 02600 Arau, Perlis, Malaysia.

⁴Faculty of Chemical Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

*roshazita@unimap.edu.my

Abstract. This study was related to the influence of the concrete properties by using different percentages of metakaolin and fixed percent of incineration bottom ash to partially replace the cement. Cement is a well-known building material and used for the construction in the world. Moreover, the used of metakaolin (MK) and incineration bottom ash (IBA) in this research would give significance to our environment as it can reduce the usage of cement in concrete. By using bottom ash, it could reduce the land filling space. The X-Ray Fluorescence (XRF) test was used to determine the chemical composition of IBA and MK. Four series of concrete have been examined, including control, IBA and MK were used as partial replacement for cement at 10%IBA + 10%MK, 10%IBA + 15%MK and 10%IBA + 20%MK of concrete mixes by volume. The curing period for the samples is 7 days and 28 days. To determine the properties of concrete, the tests such as slump test, density test, water absorption test, pulse velocity test, rebound hammer test and compression test were performed. The results proved that the strength development of 10%IBA + 10%MK concrete sample shows the highest compressive strength after 28 days of curing.

Bonding Properties of Concrete with Co-combustion Bottom Ash as Ordinary Portland Cement Partial Replacement

N. M. Ibrahim^{1,2,*}, N. L. Rahim^{1,2}, S. A. Mohamed¹, R. C. Amat^{1,2}, M. A. Rahim¹, W. W. A. Zailani³, N. Muhamad⁴

¹Faculty of Civil Engineering Technology, Universiti Malaysia Perlis, Kompleks Pusat Pengajian Jejawi 3, 02600 Arau, Perlis, Malaysia

²Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technology (CEGeoGTech), Universiti Malaysia Perlis, Kompleks Pusat Pengajian Jejawi 3, 02600 Arau, Perlis, Malaysia

³School of Civil Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

*norlia@unimap.edu.my

Abstract. Co-combustion ash is one of the waste materials generated from the industry of electricity generation. Due to large amount of ash being generated, new alternatives materials for concrete manufacturing need to be investigated by utilizing the ash. However, using new materials will eventually affect the bonding properties of concrete. Therefore, the main objective of this study is to analyse the bonding properties of concrete containing co-combustion ash (CCBA) as partially replacement of ordinary Portland cement. CCBA is tested for its elemental compositions using X-Ray Fluorescence (XRF) and its four main compositions which is silica, alumina, iron, and calcium is discussed extensively. Other testing for the property of ash including Scanning Electron Microscopic (SEM) and specific gravity for coarse aggregate. To produce sustainable concrete from waste, several tests have been conducted to determine the bonding properties of the concrete such as compressive strength, flexural strength, and splitting tensile strength. Results show that, CCBA contained majorly silica dioxide which contributing to the strength of concrete. SEM image show that CCBA is a porous structure, angular and rough texture which influenced the compressive strength. Furthermore, it was discovered that as the proportion of CCBA utilised increased, the compressive strength, flexural strength, and splitting tensile strength of the concrete were decreased. Highest compressive strength obtained was 28.28 MPa which is for 10% CCBA replacement. At 5% CCBA replacement, maximum flexural strength and splitting tensile strength achieved was 8.59 MPa and 8.74 MPa, respectively. The proposed CCBA shows promising potential to be used as a cement alternative in concrete.

The Effect of Concrete Mix Incorporating Different Percentage of Dolomite Fines

M. A. Rahim^{1,*}, I. Chan¹, N. M. Ibrahim¹, A. Ayob¹, S. Anudai@Anuar¹, N. F. Bawadi¹, S. Shahidan², S. S. M. Zuki², N. L. Rahim¹

¹Faculty of Civil Engineering and Technology, University Malaysia Perlis, 02600, Arau, Perlis, Malaysia

²Faculty of Civil and Environmental Engineering, Universiti Tun Hussein Onn, 86400, Batu Pahat, Johor, Malaysia

*mustaqim@unimap.edu.my

Abstract. Since the cost of cement increases and the pollution to environment due to greenhouse effect are becoming more serious year by year, thus, dolomite fines subjected to replace the cement in concrete mix as it has lower cost compared to cement. In this research, the replacement of cement with dolomite fines carried out in this study is 0%, 5%, 10%, 15% and 25%. The grade of concrete a designed to be 30. A total of 45 units of 150 mm x 150 mm x 150 mm concrete cube and 30 units of cylindrical concrete sample with diameter of 150 mm and height of 300 mm designed in this study. The properties of concrete sample in terms of compressive strength, splitting tensile strength, ultra-pulse velocity and rebound hammer test for various percentage replacement are determined in this study. The tests on concrete sample carried out at the age of 7-days and 28-days. Overall, its shows that 10 % replacement of cement with dolomite fines provided the highest strength to the concrete in terms of compressive strength and splitting tensile strength.

Water and Wastewater

Investigation of Microplastics Presence in the Dâmbovița River

C. Maria^{1,*}, A. A. Ivanov¹, G. Deák¹, G. Tudor¹, E.
Holban¹, C. Zamfir¹, G. Grigore¹ and A. Lungu¹

¹National Institute for Research and Development in Environmental Protection,
294 Splaiul Independenței Street, Bucharest 060031, Romania

*cristina.maria@incdpm.org

Abstract. This paper aims to identify the presence of microplastics in two of the components of the Dâmbovița River, namely in the water column and in the sediment. The samples were taken to the laboratory and the presence of microplastics was identified in all the water and sediment samples. Also, the abundance of identified microplastics was systematically higher in sediment samples than in water samples. Microscopic analysis of the microplastic particles retained on microcellulose filters has been greatly hampered by the fact that many of the particles have irregular shapes, very small sizes, are transparent, colourless and, for this reason, have been more difficult to identify and quantify.

Degradation of Reactive Black 5 Dye (RB5) using Iron Electrode (Fe.S) Derived from Iron Sludge Steel Waste via Electrochemical Method

N. Nasuha^{1,*}, N. A. Azizan^{1,3} and H. I. Maarof^{1,4}

¹ School of Chemical Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

*norhaslinda.nasuha@uitm.edu.my

Abstract. A study has been performed on the degradation of Reactive Black 5 (RB5) as pollutant using iron electrode (Fe.S) derived from iron sludge steel waste via electrochemical method. The Fe.S and titanium graphite electrodes were applied as anode and cathode respectively during the studied. The studied operating parameters were the effect of current density, initial pH, initial concentration, and the reusability of the Fe.S electrode. The experiment was carried out for 120 mins of electrolysis time. From results revealed that Fe.S could be used three times with complete degradation of RB5 from initial concentration of 50 ppm. A complete RB5 colour removal can be achieved in any pH range (3,6, and 9). The current density at 4 mA/cm² showed a faster RB5 degradation compared to at 2, 6,8, and 10 mA/cm².

Assessment on Water Footprint of Paddy Cultivation in Kedah

N. Azhar¹, W. A. A. W. Ahmad^{1,2,*}, S. A. Mohammed^{1,2},
A. G. Ahmad¹, R. Santiagoo^{1,3}, V. Vijean⁴ and R.
Ahmad^{1,2}

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

²Water Research Group (WAREG), Universiti Malaysia Perlis (UniMAP), 02600 Arau, Perlis, Malaysia

³Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technologies (CEGeoGTech), Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

⁴Faculty of Electronic Engineering Technology, Universiti Malaysia Perlis, Kampus Induk Pauh Putra, Pauh, Perlis

*amneera@unimap.edu.my

Abstract. A measurable metric to gauge both the amount of water pollution and water consumption per unit of crop is the water footprint (WF). WF can be used as a thorough indicator of the utilization of freshwater resources. This study's goal is to estimate the region of Kedah's water footprint for paddy cultivation in the year 2017. By using CROPWAT 8.0 computer programming, climatic parameters were used for the estimation of water evapotranspiration for blue and green to proceed with the water footprint accounting. The methodological framework followed the crop water requirement (CWR) option based on the water footprint assessment manual. Focusing on the water footprint accounting phase, the blue, green and grey water footprint was calculated. The findings demonstrated that the three forms of water footprints differ significantly from one another. In Kedah, the value of the green water footprint (1201m³/ton) is higher than that of the blue water (130m³/ton) and the grey water (357m³/ton) footprints. 71% of green water footprint indicates that there is enough rainfall to support paddy growth.

