TAYLOR'S UNIVERSITY

Wisdom · Integrity · Excellence

IT'S IN YOU TO **OWN THE FUTURE**

PROCEEDINGS OF

12th EURECA 2019

INTERNATIONAL ENGINEERING RESEARCH CONFERENCE

TAYLOR'S UNIVERSITY, LAKESIDE CAMPUS

3rd and 4th of July 2019

Proceedings of the International Engineering Research Conference – 12th EURECA 2019

3rd and 4th of July 2019,
Taylor's University, Lakeside Campus.

Proceedings of the International Engineering Research Conference - 12th EURECA 2019

3rd and 4th July 2019, Taylor's University, Lakeside Campus.

Editors

Satesh Narayana Namasivayam

Siva Kumar A/L Sivanesan

Mohammad Hosseini Fouladi

Eunice Phang Siew Wei

Rashmi Gangasa Walvekar

Phang Swee King

Yoon Li Wan

Published By

School of Engineering

Taylor's University

eISBN 978-967-0173-67-2

eISSN 2590-3845

Preface

On behalf of the organizing committee, I am delighted to welcome all the delegates, speakers and sponsors to Taylor's University for the 12th International Engineering research conference (EURECA) held on 3 – 4 July 2019. EURECA allows for the combination of research initiatives with the presently entrenched culture of project-based learning, as exemplified through the implementation of CDIO initiatives at Taylor's School of Engineering. We believe that the superior combination will further propel our students towards enhanced challenge-solving skills to contribute massively to the development of the nation and mankind.

Our technical program is rich and comprises of 3 keynote speeches, one from academia and two from industries such as Top Glove and BASF. We have 103 technical papers in total split into 16 parallel session. Besides, there will be a session for final year students poster presentations.

As the conference chair of 12th EURECA, I know that the success of the conference depends ultimately on the many people who have worked with us in planning and organizing the event with us. In particular, we thank the Program Chairs for their wise advice and brilliant suggestion on organizing the technical program; the external reviewers for their thorough and timely reviewing of the papers, all the external judges who accepted our invitation and our sponsors for providing their kind contributions to the event.

We hope this conference will offer participants a platform to exchange ideas, discover novel opportunities, reacquaint with colleagues, meet new friends and broaden knowledge. Lastly, I would like to extend my sincerest gratitude to my organizing team in making EURECA to be yet another success story of Taylor's School of Engineering!

Associate Professor Dr. Rashmi Gangasa Walvekar
Chairperson of the 12th EURECA 2019 conference,
School of Engineering,
Faculty of Innovation and Technology,
Taylor's University Lakeside Campus.

Contents

Effect of Turning Frequency on Composting of Empty Palm Fruit Bunches with Partially Treated Palm Oil Mill Effluent

Alvin Thong Jia Cherng [1,a)], Phoon Chow Lin [1,b)]

School of Engineering, Taylor's University, Malaysia
[a)] alvinthong96@gmail.com
[b)] Corresponding author: chowlin.phoon@taylors.edu.my

Abstract. Malaysia is the second largest palm oil producing country in the world. With the tremendous amount of palm oil produced, the current waste management process is unable to keep up with the waste produced by the refinery process of palm oil. The two major waste produced by the palm oil mill are palm oil mill effluent (POME) and empty fruit bunches (EFB). These wastes can cause severe environmental pollution if mistreated, such as water pollution caused by the seepage of POME into the underground water source and contribution to greenhouse effect through release of methane gas by the anaerobic decomposing EFB. One of the solutions to overcome the issue of these two major contributing wastes is to co-compost both wastes together and turning them into fertilizers which can be spread back to the plantation. Therefore, the objective of this research work is to study the most suitable condition to compost EFB with POME. The condition studied is using different intervals of days to turn the compost and presence of aeration aid during turning of compost. In this research, a weight ratio of 1.25 kg of EFB with 3.75 kg of POME is used for each batch, the composting mixture is turned in an interval of 0, 1, 2 and 3 days using an automated rotating drum, and for each different interval days of turning, the study of the presences of aeration aiding were also done. Throughout the composting process, the temperature of each batch is measured daily, whereas the moisture content and pH were only measured during the day of turning the compost. The maturity of the compost was determined by the measurement of carbon to nitrogen ratio (C/N) on the compost before and after 30 days. At the end of the research, the final temperature of all compost batches falls between $30 - 34$ ℃, pH ranged at $9.92 - 10.14$, moisture content falls between 16.82% to 56.67% and a C/N ratio drop from initially 43.462 to 12.893 for batch of turning frequency of 3 days without aeration aiding. It is found that using the turning frequency of 3 days without aeration aiding is the most suitable method to be used for composting EFB with partially treated POME, as this method requires the least turning process to achieve the fastest compost to reach maturity.

Keywords: Empty fruit bunch, palm oil mill effluent, co-composting, turning frequency, aeration aiding.

Wastewater treatment using *Hibiscus sabdariffa*: Drying, extraction and response surface methodology optimisation studies

Anis Izyani Mohd Ruslee [a)], Nurhazwani Ismail [b)], Chua Bee Lin[c)]

School of Engineering, Taylor's University, 47500 Subang Jaya, Selangor, Malaysia.

[a)]anisizyanilee@gmail.com
[b)]Nurhazwani.Ismail@taylors.edu my
[c)]beelin.chua@taylors.edu.my

Abstract. The process of coagulation is commonly practiced in wastewater treatment to reduce the level of turbidity, the level of dissolved chemical and others by using coagulant. The conventional coagulant of Aluminium sulphate is commonly used in coagulation process, however, treated water contains residual aluminium, which is harmful to human health that may cause Alzheimer disease and contribute to environmental issues. Natural coagulant that is non-toxic and environmental friendly was introduced to solve these issues. In this experiment, the performance of *Hibiscus sabdariffa* was studied as natural coagulant to treat dye wastewater containing Congo red. This research was aimed to select the best drying kinetic model for *Hibiscus sabdariffa* seeds, the best solid to solvent ratio of extraction (*Hibiscus sabdariffa* seeds: water) and also optimize the coagulation process using Central Composite response surface design (CCD). In this study, hot air drying with temperature 60ºC was selected as the optimum drying temperature for *Hibiscus sabdariffa* seeds with shortest total drying time. Furthermore, Madili model was chosen as the best model to describe the drying kinetics of *Hibiscus sabdariffa* seeds with highest R^2 (0.99873) and lowest RSME value (0.01129). By using protein- dye binding method (Bradford, 1976), the best solid to solvent ratio of extraction (*Hibiscus sabdariffa* seeds: water) was (5g seeds: 100 mL water) with highest protein concentration (53.188 mg/100 mL*).* The optimal coagulation conditions generated by CCD were 100 mg/L of coagulant dosage, pH 2 and 400 ppm of initial concentration with predicted color removal of 100%. Thus, *Hibiscus sabdariffa* seeds can be an effective coagulant to treat dye wastewater.