Assessment of Water Quality and Nutrient Uptake of Azolla in Different Fertilizer

I. A. Zakarya^{1,2}, N. A. N. M. Nasir¹, N. Razali¹ and M. H. Ibrahim³

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia..

² Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technologies (CEGeoGTech), Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

³Ecopro Training Centre Kebun Abi, Kampung Nesam, 01000, Kangar, Perlis

*irnis@unimap.edu.my

Abstract. The improvement of water quality through aquatic plants' nutrient uptake is one of the crucial elements in achieving a sustainable ecosystem. Water quality is affected by a variety of variables, including dissolved oxygen concentrations, nutrient overabundance, bacterial populations, salt content, and the amount of suspended particles in the water. This experiment examined the ability and effectiveness of aquatic macrophytes, *Azolla pinnata* to absorb amount of nutrients including phosphate, potassium, and nitrogen ammonia in nutrient rich medium. The water quality during cultivation period, including its turbidity, pH, and temperature were monitored. The biological and biochemical characteristics of azolla have been assessed in relation to a variety of fertilizers, including cow dung, liquid fertilizer, mushroom block fertilizer, and compost food waste, at various concentrations 5g, 10g, and 15g. The study findings indicated that the most suitable fertilizer for azolla growth is cow dung fertilizer and the least suitable fertilizer is liquid fertilizer. Rapid growth of azolla between days 15 to 25 were observed for the cow dung fertilizer at all concentration as compared to control and other fertilizers. Water quality for each parameter increase within time. The ability of azolla to absorb nutrients shows great potential for the phosphorus element when compared to potassium and nitrogen uptake. In order to reduce the amount of excessive phosphorus and potassium in water, azolla is a great candidate for eco-friendly phytoremediation.

Development and Implementation of A Methodology for National Wastewater Surveillance System of SARS-CoV-2 in Romania

R. Prangate¹, G. Deák^{1,*}, M. Matei¹, M. Boboc¹, E.
Holban¹ and G. Dumitrescu¹

¹National Research and Development Institute for Environmental Protection, Splaiul
Independenței 294, Bucharest, Romania, 060031

*dkrcontrol@yahoo.com

Abstract. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a highly transmissible and pathogenic coronavirus and has caused a pandemic of acute respiratory disease. Over time, numerous studies have demonstrated the advantages of environmental surveillance through wastewater monitoring. During the COVID-19 public health emergency, several countries have conducted studies to detect viral RNA from SARS-CoV-2 in wastewater. Also, several countries have developed a National Wastewater Surveillance System of SARS-CoV-2, currently it is also being implemented in Romania. The objective of the present study is to develop, based on the information already reported in the specialized literature, an effective methodology for the detection and quantification of SARS-CoV-2 RNA in wastewater and highlighting the sample processing methods (these methods not being standardized). In addition, we summarize current knowledge on recent advances and applicability of SARS-CoV-2 virus monitoring in wastewater as a tool for surveillance of COVID-19.

Effectiveness of Effective Microorganisms in Treating Wastewater

G. Murukaiya¹, W. A. A. W. Ahmad^{1,2,*}, A. G. Ahmad¹, R. Santiagoo^{1,3}, V. Vijejan⁴, R. Ahmad^{1,2} and S. A. Mohammed^{1,2}

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

²Water Research Group (WAREG), Universiti Malaysia Perlis (UniMAP), 02600 Arau, Perlis, Malaysia

³Sustainable Environment Research Group (SERG), Centre of Excellence Geopolymer and Green Technologies (CEGeoGTech), Universiti Malaysia Perlis, Jejawi 02600 Arau, Perlis, Malaysia.

⁴Faculty of Electronic Engineering Technology, Universiti Malaysia Perlis, Kampus Induk Pauh Putra, Pauh, Perlis

*amneera@unimap.edu.my

Abstract. Effective Microorganisms (EM), a coexisting beneficial microorganism culture made up primarily of lactic acid bacteria, photosynthetic bacteria, yeast, fermenting fungi, and actinomycetes, is claimed to be able to not only increase soil microbial turnover, which is known to increase soil macronutrients and increase plant growth and yield but also treat sewage or effluents. In the present study, the EM formulation was evaluated for reduction of turbidity, total suspended solids (TSS), pH, temperature, biological oxygen demand (BOD), and chemical oxygen demand (COD), meanwhile dissolved oxygen (DO) increases of domestic sewage under standard condition. The results obtained show that EM mudball itself is capable of reducing the temperature (56%), pH (85.25%), BOD (17.5%), turbidity (21.69%), COD (22.57%), TSS (81.28%) and increases in DO (67.87%). EMAS are capable of reduction the temperature (56%), pH (48.27%), BOD (17.5%), turbidity (23.17%), COD (61.29%), TSS (81.45%), meanwhile increases of DO (67.45%). The experiment's findings demonstrate that EM may effectively treat domestic wastewater and has the potential to improve the efficacy of wastewater treatment.

Improving Iron and Copper Uptake by Changing the Ratios in Root of Vetiver Grass

N. S. A. Halim¹, N. Hamzah^{1,*}, F. Baharudin¹, N. S. Zainuddin¹, N. L. Rahim², N. A. F. M. Kamil³, N. A. Akbar⁴ and N. S. M. Zin³

¹School of Civil Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

²Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Jejawi 02600, Arau, Perlis, Malaysia.

³Faculty of Civil Engineering and Built Environment, Universiti Tun Hussien Onn Malaysia, Batu Pahat, Johor, Malaysia

⁴School of Civil Engineering, College of Engineering, Universiti Teknologi MARA, Cawangan Pulau Pinang, Kampus Permatang Pauh, 13500 Permatang Pauh, Pulau Pinang

*nurhidayah0527@uitm.edu.my

Abstract. Phytoremediation using Vetiver grass (VG) has been used in the past few decades all over the world, but the effectiveness of its uptake mechanism in water has less been discussed especially in mix metal condition. Hence, the focus of this research was to determine and evaluate the heavy metal removal effectiveness of two heavy metals, copper (Cu) and iron (Fe), based on vetiver grass uptake and toxicity. Three treatments of Fe and Cu mixture were chosen and individual concentration act as control. The vetiver grass at height of 10 cm and a root length of 25 cm for each treatment was used and harvested at day 0,1, 3, 6 and 7. The roots were randomly cut, oven-dried and using digestion method to extract the Fe and Cu in the root. From the result, vetiver grass has better Fe and Cu uptake ability in the mixture treatment compared to the individual treatment. Fe uptake is increasing up to 25.3 % in the presence of Cu (mixture 1). Meanwhile for Cu, mixture 3 is an ideal ratio to increases the Cu uptake by 14.5%. It shows that both Fe and Cu facilitated each other's uptake in real wastewater conditions. There was also observed a minimal toxicity sign such as necrosis throughout the experiment. The appearance of vetiver grass has changed in this experiment started day 3 and remain yellowish. As conclusion, wastewater that contain high concentration of Fe than Cu can promise the improvement of both Fe and Cu uptake by vetiver grass. This study benefit researchers that apply phytoremediation to remove heavy metals in wastewater by providing a guideline of Fe and Cu removal by vetiver grass. In future, the study will focus on the mechanism and interaction of Fe and Cu uptake by root.

Organic Loads Reduction Efficiency using Natural Fiber Reinforced Polymer Encapsulated Microalgae Macrocapsule for Wastewater Treatment

Z. Dollah^{1,*}, N. A. S. Roslan¹, S. Alias¹ and N. A. Akbar¹

¹Centre for Civil Engineering Studies, Universiti Teknologi MARA, Cawangan Pulau Pinang, Permatang Pauh Campus, 13500 Pulau Pinang, Malaysia

*zuraisah@uitm.edu.my

Abstract. Organic load such as Chemical Oxygen Demand (COD) increases in the water because of the increase in human growth and industrialisation. The initial goal of the study, to characterize the natural fibre reinforced polymer encapsulated microalgae macrocapsule using Fourier transform infrared spectroscopy (FTIR) and Scanning electron microscope (SEM). Second, analyse organic load reduction utilising microalgae oil palm empty fruit bunch microcapsule. The experiment was conducted with 2 photobioreactor contains 1600 mL wastewater. Photobioreactor 1 contains wastewater. Photobioreactor 2 with 22-gram natural fiber reinforced polymer encapsulated microalgae macrocapsule. From the result, absorbance peak indicates a functional group. All functional groups for macrocapsules before and after wastewater treatment were shown. Alcohol, alkene, and aromatic amine are (O-H), (C=C), and (C-N) before treatment. (O-H), (O=C=O) and (C=C) are alcohol, carbon dioxide, and alkene after treatment. This study employs COD to test microalgae's organic load reduction. The macrocapsule COD test was reduced over 5 days. From day 1 to 5, wastewater COD reduces by 89%. COD is reduced by 129 days 1-5 with wastewater plus macrocapsule. Optical density measures microalgae growth. BBM's increasing absorbance value allows microalgae to develop optimally. Natural fibre reinforced polymer encapsulated microalgae macrocapsule shows potential for wastewater treatment.

Effect of Pyrolysis Temperature of Coconut Fibre Biochar Incorporated in Zn/Al Layered Double Hydroxide for the Removal of Nickel(II)

N. A. Awang^{1,2}, W. N. W. Salleh^{1,2,*}, F. Aziz^{1,2}, N. Yusof^{1,2} and A. F. Ismail^{1,2}

¹Advanced Membrane Technology Research Centre (AMTEC)

² Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor Darul Ta'zim, Malaysia.

*hayati@petroleum.utm.my

Abstract. Coconut fibre biochar (CCFB) pyrolyzed at different pyrolysis temperature (400 °C, 500 °C and 600 °C) was immobilized Zn/Al layered double hydroxide (Zn/Al LDH-CCFB) composites adsorbent was prepared via simple co-precipitation technique. The composites adsorbents was used to reduce the high concentration of Ni(II) metal ions from aqueous solution. The structure and morphology analysis were investigated by Brunauer-Emmett-Teller (BET), and Scanning electron microscopy (SEM). A series of batch adsorption test was conducted with different parameters including pH of the solution (3-7), initial concentration of Ni(II) (10-250 mg/L) and the contact time of the shaking time (0.16-8 h). Pseudo-second order kinetic model was well fitted for all of the samples compared to pseudo-first order and intraparticle diffusion kinetic models with the value of R² = 0.9993, 0.9719, 0.9924 and 0.9978 for Zn/Al LDH-0, Zn/Al LDH-CCFB400, Zn/Al LDH-CCFB500 and Zn/Al LDH-CCFB600, respectively. Meanwhile, the adsorption process was best described with Freundlich model with the R² = 0.9311, 0.9987, 0.9843 and 0.9981 for Zn/Al LDH-0, Zn/Al LDH-CCFB400, Zn/Al LDH-CCFB500 and Zn/Al LDH-CCFB600, respectively. From the adsorption performance test, it was found that the adsorption capacity of Zn/Al LDH-CCFB500 at pH 7 agitated for 4 h was higher compared with other samples with the adsorption capacity up to 106.95 mg/g. The adsorption capacity of all of the Zn/Al LDH-CCFB improved compared to pristine Zn/Al LDH-0. Thus, it was concluded that Zn/Al LDH-CCFB possess great potential for the adsorbent in the removal of pollutants especially the hazardous heavy metal ions.

Enhancement of Surface Hydrophobicity of Natural Rubber and Fabric for Oil Removal

O. Boondamneon^{1,2,*}, Y. Issaraseree¹, N. Phongpala¹, U. Sangwatanaroj^{1,2} and *M. Opaprakasit^{1,2*}

¹Department of Materials Science, Faculty of Science, Chulalongkorn University, Phayathai, Bangkok 10330, Thailand

²Center of Excellence on Petrochemicals and Materials Technology, Chulalongkorn University, Research building, Phayathai, Bangkok 10330, Thailand

*Orathai.B@chula.ac.th

Abstract. Oil removal from water has become more important for environment sustainability since there are many cases of oil leakage accidents. In this work, rubber foam attached with cotton fabric was prepared by casting process. The enhancement of hydrophobicity would increase the efficiency of oil removal. The cotton fabric was coated by natural rubber (NR) foam and subsequent treatment with hydrophobic agent. Firstly, the wet NR foam was prepared and then casted on the surface of cotton fabric. After that it was cured by steaming process. The obtained natural rubber foam-coated cotton fabric was immersed into a solution of trimethylolpropane tris(3-mercaptopropionate) (TMPTMS) for surface pre-treatment. Thereafter, hydrophobic treatment was proceeded using hexadecyltrimethoxysilane (HDTMS) as hydrophobic agent. The untreated NR foam-coated fabric was also prepared for comparison. The formation of hydrophobic agent with rough surface was revealed by SEM micrographs. The wetting behaviour of water on the side of cotton fabric was successfully developed achieving the superhydrophobic characteristic with the result of water contact angle (WCA) at 157°. In addition, the hydrophobicity of rubber foam surface was much improved to 140° of WCA. The treated NR foam-coated fabric exhibited oil absorption selectivity and completely removes the oily layer from water. From the results, the prepared NR foam-coated fabric presented an attractive hydrophobic property with simple and low-cost preparation.

Green Engineering & Technology

Building Surface Defect Monitoring using Photogrammetry Method

*N. M. Zahari¹, S. S. M. Razali¹, Nurhanani A. Aziz³, F. Nurhikmah³, M. H. Zawawi¹, A. Syamsir^{1,4} and M. R. Isa²

¹Department of Civil Engineering, Universiti Tenaga Nasional (UNITEN), 43000 Kajang, Selangor Darul Ehsan, Malaysia.

²Department of Mechanical Engineering, Universiti Tenaga Nasional (UNITEN), 43000 Kajang, Selangor Darul Ehsan, Malaysia.

³UNITEN R&D Sdn. Bhd., Universiti Tenaga Nasional, Jalan Ikram-UNITEN, 43000 Kajang, Selangor Darul Ehsan, Malaysia.

⁴Institute of Energy Infrastructure (IEI), College of Engineering, Universiti Tenaga Nasional, 43000, Kajang, Selangor, Malaysia.

*nazirul@uniten.edu.my

Abstract. The principle of the photogrammetry techniques is the electromagnetic radiant imagery taken by drone to record, measure and interpret photographic images. This paper presents the application of photogrammetry techniques for the inspection of buildings and structures. The aim of this research is to assess the application of Unmanned Aerial Vehicle (UAV) by using drone to develop a three-dimensional mapping model, that can be used for health infrastructure monitoring. The test was conducted at College of Engineering building in Universiti Tenaga Nasional (UNITEN). The picture captured using high-resolution camera that have been attached to the drone was used and processed using Agisoft Software. The best resolution of three-dimensional mapping using Agisoft software was compared in order to identify surface defect occurs on College of Engineering buildings. As consequence, the surface defect has been found and further analysis was conducted. Findings stated that, building surface defect monitoring using photogrammetry method can be used as one of methods to conduct the building inspection and monitoring..