Keywords: *Hibiscus sabdariffa*, Natural coagulant, Coagulation, Wastewater treatment.

Vulnerability Analysis Towards Process Reliability

Bryan Shoong Ern, Heng [a)] and Yik Teeng, Leong [b)]

[a)] bryanshoongern.heng@sd.taylors.edu.my
[b)] Corresponding author: yikteeng.leong@taylors.edu.my

Abstract. The reliability of a production line depends heavily on its ability to respond to various destructions and disturbances which creates vulnerabilities to a production line. Failure to respond to such operational risks would affect the output of a production line, thus causing huge losses financially. Therefore, it is important to be able to evaluate the vulnerability of production lines in order to find ways to mitigate them for a safer and more reliable process. A framework with includes a novel Vulnerability Number Model is developed to analyze vulnerability quantitatively in the production line. The framework adopts an approach which begins by analyzing the different types of failure in a particular production line before finding its root causes using the Cause & Effect Diagram. The root causes are then assessed in terms of its vulnerability using the newly-developed model. The Vulnerability Number Model takes into account conventional parameters such as Consequence (the magnitude of effect on production line), Occurrence (probability of failure happening) and Detectability (ability to detect failure before it significantly affects production line). In addition to those parameters, Consequence Correction Factor, f (how many outputs will a failure affect) as well as Redundancy (existing protective measures) are also included in the study of vulnerability. The proposed framework was applied to a glove manufacturer case study with real industrial data. The result showed that "Improper Stirring of Latex" has the highest Vulnerability Number among all the other failure nodes with a score of 105. Analysis also showed that Consequence Correction Factor, f has minimal effect on a glove manufacturer process given that it is a single-chain continuous process.

Investigation of Foulants in Sewage for the Application of PVDF Membrane in Membrane Bioreactor

Chu Yu Huan[a] and Dr. Oh Kai Siang[b]

Taylor's University Lakeside Campus Malaysia

[a]Chuyuhuan96@gmail.com
[b]KaiSiang.Oh@taylors.edu my

Abstract. Water scarcity is one of the biggest challenges in this era due to the needs for industrials and domestic usages. Wastewater treatment is one of the greatest solutions to regenerate good quality water by removing the undesired compounds. With wastewater treatment methods, membrane filtration is one of the common methods that is applied by the sewage treatment plant in Malaysia. Due to the good mechanical and chemical properties of the PVDF membrane, it is applied in the sewage treatment process. However, it is found that the membrane filtration efficiency decreases gradually with time. Hence, the issues that caused the degradation of the membrane need to be identified. This research aims to study the effect of foulant on the flux, molecular structure changes on the PVDF membrane, foulants in sewage that will foul the PVDF (Polyvinylidene Difluoride) membrane, determine the tolerable concentration of the PVDF membrane, and. Aluminum oxide (Al_2O_3) and Ferric oxide (Fe_2O_3) are identified to be the foulants in the sewage with concentrations of 5-15mg. The tests are run with synthetic sewage by preparing 5, 10, 15 mg/L of Aluminum oxide solutions and 5, 10, 15mg/L Ferric oxide solutions. The tests are done by using 0.45µm PVDF membrane and 47mm in diameter in the membrane filtration unit. The experiment is done at 1 bar pressure and room temperature. It is shown that the water flux by using different concentration of synthetic sewage with Aluminum oxide, the water flux decreases from 64043.20 to 48594.83L/m^2h as the concentration of Aluminum oxide increases. For Ferric oxide, the water flux decreases from 67370.12 to 54894.17L/m^2h as the concentration of Ferric oxide increases. From the results, Aluminum oxide might be a greater foulant than the Ferric oxide that foul the PVDF membrane greater. Turbidity of synthetic sewage with different concentrations of Aluminum oxide increases from 0-2.67 NTU while for ferric oxide, the turbidity increases from 0-0.72 NTU as the concentration increases and hence, the water clarity decreases. The TSS content of the aluminum oxide based synthetic sewage increased from 12-20mg/L as the concentration increases. The TSS content of the Ferric oxide based synthetic sewage increased from 11-18mg/L as the concentration increases. The higher the concentration of the foulants in synthetic sewage, the higher the TSS content. It is found that the concentration of foulants in the sewage is proportional to the turbidity and TSS content of the sewage. Other than that, the FTIR results showed molecular changes of the PVDF membrane after membrane filtration with the possible foulants through the changes in %transmittance with the unfiltered membrane. from the FTIR spectrum database, it is shown that aluminum oxide and ferric oxide is present o the membrane surface after filtration. The peak intensity also increases as the concentration of the possible foulants in the synthetic sewage increases due to the increasing amount of foulants on the membrane. As the turbidity, TSS content and the concentration of foulants increases, the water flux decreases. Both the heavy metals may need to be removed through pretreatments before entering the sewage treatment to prolong the lifespan of the PVDF membrane and reduce operating cost.

Green Wall Filtration System for Lake Water Treatment

Chua Guan Xuan[1, a)], Oh Kai Siang [b)] and Yoon Li Wan [c)]

Taylor's University, Taylor's Lakeside Campus,
No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia

[a)] Author: Chuaguanxuan@gmail.com
[b)] Corresponding Author: KaiSiang.Oh@sd.taylors.edu.my
[c)]Corresponding Author: LiWan.Yoon@sd.taylors.edu.my

Abstract. Lake water pollution has become a growing concern across the years. To address this issue, the constructed wetland is identified as one of the cheapest, environmentally friendly and effective solution. However, these systems require significant horizontal space, which are not suited to be built in urban areas. With the rising attention of green infrastructures, green wall is considered as a potential candidate to adopt the water treatment ability of constructed wetland. However, the growing media of these system must be studied to investigate its ability in treating lake water. Previous studies of suitable growing media have suggested that the combination of coir and perlite might be the potential filter media for the green wall system. Nevertheless, the efficiency of these combined media in treating lake water is unclear. Therefore, the work tested the pollutant removal efficiency of three different combined media ratios with 3:1, 1:1 and 1:3 coir to perlite in a constructed green wall system. The combined media with the best removal performance was then further tested to evaluate its effect to various lake water flow rate. The result showed that the combined media ratio with 3:1 coir to perlite provides the highest pollutants removal efficiency in terms of chemical oxygen demand (COD), total suspended solid (TSS) and turbidity with constant hydraulic load. This outcome suggested that the proportion of coir has played an important role in governing both physic-chemical and biological process due to the impact of retention time on removal. In the flow rate evaluation stage, the result showed that high flow rate has no significant removal in lake water treatment as there was insufficient time to undergo biological processes. Also, it was observed that a treatment conducted with low flow rate can cause uneven circulation of the green wall system. It was presumed that only the top layer of water was circulated throughout the system repeatedly due to the low outlet flow rate from the media containers. As a result, the rate of pollutant removal was not significant when low lake water flow rate was used in the treatment process.