Techno-Economic Analysis On Residential Solar PV System Under COVID-19 Crisis

*Arreen Anak Savlan¹, Maryam Huda Ahmad Phesal²

¹Universiti Tenaga Nasional

²Institute of Power Engineering, Universiti Tenaga Nasional

*hmaryam@uniten.edu.my

Abstract. Following the outbreak of COVID-19 and the commencement of MCO in Malaysia, the education and business sectors were severely impacted. The introduction of ODL and WFH caused the weekday residential load profiles to resemble the weekend profiles from the previous years. This paper will compare and analyse the electricity consumption during pre-COVID, during MCO and after MCO. This study also determines the optimal solar panel size of installation for a residential area in Kuching, Sarawak and conducts a techno-economic analysis on the solar panel installation. The load profile data for the past 10 months was obtained from the case study. This study demonstrated that prior to COVID, energy generated from the grid was more financially and environmentally feasible. However, due to the MCO commencement which has resulted in a surge of energy consumption, energy generated by solar PV systems is now more feasible because it is less expensive and more environmentally friendly. ODL and WFH continue after MCO, albeit less intensely than during MCO. As a result, the feasibility results for the grid system and the solar PV system are inconsistent. Future studies should consider different coverage percentages to determine the optimal array size for an energy scenario.

Marshall Stability of Combination of Perlis Limestone and Granite in Hot Mix Asphalt

*Mohd Badrul Hisyam Ab Manaf^{1,3}, Mohd Mustafa Al Bakri Abdullah², Rafiza Abdul Razak^{1, 2}, Mohd Rosli Mohd Hassan⁴ and Muhammad Munsif Ahmad¹

¹Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, 02600 Arau, Perlis, Malaysia

²Centre of Excellence, Geopolymer and Green Technology (CeGeotech), Universiti Malaysia Perlis, Kompleks Pusat Pengajian Jejawi 2, Taman Muhibbah, 02600, Jejawi, Perlis

³Water Research and Environmental Sustainability Growth (WAREG), Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, Pusat Pengajian Jejawi 3, 02600, Arau Perlis, Malaysia.

⁴School of Civil Engineering, Universiti Sains Malaysia, Nibong Tebal 14300, Pulau Pinang, Malaysia

* badrulmanaf@unimap.edu.my

Abstract. Limestone is used in many countries for road pavement, such as Poland, USA and France. However, there are limitations in terms of mechanical and surface properties, but it has been used in some regions for years, particularly in Perlis, Malaysia, due to the need for a local source. The reason is that of caution of fear, in spite of wanting to explore the opportunities of Perlis limestone being used and understand the advantages and disadvantages of that aggregate. This study focused on the stability, flow, and volumetric by using a combination of Perlis limestone and granite in hot mixed asphalt (HMA) mixtures. Furthermore, there will be a cost increment in road construction due to logistic and transportation problems in delivering imported granite aggregate from Kedah state. The result showed that HMA with less Perlis limestone aggregate showed a higher value of stability, flow and stiffness. As for the conclusion, HMA with more granite aggregate has better strength with less deformation compared with HMA with more Perlis limestone aggregate. HMA with more granite aggregate was also stiffer, mainly due to the interlocking and frictional resistance of the aggregate due to the angularity and rougher surface of granite. However, since all the samples complied with the PWD specification, Perlis limestone proved it can be an alternative aggregate to be used in HMA.

Clean Green Value Stream Mapping

*Alaa Salahuddin Araibi¹, A I M Shaiful², Ezzet H. Abdulsalam³, Yasser M. Kadhim¹, Muhannad Hatem Shadhar¹, Faten Gh. Dawood¹, Rawand M. Badri¹, Mustafa Talib Shareef¹, Mazin Hussien Abdullah¹ and Ali AbdulJabbar Al-Fahad¹

¹Civil Engineering Department, Dijlah University College, Almasafi Street, 10022 Aldora, Baghdad, IRAQ.

²Faculty of Mechanical Engineering and Technology, Universiti Malaysia Perlis, Kampus Alam Pauh Putra, 02600 Arau, Perlis, MALAYSIA.

³Mechanical Power Technical Engineering Department, Dijlah University College, Almasafi Street, 10022 Aldora, Baghdad, IRAQ.

*alaa.salahaldin@duc.edu.iq

Abstract. Lean manufacturing (LM) or Toyota Production System (TPS) has shown clear examples of improvements in the field of manufacturing and management. LM succeeded to eliminate waste, reduce inventory, reduce cost, improve productivity, and satisfy customers by listening to their suggestions for more improvement. Recently, the increase in pollution, cost of energy, and global warming, companies started to adopt lean with green concept. Green Lean manufacturing (GLM) has received attention from manufacturing companies as it focuses on decrease the effect on environment. This study performs a literature review with a developed conceptual model to identify the concept of GLM. Although the model has not been tested yet, it is anticipated that it will bring more advantage because it takes into account the environmental wastes.

Management of organizational change within the Romanian railway industry

*Cătălin-Laurențiu Bulgariu¹ and Aurel Mihail Țîțu²

¹Politehnica of Bucharest, Faculty of Industrial Engineering and Robotics, Splaiul Independenței, 313, 6th District, Bucharest, Romania

²"Lucian Blaga" University of Sibiu, 10, Victoriei Street, Sibiu, Romania

*mihail.titu@ulbsibiu.ro

Abstract. Within this work, the importance of organizational change and change management within railway organizations is analyzed. In today's times, changes are more and more frequent and any change can be defined as an act of creation. Reducing the time between two changes is equaled by the permanent creation of one's own creative capacity in one's own organizational structures, by the flexibility of management structures, by the permanent training of the staff in a position to ensure the increase in the speed of assimilation of the new, by the manager's degree of receptivity to changes, of the management's motivation. Change is a constant and a reality of our daily lives. Taking into account the turbulent times in which we find ourselves, the importance of change and adaptation to the new becomes a necessity for most organizations, even more so for the railway ones. In order for any change to be carried out in optimal conditions and on time, study and understanding are necessary notions regarding change management and overcoming resistance.

The implication of artificial intelligence in the safety and security (cyber security) of railway transport

*Aurel Mihail Țîțu¹ and Cătălin-Laurențiu Bulgariu²

¹"Lucian Blaga" University of Sibiu, 10, Victoriei Street, Sibiu, Romania

²University Politehnica of Bucharest, Faculty of Industrial Engineering and Robotics, Splaiul Independenței, no. 313, 6th District, Bucharest, Romania

*mihail.titu@ulbsibiu.ro

Abstract. The rapid development of new technologies and artificial intelligence offers the field of railway transports and not only that, a series of opportunities related to the aspects of safety, security, performance and other concerns that this sector faces. This paper presents the implications that artificial intelligence can have in railway transports and the relationship between this technology and the transport system. The implications of artificial intelligence in the field of rail transport can cover a wide range of problems that the system faces, such as: safety and security, maintenance and inspection, management and planning, driving and control of railway vehicles and, last but not least, passengers' mobility. This paper provides an overview of the role of artificial intelligence in the development of railways and what it can offer not only at the level of track maintenance, but also at the level of management and decision-making. Despite the rapid development of these new technologies, artificial intelligence research in the railway sector is still in its infancy.

Preliminary Modelling Of Hydrological Performance For Green Roof Drainage Layer Using Response Surface Methodology

*Movierawanna Bernard¹ and Salinah Dullah¹

¹Faculty of Engineering, Universiti Malaysia Sabah, 88400 Jalan UMS, Kota Kinabalu, Malaysia

*nazirul@uniten.edu.my

Abstract. Response Surface Methodology modelling is used in this study to investigate experimental result for waterproofing and drainage layers with slope; 0, 2 and 6% test beds for three different types of drainage layers, rubber crumbs, oil palm shells and polyform. The aim of this study is to determine the accuracy and effectiveness of RSM through investigating the hydrological performance of green roofs. Nine sets of experimental data were used to analyse and the input parameters include type of material drainage layer, slopes and water absorption of the materials. The output variables were hydrograph and peak runoff, peak attenuation and water retention for each material. It was proven that the mathematical equations developed by the RSM model are capable of predicting the output response, with ANOVA analysis being used to determine the level of significant effect of the input parameters on the green roof hydrological performance. Furthermore, the RSM model's 2D contour plot and 3D surface plot revealed that slope and water absorption have a significant effect on peak runoff, peak attenuation, and water retention. It is proven that the RSM can be used to investigate various factors that affecting green roof hydrological performance.