Preparation and Characterization of Chitosan-Polyvinyl Alcohol Hybrid Membrane

Emir Danial Iskandar Abdul Razak[1, a)] Pang Ming Meng[1, b)] Oh Kai Siang[2]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia*

[a)] Corresponding author: emirdanialiskandarabdulrazak@sd.taylors.edu.my
[b)] mingmeng.pang@taylors.edu.my

Abstract. Membrane technology has played a substantial role in water treatment industries and is preferable method for water separation because of its energy saving approach. Conventionally, water separation membrane is made up of non-biodegradable polymers. However, due to the increasing awareness of preserving the environment, biodegradable polymers have the potential to play a critical role among various membrane technologies. Biodegradable polymers often have unique compatibility with one another due to rigorous hydrogen bond interactions. Therefore, this project focuses on two biopolymers, chitosan and polyvinyl alcohol (PVA) to form a hybrid membrane with good filtration performance and mechanical properties. The fabrication method is by using solution casting, whereby hybrid membrane samples are casted on a round glass plate in an acidic medium. The chitosan and PVA weight ratios in the casting solution are varied, to find the most desirable hybrid membrane. The characterization of the hybrid membrane is an indicator on whether it is suitable for practical application. Furthermore, it can help preserve the environment and reduce dependency towards non-biodegradable materials. From the FTIR test, the hybridization of the two biopolymers, chitosan and polyvinyl alcohol contributes to the formation of intermolecular and intramolecular hydrogen bonding in the hybrid membrane with weight ratio of chitosan to PVA of 3:1 and 1:3. Thus, the hybridization of the membrane exhibits the compatibility of chitosan and polyvinyl alcohol to one another, as the crosslinking between chitosan to PVA exist in the hydrogen bond form. FTIR spectra with the range of 3300 to 3400 cm^{-1} indicates that there exist O-H stretch within the membrane and hydrogen bond exist. Swelling ratio as low as 271% is achieved when there is equal weight ratio of the chitosan to the PVA, and the value is due to low water penetration, caused by the amount of crosslinking across the molecules.

Keywords: Membrane technology, biodegradable polymer, chitosan-Polyvinyl alcohol membrane, FT-IR, swelling ratio, pore forming agent.

Effect of Plasticizer on Properties of Polylactic Acid filled Graphene

Goh Kah Sheng Derek[a)] Pang Ming Meng[b)], Koay Seong Chun[c)]

[1]*School of Engineering, Taylor's University, Malaysia*

[a)]gohkahshengderek02@sd.taylors.edu my
[b)]MingMeng.Pang@taylors.edu.my
[c)]Seongchun.koay@taylors.edu my

Abstract. In a span of decade, Polylactic acid (PLA) has been discussed over among researchers as the key replacement for petroleum-based polymers. It is a key replacement as PLA is biodegradable and can reduce waste produced from plastic that are Polylactic acid (PLA) composite filled with Graphene Nanoplatelets (GNP) an allotrope of carbon mineral plasticized with Castor Oil (CO) via melt blending method. Four compositions of 1%, 3%, 5% and 7% of GNP plasticized with 10% and 20% of CO as reinforcing agent due to PLA poor elasticity and mechanical properties. The aim of this study is to determine the optimum composition of PLA/GNP/CO for conductive polymer packaging material (i.e. electronic packing) by characterizing the properties of the composite into thermal, mechanical and conductivity properties. To characterize the thermal properties of PLA composites, heating process for Thermo-Gravimetric Analysis (TGA) was performed under nitrogen flow. PLA/GNP/CO were prepared using melt compounding method at 180 °C with 50 rpm motor speed. The compounded polymer is then compressed molded into sheets before undergoing characterization. A variety of test were done to identify the thermal properties, mechanical properties and electrical properties of the composite. Thermal Gravimetry Analysis (TGA) was carried out to test the mechanical properties, tensile test was carried out to identify the mechanical properties and lastly electrical resistivity test was carried out to determine the electrical properties of the compound. Hence, for electrical resistance test, 7wt% GNP with 20wt% CO shows the lowest resistivity of 10^2 ohms. However, for thermal stability, composite with 5wt% GNP with 10wt % shows the highest temperature onset of 340.13°C. Higher weight percent of GNP in the composite have proven to enhance the mechanical properties of PLA where the 7% wt GNP produced percentage elongation of 4.75%.

Keywords: Conductive polymer composite (CPC), Polylactic acid (PLA), Castor Oil (CO), Graphene nanoplatelet (GNP).

Chitosan-PEG membrane for Greywater treatment: A study of the effect Non-Woven Fabric support on the membrane properties

Jabe Abdelrahaman Roman Jermalili[1], Tee Lee Hong[1], Oh Kai Siang[1*]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor, Malaysia.*

*Corresponding author: KaiSiang.Oh@taylors.edu.my

Abstract: Flat sheet chitosan-PEG was fabricated in two ways, with a non-woven fabric support and without. The distilled water flux of the membranes were measured for pressures of 1-3 bar. The chitosan-PEG/NW was found to have a lower distilled water flux at the three operating pressures. The membranes were used to treat greywater. The highest treatment efficiency for Chitosan-PEG were 54.2 % and 100% for COD and turbidity respectively. The highest treatment efficiency for the Chitosan-PEG/NW were 65.2 % and 97.8% for COD and turbidity respectively. Hermia's pore blocking models were used to describe the fouling phenomena in the membranes. The models that best described the fouling phenomena were standard pore blocking and cake formation.

Synthesize A Sustainable Wastewater Treatment Plant (WWTP) For Sago Industry

Kelvin Teo Kai Wen[1, a)], Yoke Kin Wan[1, b)], Yik Teeng Leong[1, c)]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor, Malaysia.*

[a)]Corresponding author: kelvinkaiwen.teo@sd.taylors.edu my
[b)]yokekin.wan@taylors.edu.my
[c)]yikteeng.leong@taylors.edu.my

Abstract. The importance of wastewater treatment plant (WWTP) is given high attention in the past decades as it helps in increasing the environmental sustainability of the manufacturing industries. However, wastewater treatment plant is a mandatory investment, but non-profitable process, detailed calculation and extensive researches are needed to construct an optimal treatment pathway, which is low in capital cost while having sufficient performance to meet the wastewater discharge standard set by the government. In the stage of forming the optimum wastewater treatment pathway, area footprint (land area) occupied by the technologies is one of the crucial factors to be taken under consideration, yet to be studied in the previous studies. It is noted that different combination of technologies is accompanied with different capital cost and associated cost due to the area occupied by the wastewater treatment plant and therefore, area footprint is expressed in dollar and cents in this project by taking the cost needed to purchase the required land area for the treatment plant into account. In this work, a mathematical approach has been developed to synthesize an optimum treatment pathway based on the total capital cost needed and the area footprint required using a commercial optimization software, LINGO 18.0. Fuzzy-based optimization software. Relevant mathematical modelling has also been constructed in this work to establish the relationship to trade-off the impact of these two parameters as it is proved that there is a contradiction between area footprint and the total capital cost needed to construct the WWTP. To demonstrate the viability of the developed approach, an industrial case study has been solved in this work.

Direct Saccharification of Lignocellulosic Biomass by Using Deep Eutectic Solvent for Reducing Sugar Production

Wei Hang Ker[1, a], Li Wan Yoon[1, b] and Yin Hui Chow[1]

[1]*School of Engineering, Faculty of Innovation and Technology, Taylor's University, Malaysia.*

[a]weihang ker@sd.taylors.edu my
[b]LiWan.Yoon@taylors.edu my

Abstract. Lignocellulosic biomass has been recognized as one of the potential and sustainable sources, wherein pretreatment and subsequent saccharification are required for biofuel production. Each of the currently available conventional saccharification method have their own drawbacks respectively in aspects of environmentally sustainable and economical viable. In this study, deep eutectic solvent formed by using choline chloride and glycerol was employed to direct saccharify sugarcane bagasse, aiming to resolve the disadvantages exhibited from conventional saccharification method. Hydrolysate and biomass fraction of saccharified sample were separated by centrifugation for further analytical test.3,5-dinitrosalicylic acid method was used to determine the reducing sugar content of hydrolysate. Generalized Saeman model was applied to express the kinetic of the saccharification process and determine the optimum operating condition of the process. In this work, deep eutectic solvent saccharification was favored at higher saccharification temperature. The time taken to obtain maximum reducing sugar concentration has become shorter as the saccharification temperature increased Maximum reducing sugar yield of 61.9% was achieved at optimum temperature of 130ºC and duration of around 53 minutes. Based on the kinetic study, the rate constants of reducing sugar formation (k_1) and degradation (k_2) at optimum condition were 0.0631 min^{-1} and 0.00259 min^{-1} respectively. The activation energy for the reducing sugar formation and degradation were 93.13 kJ/mol and 43.54 kJ/mol respectively. In overall, the findings from this study showed that the application of DES in saccharification of lignocellulosic biomass is feasible.

Keywords*: Deep Eutectic Solvents, Direct Saccharification, Lignocellulosic Biomass, Reducing Sugar, Saeman Model*

Development of Eco-friendly Polymer Films based on Liberica Spent Coffee Ground Extract and Poly(vinyl alcohol) for Active Packaging Application

Shu Wen Lim[1, a)], Jiun Hor Low[1, b)] and Yin Hui Chow [1, c)]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia*

[a)]shuwen.lim@sd.taylors.edu.my
[b)]Corresponding author: jiunhor.low@taylors.edu.my
[c)]yinhui.chow@taylors.edu.my

Abstract. To form films for active packaging application, polyvinyl alcohol was incorporated with Liberica spent coffee ground to develop an eco-friendly polymer film. This study reports the utilization of spent coffee ground (SCG) as reinforcing fillers on the tensile properties, thermal stability, water vapor permeability and water solubility of polyvinyl alcohol (PVOH) film. SCG-PVOH films were characterized in terms of tensile properties, thermal stability, FTIR spectrometry, water vapor permeability and solubility. SCG-PVOH films were prepared by first extracting the SCG extract from Liberica spent coffee ground. Different weight percentages of SCG extract namely from 0 wt % to 5 wt % were then incorporated into PVOH solution by mixing and citric acid was added into each formulation to promote crosslinking. SCG-PVOH films were produced using a 100 μm coating bar on a release paper. For unmodified PVOH films, they have high water permeability and poor mechanical properties. By incorporating SCG extract, the ultimate tensile strength of the SCG-PVOH films improved. The maximum tensile strength was 8.177 MPa when the content of SCG extract was 5 wt %. At this point, the Young's Modulus and elongation at break were 341.14 MPa and 96.79 % respectively. SCG-PVOH film achieved thermal stability of after 3 wt % of SCG extract is incorporated into the PVOH film. SCG-PVOH film has the lowest initial degradation temperature when SCG extract content is at 5 wt % with 203.84 ˚C. From FTIR spectrometry, the stretching of C=O from carboxyl group can be seen increasing as the content of SCG extract increases. As for water vapor permeability, the subsequent increase of SCG extract content beyond 1 wt % of SCG extract in PVOH decreases the water vapor permeability. The increase of SCG extract content also decreases the solubility of PVOH films. Esterification had occur when SCG extract is incorporated into PVOH films, this increased cross-linkage between PVOH compounds and limited hydroxyl group of PVOH from bonding with water.

Preparation and characterisation of polylactic acid composites filled with hybrid conductive filler

Mohamad Amirul Haziq Mohd Azhar [a)], Pang Ming Meng [b)], Koay Seong Chun [c)], Yose Fachmi Buys[2]

[1]*School of Engineering, Taylor's University Lakeside Campus, No 1 Jalan Taylor's, 47500 Subang Jaya, Selangor, Malaysia.*
[2]*Department of Mechanical Engineering, Faculty of Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia*

[a)]amirulhaziiq@gmail.com
[b)]MingMeng.Pang@taylors.edu.my
[c)]Seongchun.koay@taylors.edu my