Effect of Temperature and Duration Parameters On Pyrolysis Product Quality In The Catalytic Co-Pyrolysis Of Waste Cotton Fabric and Plastic

*Nur Syamimi Syahirah Azman¹, Muhammad Zahiruddin Ramli¹ and N.A.A., Bashah¹

¹School of Chemical Engineering, Universiti Teknologi MARA Cawangan Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang Malaysia

*muhammad159@uitm.edu.my

Abstract. Catalytic co-pyrolysis of waste cotton fabric and polypropylene (PP) plastic at different temperatures and durations in a fixed bed reactor was carried out. Various Cr-Al catalyst loading that prepared via wet impregnation method were used. The gas, liquid and char product were analyzed to investigate its influence towards temperature and pyrolysis duration. A mixed trend of product yield was observed as temperature increases. At lower temperature (300°C), gaseous component dominates the overall product yield. However, liquid product as the desired component increased significantly and peaked (40.6 wt%) at 600°C. The highest liquid product yield in terms of quantity was achieved during 30 minutes of pyrolysis, whereas the best product quality was achieved for 60 minutes. Therefore, pyrolysis at 600°C for 60 minutes using 20% Cr-Al catalyst loading was the optimal condition for the catalytic co-pyrolysis of waste cotton fabric and PP.

Optimization of the Surface Roughness of the Milling Process using Al₂O₃ Nanoparticles in MQL Coconut Oil Based on the Taguchi Method

*Muhammad Yanis¹, Arie Yudha Budiman¹, Muhammad Maulvy Syaukani¹, Amrifan Saladin Mohruni¹, Safian Sharif², Mohd Azlan Suhaimi² and Nova Yuliasari³

¹Department of Mechanical Engineering, Faculty of Engineering, Universitas Sriwijaya, Palembang, Indonesia

²Faculty of Mechanical Engineering, Universiti of Teknologi Malaysia, Skudai-Johor, Malaysia

³Department of Chemistry, Faculty of Mathematics and Natural Science, Universitas Sriwijaya, Palembang, Indonesia

*yanis@unsri.ac.id

Abstract. In the machining process, cutting fluids are used to transfer heat, reduce friction, and remove chips from the cutting zone. The Minimum Quantity Lubrication (MQL) technique under vegetable oil as a cutting fluid has been developed to consider its impact on health, the environment and sustainable machining. In recent decades, the use of cutting fluids mixed with nanofluid particles has provided heat transfer efficiency compared to conventional fluids. In this study, optimization of milling machining parameters and the comparison of two vegetable-based cutting fluids on the surface roughness of AISI 1045 workpieces was carried out. The cutting fluid used was pure coconut oil and coconut oil with 1% mixture of Al₂O₃ nanoparticle. Cutting speed, feed rate, and axial depth of cut were considered as milling machining parameters. Taguchi's L₉(3³) orthogonal array, and analysis of variance (ANOVA) were used to analyse the impact of machining parameters. The analysis of the results shows that the optimal machining with the best surface roughness is high cutting speed (40.82 m/min), low feed rate (0.042 mm/tooth), and low depth of cut (6 mm). The comparison of cutting fluid showed that coconut oil suspended with nanoparticles resulted in better surface roughness (8.89%) than pure coconut oil.

Nutrient Removal from Synthetic Wastewater Using Sequence Batch Reactor SBR in the Attached Growth System

* Baker Al-dhawi¹, SRM Kutty¹, Lavania Baloo¹, AH Jagaba¹, NMY Almahbashi¹, AAS Ghaleb¹, Vicky Kumar¹, A.A.H. Saeed², Al-Baraa Al-Mekhlafi³ and Yaser Alsaeedi⁴

¹Department of Civil and Environmental Engineering, Universiti Teknologi PETRONAS, Bandar Seri Iskandar 32610, Perak Darul Ridzuan, Malaysia

²Department of Chemical Engineering, Universiti Teknologi PETRONAS, Bandar Seri Iskandar 32610, Perak Darul Ridzuan, Malaysia

³Department of Management & Humanities, Universiti Teknologi PETRONAS, Seri Iskandar 32610, Perak, Malaysia

⁴Department of Civil and Environmental Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor

*bakeraldhawi@gmail.com

Abstract. Domestic wastewater streams frequently include harmful or disease-causing microbes, posing a concern to well—the being of humankind. Conventional wastewater treatment plants are still unable to fulfill Malaysian discharge limitations. Stringent regulation imposed by regulatory institutions makes compliance with discharge requirements to meet ammonia and nitrate levels required. A submerged attached growth is proposed to help the system reach these limits. Palam Oil Clinker POC can be inserted into the conventional treatment system. The current study comparison of synthetic domestic wastewater treatment (DWW) was established between the conventional activated sludge and submerged attached growth-activated sludge systems. The sequential batch mode study with medium-strength synthetic domestic wastewater was conducted to determine the highest removal of NH₄, NH₃, and PO₄. The effects of cycle time (CT) were studied and 91 mg/L, 89.4 mg/L, and 80 mg/L removal efficiencies were obtained for NH₄+N, NH₃, and TP respectively. This was achieved in a submerged attached growth sequential biofilm batch reactor. The optimization study determined the optimal solution of CT to be 72 hours. The predicted mean of responses for the optimal solution was 91 mg/L, 89.4 mg/L, and 80 mg/L for NH₄+N, NH₃, and TP removal, respectively.

Investigating the Effects of Body Weight and Physical Activities on the Electrical Generation of Piezoelectric Generator

*Nicholas Zhan Xin Lo¹, Hassan Mohamed^{1,2}, Zubaidi Faiesal Mohamad Razaai¹, Hazlina Junoh^{1,2}, Bidattul Syirat Zainal^{1,2} and Abd Halim Shamsuddin²

¹Mechanical Engineering Dept., College of Engineering, Universiti Tenaga Nasional, Jalan Ikram-Uniten, 43000 Kajang, Selangor, Malaysia

²Institute of Sustainable Energy (ISE), Universiti Tenaga Nasional, Jalan Ikram-Uniten, 43000 Kajang, Selangor, Malaysia

Abstract. This research paper investigates the effects of body weight and physical activities on the electrical generating capability of piezoelectric generators. The objectives of this paper include investigating the application of piezoelectric generators in converting mechanical energy from human activities to generate electricity, assessing the effect of active and sedentary activities on piezoelectric generation, and evaluating if different body weight affects the electrical output. To accomplish these objectives, two piezoelectric generators were built. The first generator was built to harvest electrical energy from jumping, walking, and running, and the second was built to harvest electrical energy from sitting. Next, an Arduino device was programmed as an oscilloscope to track the power output from the piezoelectric device. The experiment's sample size was five participants, with three males and two females. The results of the investigation concluded that active activities are more capable of producing higher amounts of power than sedentary activities. However, fatigue is observed when doing active activities, whereas sedentary activities do not show any sign of fatigue. Furthermore, this experiment reported that the body weight factor does not significantly affect the final power generation due to a possible limitation of the piezoelectric material.

Malaysia toward Renewable Energy: Biogas Generation from Anaerobic Digestion of Durian Musang King Waste

*Hazlina Junoh^{1,2}, Khairul Anwar Rahman^{1,2}, Hassan Mohamed^{1,2}, Bidattul Syirat Zainal^{1,2}, Nur Atiqah Mohamad Aziz^{1,2} and Abd Halim Shamsuddin¹

¹Institute of Sustainable Energy (ISE), Universiti Tenaga Nasional, Jalan Ikram-Uniten, 43000

Kajang, Selangor, Malaysia

²Mechanical Engineering Dept., College of Engineering, Universiti Tenaga Nasional, Jalan Ikram, Uniten, 43000 Kajang, Selangor, Malaysia

*hazlina.junoh@gmail.com

Abstract. Producing Bio-Methane gas from biomass to generate energy has been researched and studied thoroughly by many global researchers since the awakening of the importance of renewable energy. In this study, Durian Musang King's waste has been chosen as the substrate for Anaerobic Digestion (AD) to produce biogas for renewable energy. Three manipulated factors were tested in the one-week design experiment through the Bio Methane Potential (BMP) Test, namely (1) pre-treatment of substrate, (2) change in Inoculum to Substrate Ratio (ISR) and (3) change in the type of inoculum to be compared with a Standard Solution (1.05 g untreated substrate, 3:1 ISR and EM-1 inoculant as inoculum). The experiment results show that applying the pre-treatment process of grinding on Durian waste was unnecessary as there was no significant improvement in the biogas production. Using ISR 2:1 rather than 3:1 drastically increased the biogas generation from durian waste and elongated the biogas generation period. Palm Oil Mill Effluent (POME), another type of inoculum in the third experiment to compare with a commercial EM-1 Microbial Inoculant, has resulted in POME ranked below EM-1 in the total volume of biogas production.