Abstract. The usage of plastics is increasing in producing various types of products within a broad range of fields. Most common plastics are made from the polymerization of petroleum, a non-renewable source. Despite the advantages that plastics can offer such as ease of manufacturing, low manufacturing cost, and excellent chemical and physical properties, the drawbacks of using plastic material should be emphasized on. Non-biodegradable and pollutes the environment are the two most significant drawbacks in using this material. However, several composites had been able to be a substitute to plastics. These materials are biodegradable and does not cause harm towards human's health. The limitations of using these composites are the incompetent mechanical properties, thermal properties and also electrical conductivity. This research aims to improve the characteristics of the composites by adding hybrid conductive filler. By using polylactic acid (PLA) as base polymer, addition carbon black (CB) and graphene nanoplatelets (GNP) as hybrid conductive filler is studied to produce a conductive polymer composite (CPC). PLA/CB/GNP composites were prepared by using melt blending method at 180˚C operating temperature with 100rpm motor speed. The composite is then subjected to compression molding before proceeding to characterisation stages. A series of testing were done to measure the electrical resistivity, thermal properties and mechanical properties of the composites. For surface resistivity, the sample with 1%CB-8%GNP shows the lowest resistivity which is is 1.07E+04Ω while 8%CB-8%GNP shows the lowest volume resistivity value (4.87E+02Ω). 8%CB-8%GNP composition also provides the best result for thermal degradation properties (T_{on}= 372.52˚C). Higher CB loadings had proven to provide better mechanical properties in terms of tensile strength, tensile modulus, and elongation at break. Therefore, highest CB loading (8%) is preferable in improving mechanical properties of PLA. 8%CB-8%GNP filler loading shows overall improvements in electrical resistivity, thermal properties, and mechanical properties of the PLA composite.

Keywords: Conductive polymer composite (CPC), Hybrid conductive filler, Polylactic acid (PLA), carbon black (CB), graphene nanoplatelets (GNP).

Experimental Measurement of Viscosity Of Blood Mimic For 3D-Printed Medical Simulator

Muhammad Faris Mohd Fauzi[1, a)] Anis Suhaila Shuib[1, b)] Muhammad Izzat Ahmad Sabri[2] Ahmad Sobri Muda[3]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia*
[2]*Lönge Medikal Sdn. Bhd., Putra Science Park, Malaysia*
[3] *Imaging Department, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, Malaysia.*

[a)]Corresponding author: muhammadfarismohdfauzi@sd.taylors.edu.my
[b)]AnisSuhaila.Shuib@taylors.edu.my

Abstract. In rehearsing surgical simulation of a complicated surgery using 3D-printed human anatomical model, blood mimic is employed. It is used to replace actual blood if a 3D-printed anatomical model is used and it is required to replicate the tactile response of a patient's blood to maximise surgeon learning. Viscosity is an important criterion that influences the tactile accuracy and haptic element during surgical simulation. Actual blood behaves as a shear thinning fluid and can be characterised using a non-Newtonian Power Law model. However, during procedures, a contrast agent is added to the fluid so that the flow can be viewed by medical imaging devices such as computed tomography angiogram (CTA). This work presents experiment work designed to develop and characterise a blood mimic which considered the addition of radio-contrast agent in CTA imaging. In this research, samples of blood mimicking fluid were prepared by varying chemical compositions of xanthan gum, distilled water and glycerol at different ratios within a shear rate range of 10 to 1000 s^{-1}. The contrast agent, Omnipaque 300 was added to evaluate the influence on the viscosity of blood. Viscosity measurements of the mimic fluid was performed at a constant room temperature of 25 °C similar to surgical simulation temperature using rotational viscometer. The addition of xanthan gum at 0.01%, 0.02% and 0.03% by weight to the fluid with a chemical ratio of glycerol at 79.1 %v/v and water at 20.9% v/v, resulted a shear thinning viscosity closely matching that of blood. The addition of contrast agent to the mimic fluid was found to lead to a decrease in viscosity.

Keywords: Blood Mimicking Fluid, Whole Blood Viscosity, Shear Thinning, Non-Newtonian, CTA

Preparation and Characterization of Thermoplastic Starch and Garden Waste Fibers as Green Composites

Qi Sean Ong[1, a)], Phang Siew Wei[1, b)], Li Wan Yoon[1, c)]

[1]*School of Engineering, Faculty of Built Environment, Engineering, Technology and Design, Taylor's University, Malaysia.*

[a)]qisean.ong@sd.taylors.edu my
[b)]Corresponding author: SiewWei.Phang@taylors.edu.my
[c)]Corresponding author: LiWan.Yoon@taylors.edu.my

Abstract. Recently, growing environmental impact arouse the development of biodegradable composite. The present study aims to investigate the suitable method to treat garden waste for biocomposite production, along with the effect of garden waste fiber dosage on its functional group. Garden waste fiber with cassava starch, different dosage of fiber at rates ranging from 0.5 phr to 3 phr were conducted. These garden waste fibers were treated with 60% of sulfuric acid and 4% of sodium hydroxide respectively. Biocomposite film prepared from cassava starch and fiber using solution casting technique by adding glycerol as plasticizer. Fourier transform infrared spectrometer (FTIR) was used to determine the functional groups of the casted film. The result found that increase of fibers concentration in biocomposite film showed a better hydrogen bonding. Acid treatment method is more suitable to treat garden waste for biocomposite production due to the removal of hemicellulose and lignin.

Keywords: Thermoplastic starch, Garden waste, Treated fibers. Green composite, Solution casting

Separation of Intracellular Ectoine Produced by *Halomonas salina* Cells using Aqueous Biphasic System

Chin Tee Poh[1, a)], Hui Suan Ng[2], Li Wan Yoon[1], Yin Hui Chow[1, *, b)]

[1]*School of Engineering, Faculty of Built Environment, Engineering, Technology and Design, Taylor's University Lakeside Campus, 47500 Subang Jaya, Malaysia.*

[2]*Department of Food Science and Nutrition, Faculty of Applied Science, UCSI University, 56000 Kuala Lumpur, Malaysia.*

[a)]chintee.poh@sd.taylors.edu.my

[b)]YinHui.Chow@taylors.edu my

Abstract. Ectoine is a compatible solute produced by halophiles as an osmoregulatory compound in harsh environment. Its attractive properties such as UV-radiation reduction and anti-inflammation allows it to be used in wide variety of applications, which heightened the interest to develop cost viable downstream processing technology. Alcohol-salt aqueous biphasic system (ABS) was used to recover ectoine secreted from *Halomonas salina* DSM5928^{T}. Alcohol-salt ABS, which consist of top-phase alcohol component (ethanol, 1-propanol, 2-propanol) and bottom-phase salt component (dipotassium phosphate, ammonium sulphate) were investigated to determine the composition of alcohol-salt ABS for the recovery of ectoine at high separation efficiency and yield. Ectoine which partitioned in the two-aqueous phases of the ABS was quantified using the high-performance liquid chromatography (HPLC) with 5mM calcium chloride solution as the mobile phase. Maximum ectoine recovery was achieved using alcohol-salt ABS that compose of 16% (w/w) 1-propanol, 20% (w/w) ammonium sulphate solution and 20% (w/w) crude load with partition coefficient and yield of 10.28 and 97.44% respectively.

Keywords: Ectoine, Halomonas salina, Aqueous Biphasic System, Bio-separation, HPLC

Protein Partitioning In Sugaring-Out Assisted Aqueous Biphasic System

Sahlini Alagan[a)], Yoon Lin Wan[b)] ,Chow Yin Hui[c)]

School of Engineering, Faculty of Built Environment, Engineering, Technology & Design, Taylor's University Lakeside Campus, No. 1 Jalan Taylor's, 47500 Subang Jaya. Selangor, Malaysia.

a)sahlini28@gmail.com
b) LiWan.Yoon@taylors.edu.my
c) HinYui.Chow@taylors.edu.my

Abstract. Alcohol-sugar aqueous biphasic system (ABS) was employed in this studies for the extraction of Bovine Serum Albumin (BSA) for the first time in literature. Alcohol-sugar ABS offers several process advantages such as biodegradable, cost-effective and a green process. The biphasic region of 1-propanol-sugar ABS was larger than that of the 2-propanol-sugar ABS. It is the main result of the more hydrophilic nature of 2-propanol compared to 1-propanol, thereby leading to lower phase-forming ability of the 2-propanol. No phase formation was observed for the mixture of ethanol and sugar examined due to their close proximity in the hydrophilicity degree. To evaluate the feasibility of alcohol-sugar ABS in the recovery of protein, the partitioning behavior of BSA in the ABS composed of 1-propanol+glucose, 1-propanol+mlatose, 1-propanol+sucrose, and 2-propanol+glucose, 2-propanol+sucrose, 2-propanol+maltose ternary aqueous mixture were investigated. The BSA protein preferentially partitioned to the alcohol-rich top phase at low concentration of sugar and alcohol. Maximum partitioning efficiency of BSA was achieved in 35% 1-propanol-22% (w/w) maltose ABS with K of 6.03 ± 0.17 and Y of 87.84 ± 0.61. These results indicated that the alcohol-sugar ABS is feasible for protein extraction.

Keywords: Bovine Serum Albumin, Aqueous biphasic system, Extraction, Binodal, Alocoh-sugar, Partition coefficient, Yield.

Ultrasound-assisted Extraction of Phenolic Compounds from *Salvia officinalis L.* using Deep Eutectic Solvents: Antioxidant Capacity

Sem Yong Hao,[1, a)] Chua Bee Lin[1, b)] and Yoon Li Wan[1, c)]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor Malaysia*

[a)]Corresponding author: YongHao.Sem@sd.taylors.edu.my
[b)]BeeLin.Chua@taylors.edu.my
[c)]LiWan.Yoon@taylors.edu my

Abstract. *Salvia officinalis L.* is a medicinal plant from the Lamiaceae family, whose major diterpenoid ingredients are carnosic acid and carnosol, is well-known for its natural antioxidant capacity and is widely used in the field of pharmacology and food industry. In order to establish an environmental-friendly extraction method for *Salvia officinalis L.* leaves, deep eutectic solvent (DES) is selected as an alternative green solvent to conventional organic solvent. The objective of this research will focus on the optimisation of *Salvia officinalis L.* leaves extraction using DES with different combination of hydrogen bond donor (HBD) such as ethylene glycol, lactic acid, oxalic acid and urea. The molar ratio of DES (Choline chloride to HBD) used in this study varies from 1:1 to 1:5 at water concentrations of (15% and 30%) to determine the DES combination that produces the highest yield of total phenolic content (TPC), antioxidant capacity and phenolic compounds (carnosic acid and carnosol) using highly efficient ultrasound-assisted extraction (UAE) technique. TPC of *Salvia officinalis L.* leaves extract will be quantified using Folin-Ciocalteu analysis and the absorbance value of the extract will be measured by microplate reader at wavelength of 765 nm using gallic acid as reference. Antioxidant capacity of *Salvia officinalis L.* leaves extract will be quantified using 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay, the antioxidant capacity is expressed as percentage of inhabitation in relative to blank absorbance value. Quantification of carnosic acid and carnosol will be conducted using high-performance liquid chromatography (HPLC). The exact quantification of phenolic compounds will be measured by an external calibration curve using carnosic acid and carnosol as standard markers. Additionally, in this study, DES with the combination of oxalic acid in molar ratio of 1:1 at water concentration of 15% is determined as the most promising solvent, resulting in more effective extraction of phenolic compounds (carnosic acid and carnosol) from *Salvia officinalis L.* leaves.

Application of Black Liquor Derived Carbonaceous Compound in Direct Carbon Fuel Cell

Shu Wei Teoh, Li Wan Yoon*, Jiun Hor Low

School of Engineering, Faculty of Built Environment, Engineering, Technology and Design, Taylor's University, Malaysia

shuwei.teoh@sd.taylors.edu my
*Corresponding author: liwan.yoon@taylors.edu.my

Abstract. Direct carbon fuel cell (DCFC) is a technology that capable with many advantages which includes higher power efficiency and less emissions. The application of using biochar as the fuel source in DCFC tends to replace for the use of coal in power generation. Recently, black liquor from the paper production was found rich with lignin content and being treated for activated carbon and acid solid catalyst. However, the lignin recovered from black liquor to be treated as fuel source for DCFC is yet to be investigated. In this study, the feasibility of using lignin from black liquor as fuel source in DCFC were investigated and evaluated based on its electrochemical performances. Five different pyrolysis temperature (400°C, 500°C, 600°C, 700°C, and 800°C) were chosen to convert lignin for carbon-rich biochar. The optimum pyrolysis temperature for biochar production from black liquor was further analyzed with the power generation. Coal was used as the control in the performance test to compare for the electricity efficiency. In the result, the OCP obtained from the carbonaceous fuels extracted from black liquor show closely same value as coal, in the range of 0.74 – 0.80V. Biochar which treated under 500°C shown the best result among the extracted carbonaceous fuels in both power density and current density. The operating conditions of DCFC could be optimized to further enhance for the performances of carbonaceous compound derived from black liquor as fuel source in DCFC.