A review on operations management in managing major oil spills from ships (tankers) in the Straits of Malacca, Malaysia

*Md Badron Ismail¹ and Che Azlan Taib²

¹School of Technology Management and Logistics, College of Business, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia

²School of Technology Management and Logistics, College of Business, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia.

*badron4822@yahoo.com

Abstract. Operations management (OM) is concerned with the designing and controlling processes or redesigning business operations for production of goods and services. More so in managing oil spills from tankers in the Straits of Malacca (SOM). Mistakes in decision making couple with outdated practices exposed marine living and non-living resources to damages as a result of the shipping casualties. In any major global oil pollution from tankers or sometimes addresses as oil pollution disaster has hardly achieved a fully oils recovery due to several factors; natural or physical or both. In the case, the previous study found that this phenomenon happened anywhere in the world including in the SOM. Operations management of this specialised mechanism requires specialists from various expertises such as engineering, chemical, biological, nautical, environmental economics, legal persons and social scientists. The whole spectrum of expertises determined the structure of frameworks such as legislation, institutional and operational that assimilated into national oil spill contingency plan (NOSCP). The plan documentation dictated the requirement of oil spills preparedness and response, distribution of oil spill response equipment (OSRE) stockpile strategically, and the way how its operations be managed and maintained to undertake any eventuality of future oil spills disaster in the SOM

Structural Modulus of the Unit Cell of the Bone Tissue Engineering Scaffold Based on Triply Periodic Minimal Surfaces (TPMS)

*Nur Syahirah Mustafa¹, Nor Hasrul Akhmal¹, Izman Sudin¹, Noordin Mohd Yusof¹ and Ani Idris²

¹Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia

²c/o Institute of Bioproduct Development, Faculty of Chemical Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia

*norhasrul@utm.my

Abstract. Human bone can be subjected to various types of diseases which will eventually damaging the bone. Recently, bone grafting and bone cement are used to treat damaged bone. However, the techniques might have drawbacks that lets the researchers to discover tissue engineering. In tissue engineering, scaffold is crucial in ensuring the cell proliferation to perform with the aid of high structural modulus and porosity. Therefore, it is important to determine the appropriate designs of unit cell of the scaffold to enable bone regeneration to perform smoothly. In this paper, we discussed the method to simulate the structural modulus of the unit cell scaffold of bone tissue engineering ranging from various type of unit cells. From our finding, Triply Periodic Minimal Surfaces (TPMS) design possess a high structural modulus with high amount of porosity as compared to the simple pore unit cell. From all the TPMS designs that had been simulated, we found that primitives have a high structural modulus and porosity as compared to the others. In conclusion, we can see that the TPMS designs play an excellent role in ensuring the cell proliferation and bone regeneration to occur smoothly and fast.

Corrosion inhibition of musa acuminata and its synergism effect of halide ions on mild steel in an acidic environment

*Norbaayah Ahmad Reza¹, Nor Hasrul Akhmal Ngadiman¹, Nor Akmal Fadil¹ and Mohd Firdaus Mohd Taib¹

¹Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia

*norhasrul@mail.fkm.utm.my

Abstract. Mild steel is widely used in industries. So, it is very important to keep the metal in pristine condition. One of the ways is by using the acid-cleaning method which also leads to the acid stripping of the metal. Thus, corrosion inhibition is deployed which forms a barrier between the metal and the acidic environment. In this study, Musa Acuminata is chosen as the basis for the corrosion inhibitor. The concentration of the corrosion inhibitor, the soaking temperature, and the time of soaking have been kept constant at 500 ppm, 70°C, and one hour. Corrosion inhibition efficiency is recorded at 32.74 percent. Three types of additives are added to the inhibitor namely potassium iodide, potassium chloride, and potassium bromide. As a result, the maximum inhibition efficiency increased to 47.69 percent. The majority of the synergism effect has shown a positive increment of efficiency up to 15 percent compared to the usage of Musa Acuminata alone. The surface coverage increases following the addition of halide ions into the system. In a conclusion, the corrosion inhibitor is capable to reduce the corrosion rate in the high-temperature setting. This finding has also been amplified by the addition of halide ions into the system.

Improvement of Vehicle Cabin Ventilation Safety System Detected by Alcohol Detector Device

*Mohamad Hafiz Harun¹, Fauzi Ahmad², Muhammed Daniel Hakimi Ahmad¹, Mohd Hanif Che Hasan³ and Ubaidillah Sabino⁴

¹Faculty of Mechanical and Manufacturing Engineering Technology, Universiti Teknikal Malaysia

Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

²Faculty of Mechanical Engineering, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

³Faculty of Electrical and Electronic Engineering Technology, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

⁴Faculty of Engineering, Universitas Sebelas Maret, Kota Surakarta, 57126 Jawa Tengah, Indonesia

Abstract. Recently, cases of fatal traffic accidents involving inebriated drivers have been often reported in the news. This issue has not only endangered the safety of drivers but also other road users. Drunk driving has been listed as one of the leading factors in fatal car accidents. To overcome this problem, drunk driving detectors have the potential to be explored to reduce the rate of road accidents. In this study, a drunk driving detection device was introduced using a microcontroller embedded into the vehicle starting system. Alcohol sensors were used in this study to detect alcohol levels in human breath. The device will detect the level of alcohol in the breath. When the alcohol concentration is detected more 50 milligrams per 100 millimeters in blood, the vehicle's starting system is disabled so that the vehicle cannot be started. Consequently, the driver's window will slide down automatically by 20 mm for the purpose of vehicle cabin ventilation. By using this system, road accidents caused by drunk drivers can be reduced. In addition, a driver who is intoxicated can rest in the car cabin until he wakes up from the state of intoxication without drowning in the vehicle cabin.

Effect of CuO nanofluid concentrations on pressure drop of microchannel heat sink

*Qamar Fairuz Zahmani¹, Norzelawati Asmuin²,
Mohamad Kamil Sued^{1,3}, Siti Nor'ain Mokhtar¹,
Muhammad Hadzim Ashraff Mazlan¹

¹Faculty of Mechanical and Manufacturing Engineering Technology, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal Melaka, Malaysia.

¹Centre for Advanced Research on Energy, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat Johor, Malaysia.

²Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat Johor, Malaysia.

³Faculty of Manufacturing Engineering, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal Melaka, Malaysia.

*qamar@utem.edu.my

Abstract. Microchannel heat sinks (MCHS) are commonly used to cool electrical devices. The pressure drop in straight microchannel heat sinks (MCHS) is investigated utilizing varied concentrations (1, 2, 3, 4, and 5%) of Water-CuO nanofluids as working fluids. For this, a CFD examined the performance of nanofluids in microchannel heat sinks. Pressure drops, temperature, velocity, surface Nusselt number, and surface heat transfer coefficient contours were presented for each microchannel. At a reference inlet velocity of 2 m/s, the thermo-physical characteristics of nanofluid are examined. The heat flux generated at the microchannel's bottom surface was 160000 (W/m²). Increasing the temperature reduces the pressure drop. Increasing velocity reduces pressure drop. Increased nanofluid volume concentration increases viscosity, which increases pressure drop. Temperature increases alter viscosity, lowering pressure drop. Overall, comparing all Water-CuO nanofluid concentrations shows that 1% Water-CuO is the best for cooling since it has the lowest pressure decreases compared to the other nanofluids. By raising flow velocity, improving heat transfer, and minimizing pressure drop, this Water-CuO 1% concentration can completely leverage the advantages.