Keywords: Black liquor, Biochar, Temperature, Direct carbon fuel cell

Fabrication of 3D-Printed Bone Scaffold of Natural Hydroxyapatite from Fish Bones in Polylactic Acid Composite

Vickneson A/L Nadarajan[1, a)], Siew Wei Phang[1, b)] and Choo Hui Leng[1, c)]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No.1, Jalan Taylor's, 47500 Subang Jaya, Selangor Darul Ehsan, Malaysia*

[a)]Corresponding author: vicknesonnadarajan@sd.taylors.edu.my
[b)]siewwei.phang@taylors.edu.my
[c)]huileng.choo@taylors.edu.my

Abstract. This article focuses on implementation of bio composite materials made from natural resources in medical field applications. A study on the compatible biomaterials was conducted and has led to the use of natural Hydroxyapatite (HAp) with Polylactic Acid to form a composite. The natural hydroxyapatite used was extracted from bones of a specific fish called Whitefin Wolf Herring. The fish bones were cleansed to remove impurities, undergo calcination at 800°C for 4 hours and grinded into powder of 200μm. Hydroxyapatite was fused with Polylactic acid in varying percentages (0% HAp, 2.5% HAp, 5% HAp, 10% HAp, 20% HAp and 30% HAp) using melt-mixing technique. Thermogravimetric Analysis (TGA) was done on the samples to analyze the difference in thermal stability based on the amount of varying amount of HAp present. Fourier-Transform Infrared Spectrometer (FTIR) was carried out to identify and validate the functional groups present in the samples. The interactions between the functional groups present in the samples and the breaking down of the functional groups and also development of new ones were also analyzed. The addition of HAp have also further enhance the thermal resistance of the composite samples compared to pure PLA. The increased of HAp also provides better interaction between PLA and HAp molecules in the composite. This work contributes to the part of the characterization of the PLA/HAp composite and also encourage the development of use of biomaterials such as HAp for medical applications.

Resiliency Analysis in process of glove manufacturing line

Wong Yong Liang[1, a)] and Leong Yik Teeng[1, b)]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor, Malaysia.*

[a)]Corresponding author: wongyongliang30@gmail.com
[b)]YikTeeng.Leong@taylors.edu my

Abstract. In this paper, a resilience analysis framework and a model of resilience measurement were proposed. Resiliency of a manufacturing line depends on the ability to absorb and recover the damages from events of failures and disturbances. Failure to absorb and recover the operating performance would lead to huge loss of production. This framework is developed based on the resilience parameters of recoverability, redundancy and absorbability from a disruptive event in a system to evaluate the resiliency of manufacturing line so, a manufacturing processes that is more reliable and stable can be achieved. Analyzing the possible types of failure in a manufacturing line is the first step for the framework to start an approach. The types of failure with highest frequency of occurring the failure will be proceeded further to find the root causes of the failure with the aid of Ishikawa Diagram. The identified root causes will be evaluated in term of its resiliency with the aid of the proposed model. The proposed resilience model was applied to a glove manufacturing line. The contribution of this paper is the framework can be able to act as a decision tool for maintenance management and use of redundancies in manufacturing line and assist plant designers to improve a low resilience process in the overall process plant. Based on the result, it showed that the Improper Stirring of Latex has lowest Resiliency which has a score of 6.03

Two-stage Hybrid Pre-treatment of Ultrasound-Assisted Osmotic Dehydration and Freeze Drying of *Momordica Charantia* leaves

Wong Zhen Bing[1] and Chua Bee Lin[1*]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia*

*Corresponding Author: BeeLin.Chua@taylors.edu.my

Abstract. The aim of this study was to evaluate the impact of osmotic dehydration conditions (temperature, glucose concentration and the time of osmotic dehydration) on the total phenolic content. Meanwhile, this study also aims to reduce the total drying time of *Momordica Charantia* leaves using the hybrid drying methods (ultrasound-assisted osmotic dehydration finishing with freeze drying). The total drying time reduce significantly when hybrid drying technique was applied. Leaves are soaked into osmotic solutions in a ultrasound-assisted water bath finishing by freeze drying. It was found that, the suggested hybrid drying technique helps to reduce the drying time from 3.30 hours to 1.45 hours. In addition, the highest TPC content was obtained at 50℃, 50% glucose concentration, and 30minutes osmotic dehydration time with a value of 0.986 mg GAE/g bitter gourd leaves.

Keywords: Momordica Charantia, bitter gourd, hybrid drying technique, TPC content

An intelligent algorithm for stock market prediction using Long Short Term Memory (LSTM)

Ang Zhe Han [a)], Dr. Edwin Chung [b)], Dr. Mun Hou Kit [c)]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor, Malaysia.*

[a)] zhehan_ang@hotmail.com
[b)] ChinYau.EdwinChung@taylors.edu my
[c)] HouKit.Mun@taylors.edu.my

Abstract. Stock market prediction is the challenge of forecasting the future value of a company stock traded on an exchange. Accurate prediction of a stock price provides valuable insights to investors and may results in high return on investment. The objective of the research is to develop an intelligent algorithm for stock market prediction using Long Short-Term Memory (LSTM) to assist novice investors in making better trading decision. LSTM model is a Recurrent Neural Network (RNN) architecture designed to implement time sequence prediction for large datasets due to its ability to capture time series influence. The few major developing steps are data preprocessing, model development and train and test model. The forecasted results will be compared with the actual results for analysis. The algorithm was coded with Python language using Spyder software which can be downloaded from Anaconda. Pandas library was used for data management, TensorFlow library was used for deep learning computation and Keras was used for RNN modelling. The project focuses on stock market prediction in Bursa Malaysia to predict the open, close, high and low price of a particular stock for the next day.

Traffic Monitoring Using Bluetooth Signals

Bryan X. Q. Chang[1, a)] and Edwin C. Y. Chung[1, b)]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1, Jalan Taylor's, 47500, Subang Jaya, Selangor Darul Ehsan, Malaysia*

[a)] xqchang1996@gmail.com
[b)] Corresponding author: Edwin.Chung@taylors.edu.my

Abstract. Existing technologies for traffic monitoring are costly as they are mostly visually based or through the instalment of additional tags in vehicles. This research exploits the readily available Bluetooth signals in newer vehicles. By using the Bluetooth signals we can determine a vehicles speed by comparing the timestamps the Bluetooth responds to the inquiry as the device travels through the road. The detector can be manufactured at a lower cost compared to visual based systems and have a lower energy consumption. Bluetooth also allows the system to anonymously collect traffic data as it only requires the MAC ID of Bluetooth devices. Currently available technologies, which utilizes Bluetooth, measures the average speed over long distances by placing 2 detectors at opposite ends of roads. The aim of this research is to determine the speed or traffic condition using Bluetooth in a single location based on its received signal strength indicator (RSSI) collected through the inquiry mode. The system detects Bluetooth devices and determine its travelling speed at low speed conditions and ignores higher speed conditions and are assumed to be normal traffic conditions. The results of our experiments and what is needed to realise such a system are discussed.