Effect of Activating Agent on Porous Activated Carbon in Alginate Macrobeads for Removal of Remazol Red Dye

*Nurul Izzati Muhamad Zakir^{1,2}, Zunaida Zakaria^{1,2},
Hakimah Osman^{1,3}, Hafiza Shukor^{1,3} and Abdulhakim
Masa⁴

¹Faculty of Chemical Engineering and Technology, Universiti Malaysia Perlis.

²Centre of Excellence Geopolymer & Green Technology (CEGeoGTech) Universiti Malaysia Perlis (UniMAP), 02600, Arau Perlis, Malaysia.

³Centre of Excellence for Biomass Utilization, Universiti Malaysia Perlis (UniMAP), 02600, Arau Perlis, Malaysia

⁴Rubber Engineering and Technology Program, International College, Prince of Songkla University, Hat Yai, Songkhla, 90110 Thailand

Abstract. Alginate macrobeads filled with porous activated carbon (PAC) treated using different types of chemical activating agents were prepared in this study. Rice husk ash (RHA) was treated using five types of chemicals, such as sodium hydroxide (NaOH), potassium hydroxide (KOH), zinc chloride (ZnCl₂), hydrochloric acid (HCl) and citric acid, at a low temperature (~80°C) for 2 hours to produce PAC with high porosity and compared to the conventional process using furnace with a high processing temperature. A biopolymer, namely sodium alginate, was used to hold the PAC powder to produce an immobilized structure of PAC in macrobeads form. Adsorption of remazol red (RR) dye using macrobeads was measured using UV-spectrophotometer, while the morphology and composition of PAC were observed using scanning electron microscope (SEM) and energy dispersive X-ray (EDX), respectively. The functional groups of PAC were identified using attenuated total reflection Fourier transform infrared (ATR-FTIR). The results indicated that the alkali treated PAC successfully removed up to ~99% of the dye in 120 minutes, while the acid treated PAC could only remove ~30% the dye at the same time. This demonstrated that alkaline treatment produced PAC with higher porosity structure and the PAC produced using NaOH has high adsorption of RR dye.

Tribological Properties Improvement of Zinc Induced Palm Oil Bio-Lubricant with Addition of Molybdenum Dialkyldithiophosphate

*Muhamad Azwar Azhari¹, Nor Hasrul Akhmal Ngadiman¹, Noordin Mohd Yusof¹ and Ani Idris²

¹Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Skudai, 81310 Johor, Malaysia.

²Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia, Skudai, 81310 Johor, Malaysia.

Abstract. Different concentration of Molybdenum Dialkyldithiophosphate is added into Zinc Dialkyldithiophosphate induced bio-lubricant with palm oil as the parent base oil to investigate the effect on friction and wear reduction. The increasing concern on depletion of mineral oil sources and the environmental impact its waste could impose causes the focus on development of lubricant to shift to a new renewable precursor. New formulated bio-lubricant with addition of 0.05wt% MoDTP in 2wt% ZDDP induced palm oil exhibited a superior anti-friction and wear reduction characteristics. From four ball test results, the friction of palm oil added with 0.05wt% MoDTP and 2 wt% ZDDP reduced to 0.072 compared to pure palm oil. The wear scar diameter reduced from 132 μm for pure palm oil to 74 μm with addition of the same additives. The combination of ZDDP and MoDTP at the desirable concentration has reduced the friction and wear scar by forming a polymer layer of phosphates between metal surfaces.

Epoxidation Of Oleic Acid Under Moderate Temperature

*Siti Mariam A. Rahman¹, Mohd Azril Riduan², Tunku Arif Zafri Tunku Ozir³, Intan Suhada Azmi³, Mohamad Zarqani Yeop³, Veronique Gloria V Siduru¹ and Mohd Jumain Jalil¹

¹Centre for Chemical Engineering Studies, Universiti Teknologi MARA, Cawangan Johor, Kampus Pasir Gudang, 81750 Masai, Johor, MALAYSIA

²Comgreat Solutions Sdn. Bhd, Ipoh, Perak, MALAYSIA

³School of Chemical Engineering, Universiti Teknologi MARA, Cawangan Pulau Pinang, Kampus Permatang Pauh, 13500 Permatang Pauh, Pulau Pinang, MALAYSIA

*mjumain0686@uitm.edu.my

Abstract. Epoxidized palm oleic acid are largely employed as plasticizers instead of harmful phthalates and they can be a sustainable choice to produce green chemical intermediate. The aim of this work is to study the reaction of palm oleic acid epoxidation by ion resin exchange using safer reactant. The optimal reaction conditions for the production of epoxidized palm oleic acid in response to oxirane content were found to be ion exchange resin, a temperature of 75 °C and hydrogen peroxide concentration 50wt%. By employing the optimal circumstances, the maximum relative conversion of palm oleic acid to oxirane was reached up to 76.6%.

Short review of Magnetorheological Elastomer Embedded with Piezoelectric Energy Harvester

*M. F. Jaafar^{1,2} and Shaquille Rashuan Mohd Napi¹

¹Department of Mechanical Engineering, Universiti Tenaga Nasional, 43000 Selangor,
Malaysia

²Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor,
Malaysia

*mohd.firdaus@uniten.edu.my

Abstract. This paper reviews the possibility of improving the harvested energy from piezoelectric-based vibration energy harvester (PEH) by embedding magnetorheological elastomer material (MRE). PEH have been investigated for many years, but no works have looking into incorporating MRE within the design of the PEH. With the controllable stiffness and damping abilities of MRE, the prospect for higher output energy with wider frequency bandwidth are possible for the MRE-based PEH. This paper review on the potential applications of MRE based on the sizes and shapes of the PEH design.

Simulation of piezoelectric energy harvester with different shapes

*M. F. Jaafar^{1,2} and Shaquille Rashuan Mohd Napi¹

¹Department of Mechanical Engineering, Universiti Tenaga Nasional, 43000 Selangor, Malaysia

²Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

* mohd.firdaus@uniten.edu.my

Abstract. At a time when the entire globe is looking for green energy as an alternative source, energy harvesting is a fascinating area of research. Over the years, Piezoelectric has been considered and used as one of the energy harvesters. This work provides the analysis of different Piezoelectric material, as well as the different shaped of Piezoelectric Energy Harvester. The constructed model was then analysed using COMSOL Multiphysics software. The results obtained from the analysis was then tabulated to determine the suitability and the generation of voltage, mechanical power out and electric power out for each of the Piezoelectric Energy Transducers.

Dynamic compression simulation of magnetorheological elastomer using Bouc-Wen hysteretic model

*M. F. Jaafar^{1,2}, Faizal Mustapha² and Mazli Mustapha³

¹Department of Mechanical Engineering, Universiti Tenaga Nasional, 43000 Selangor, Malaysia

²Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

³Mechanical Engineering Department, Centre for Corrosion Research, University Teknologi PETRONAS, 32610 Seri Iskandar, Perak, Malaysia

*mohd.firdaus@uniten.edu.my

Abstract. This paper explores the versatility of Bouc-Wen hysteresis model in simulating the dynamic behaviour of magnetorheological elastomer (MRE) material. Bouc-Wen model have been used in many field of science including modelling the hysteresis phenomenon happen in magnetic material, elastomer, base isolation of structures and many more. Introduced by the Robert Bouc, this nonlinear hysteretic model has been modified by many researchers to suit different applications. Compression testing of MRE material under high strain amplitude produces nonlinear hysteresis curve based on stress-strain data. Bouc-Wen hysteretic model has been found to be able to simulate the hysteresis curve of MRE material using parameter identification method within MATLAB Simulink.

Air Flow Distribution at Three Floors of Classrooms Act as Temporary Evacuation Centers (TEC): A Case Study in Melaka

*Xiang Ooi Qi¹, Damanhuri Amir Abdullah Muhamad²,
 Abdullah Muhamad Ilman Hakimi Chua², Hamzah
 Khairum² and Lemam Abdul Mutalib³

¹Faculty of Mechanical Engineering, Universiti Teknikal Malaysia Melaka (UTeM),
 Jalan Hang Tuah Jaya, 76100, Durian Tunggal, Melaka, Malaysia

²Faculty of Mechanical and Manufacturing Engineering Technology, Universiti
 Teknikal Malaysia Melaka (UTeM), Jalan Hang Tuah Jaya, 76100, Durian Tunggal,
 Melaka, Malaysia

³Faculty of Engineering Technology, Universiti Tun Hussein Onn Malaysia (UTHM),
 86400, Batu Pahat, Johor, Malaysia

*amir.abdullah@utem.edu.my

Abstract. During floods, the Malaysian Welfare Department (JKM) oversees the opening and assigning the victims to the evacuation centres in certain public buildings such as school classrooms and community halls as temporary evacuation centers (TEC) that can last up to two weeks. The foldable tents will be provided from JKM to each family at the evacuation centres to assure that the victims have personal space. In this study, three levels of classroom namely School A in Melaka, Malaysia which act as temporary evacuation centres (TEC) were investigated to simulate the airflow distribution accordingly which. In-situ air sampling measures were performed using indoor air sampling techniques with 5 minutes interval for 24 hours with foldable tent located inside the TEC. Air flow distribution throughout the areas were simulate using computational fluid dynamics (CFD) to identify the direction of airflow. The average airflow rate between for ground floor, first floor and second floor are 0.47 ms⁻¹ 0.64 ms⁻¹ and 1.33 ms⁻¹ respectively. Meanwhile, the average air temperature between ground floor and second floor were varies from 30.3 °C and 27.7°C. The existence of foldable tent inside the classroom clearly shows disturbance to the air flow distribution inside the classroom. Second floor shows highest air velocity and good temperature distribution compared to other floors. The limitation of occupants tents and present of mechanical fan may improve air flow and comfort to the occupants.

Numerical Analysis and Optimization of Dual Rotor Wind Turbine for Low Wind Speed Area

H Hakim Mad Hair¹ and V Vicki Wanatasanappan^{1,2}

¹Department of Mechanical Engineering, Universiti Tenaga Nasional, Kampus Putrajaya, 43000 Kajang, Selangor, Malaysia.

²Institute of Power Engineering, Universiti Tenaga Nasional, Kampus Putrajaya, 43000 Kajang, Selangor, Malaysia.

*vignesh@uniten.edu.my

Abstract. In comparison to single-rotor wind turbines, dual-rotor wind turbines have recently been designed to increase wind capture and power generation. However, in low wind speed areas with average wind speeds of less than 4 m/s, the wind turbine struggles to function and operate at its best. In this paper, different dual rotor wind turbine geometries are designed and simulated using computational fluids dynamic software and optimized using response surface methodology to compare the performance of the wind turbine. The main objective is to investigate the effect of different blade materials on different wind speeds to the performance of the wind turbine by using ANSYS WORKBENCH R2 and choose the best blade material for the wind turbine by using Design Expert 13. Wind turbines have been analyzed at a different wind speeds of 2 m/s, 3m/s and 4 m/s. Three different blade materials are compared to the force performance in this study. The wind turbine performance was also investigated numerically. In this research work, lift force and drag force are the parameter that determines the thermal performance of the heat sinks. The findings revealed dual rotor wind turbine with carbon fiber blade was the best to be used in low wind speed areas..

Development of an Automated Spray Cooling System for Solar Panel Application with Different Cooling Fluids

*M Meerza Zaidi¹ and V Vicki Wanatasanappan^{1,2}

¹Department of Mechanical Engineering, Universiti Tenaga Nasional, Kampus Putrajaya, 43000 Kajang, Selangor, Malaysia.

²Institute of Power Engineering, Universiti Tenaga Nasional, Kampus Putrajaya, 43000 Kajang, Selangor, Malaysia.

*vignesh@uniten.edu.my

Abstract. Cooling fluids are fluids that function to remove heat from certain object. In this paper, different cooling fluids were used to cool down the temperature of solar panel. The main objective is to investigate the effects of different type of working fluid on the cooling performance of the solar panel. The cooling fluids that have been used are water, ethylene glycol and mixture of ethylene glycol and water. These different cooling fluids will be used to determine the effects to the solar panel temperature, the power output of solar panel temperature and the efficiency of the cooling fluids on cooling performance. In this research work, the power output of the solar panel is the parameter that determines the cooling performance of working fluids. Longer cooling time of the solar panel shows a significant increase in solar panel power output. The findings revealed that the solar panel power output has achieved the highest efficiency at 8.18% when the water is introduced as cooling fluid compared to ethylene glycol at 3.18% efficiency and mixture of water and ethylene glycol at 1.91% efficiency.

Prototype Development of Automated Electrical Appliances Operation Using Malay Dialect Command

Amirul Khairan Mohamad Sapri¹, *Siti Marwangi
 Mohamad Maharum^{2,1}, Zuhanis Mansor³
 and Izanoordina Ahmad²

¹Electrical Technology Section, Universiti Kuala Lumpur British Malaysian Institute,
 53100 Gombak, Selangor, Malaysia

²Electronics Technology Section, Universiti Kuala Lumpur British Malaysian Institute,
 53100 Gombak, Selangor, Malaysia

³Communication Technology Section, Universiti Kuala Lumpur British Malaysian
 Institute, 53100 Gombak, Selangor, Malaysia

*sitimarwangi@unikl.edu.my

Abstract. Nowadays, Industrial Revolution 4.0 (IR 4.0) is not only changing the industrial landscape in Malaysia but is also accepted by researchers and society for its positive impact. The Internet of Things (IoT) is one of nine technology pillars in IR4.0 that requires the internet as the basis for connecting physical devices. Many companies have incorporated IoT into their products and one of the products is the home automation system to control electrical appliances operation. Unfortunately, due to the high price, not everyone could afford to own a home automation system. Moreover, the commercialized systems use English as the communication medium, which may be disadvantageous for users who prefer their native language as the communication medium. To overcome this limitation, this paper proposes the prototype development of electrical appliances automation control using Bahasa Malaysia commands. The functionality of the proposed system was evaluated using real electrical appliances, and it worked successfully with the use of Malay Kelatanese dialects. The proposed system was developed at a low cost and could be marketed at an affordable price. Therefore, this project could significantly reduce the gap between different Malaysian social classes (i.e., B40, M40 and T20 groups) in adopting the concept of IR4.0 in their daily lives.

Planar Quasi-Yagi Multiple Array Antenna System Design for Millimeter Wave: A Parametric Analysis

*Z. Mansor, N.H.M. Rais, M.K.A. Rahim

¹Communication Technology Section, Universiti Kuala Lumpur British Malaysian Institute, Selangor, Malaysia.

²Communication Engineering Department, Universiti Teknologi Malaysia Johor, Malaysia.

*zuhanis@unikl.edu.my

Abstract. The performance of millimetre wave parametric analysis using a planar quasi-Yagi multiple array antenna system at 28 GHz is investigated. The proposed quasi-Yagi antenna has a truncated ground plane representing a reflector, a dipole driver, three to five directors, and a microstrip feed. Investigations are also made into the MIMO configuration which consists of two orthogonally positioned sets of arrays. Results demonstrate that the proposed design, which produced a good frequency bandwidth and acceptable gain, employed three directors. Results included return loss, bandwidth, gain, and radiation pattern. Based on the reflection coefficient, the proposed two-element planar quasi-Yagi antenna performs well with minimal mutual coupling in the frequency range of 24 – 30 GHz. It can be seen that the antenna performed well with a frequency range of 24.84 – 29.10 GHz.



ICONGEET

4th International Conference on Green
Environmental Engineering and Technology

**ICongGETECH
2022**

INTERNATIONAL CONFERENCE ON
GREEN ENGINEERING & TECHNOLOGY