Performance Analysis of Microwave Microstrip Ring Sensor for Determination of NPK Nutrients Contents of Fertilizer

Cheah Yong Jin[1, a)], Mun Hou Kit[1, b)], Teh Aun Shih[1, c)]

[1] *School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia*

[a)] Corresponding author: yongjin.cheah02@sd.taylors.edu my
[b)] houkit mun@taylors.edu.my
[c)] aunshih.teh@taylors.edu my

Abstract. There are three types of nutrients that are primarily being used in commercial fertilizers for its contents. These nutrients are nitrogen, phosphorus, and potassium (NPK). The purpose of this conference paper is to introduce a microwave-based microstrip ring sensor to determine the NPK nutrients content of fertilizers. The design of the sensor is aimed to have a lower cost, higher portability, easier to fabricate, and a better response time compared to currently existing methods to determine NPK nutrients contents. The first stage of the research process is designing and simulating the microwave microstrip ring sensor, the second stage is fabricating the microwave microstrip ring sensor, the third and final stage is preparing the liquid fertilizer and measuring its NPK nutrients content using the microwave microstrip ring sensor. When measuring the NPK nutrients contents of the liquid fertilizer using the microwave microstrip ring sensor, multiple tests involving different concentrations and mixtures of the liquid fertilizer is conducted. The testing of the sensor initially begins with a liquid fertilizer solution with one type of nutrient with varying concentration mixed into it, followed by a liquid fertilizer mixed with different combinations of nutrients with varying concentrations for each nutrient. The tests are conducted to deduce the accuracy of the measurements until the sensor is able to reliably measure the NPK nutrients contents of the liquid fertilizer.

Robust tracking drone flight controller design for target tracking and following

Hou Yuen Lee[a)] and Swee King Phang[b)]

Taylor's University Lakeside Campus, Selangor, Malaysia

[a)] houyuen.lee@sd.taylors.edu.my

[b)] sweeking.phang@taylors.edu.my

Abstract. The article demonstrates the result of the construction of a 3kg drone in SOLIDWORK drawing. In the result and discussion, the selections of each components are detailed explain and a SOLIDWORK drawing with the ratio of 1:1 of simulation drawing against real drone is provided. The performance of a drone is mostly affected by the weight of the battery due to the battery contribute the most weight ratio to the drone. It could affect the center of the gravity of the drone if not properly position and calculate. The selection of the battery with decision matrix is made in the mathematical section below.

Design and Analysis of Self-powered Printed Temperature Sensor

Chow Kwai Yuen Vince[a)], Aun Shih Teh[b)] and Hou Kit Mun[c)]

[1]*School of Engineering, Taylor's Lakeside Campus, No.1 Jalan Taylor's, 47500 Subang Jaya, Selangor Darul Ehsan, Malaysia*
.

[a)]Author: vince.cky94@gmail.com
[b)]Corresponding author: aunshih.teh@taylors.edu.my

Abstract. The purpose of this manuscript is to analyse the functionality of the printed temperature sensor in terms of resistance response and the feasibility of the RF energy harvesting device to be incorporated into the sensing module. Experiments were carried out to test for the change in resistance in response to the temperature range of 25℃ to 80℃. Three sensors were printed for each set of experiments with active area ranging from $1cm^2$ to $3cm^2$ to $5cm^2$ while the width of silver line of 500 µm in the first set of experiment and 1000 µm for the second set of the experiment. It was shown that the resistance of the sensors were becomes higher as the active area increases and the resistance of the sensors were recorded at 67.03 Ω, 171.40 Ω and 251.60 Ω while the active areas were printed to be $1cm^2$, $3cm^2$ and $5cm^2$ for the first set respectively. In the second set of experiment, the resistance of the sensors also increases as the active area increases and he sensors resistance were recorded at 18.50 Ω, 55.10 Ω and 88.70 Ω while the active areas printed were $1cm^2$, $3cm^2$ and $5cm^2$ respectively. The experiment also showed that the set up demonstrated positive response and the RF component was able to generate any amount of voltage when exposed to electromagnetic wave.

Keywords: Printed temperature sensor, RF energy harvesting, temperature, resistance, active area and voltage

Development and Design of a Non-Rigid Blimp Shape to Improve its Aerodynamic Efficiency at Different Altitudes

Aaron Gayvin*, Abdulkareem Sh. Mahdi Al-Obaidi,
Swee King Phang, Shahrooz Eftekhari

School of Engineering, Faculty of Innovation & Technology - Taylor's University, Malaysia

*Corresponding author: aarongayvin.peterfrancisxavier@sd.taylors.edu my

Abstract. Road traffic monitoring mainly exists because of traffic congestion. There are different types of monitoring systems and one such system is airborne. This suggests the monitoring system is attached onto an airborne vehicle. In modern times, unmanned aerial vehicles (UAV) have been hailed as the technological evolution in the development of airborne vehicles. Airships or blimps, chosen for this research trumps certain limitations that plague UAVs such as flight duration. The aim of this research is to firstly design three different non-rigid blimp shapes, whereby all designs have the same envelop volume and weight, secondly, test the aerodynamic efficiency of all three designs and finally, select the best design for a prescribed operating condition. The aerodynamic testing focuses on obtaining the drag coefficient for each design at six different angles of attacks and at two different axes. This puts the total number of case studies at 36. SolidWorks 2018 is used to create the three designs. The case studies are numerically analyzed through computational fluid dynamics (CFD) method using the flow simulation add-on within SolidWorks 2018. The data obtained from analysis is manually tabulated into Microsoft Excel, where graphs are illustrated for discussion purposes. The numerical results are compared and validated using wind tunnel experiments. Furthermore, both the numerical and experimental data closely validates the theoretical results found in previous research. The results obtained from both analyses suggests one of our designs has the lowest drag coefficient of 0.0785, specifically to the x-axis and another with a drag coefficient of 0.2023, specifically to the z-axis. In addition to this, the design that averages in both axes has the best aerodynamic efficiency and its drag profile at different altitudes of 10, 30, 50 and 70 meters show how well its efficiency is, however, the results show that the different altitudes have minimal effects in its efficiency. This shows that the design's efficiency is capable of descending and ascending without effecting its aerodynamic efficiency. This would assist future research or development that requires additional data on the aerodynamic efficiency of blimps that would be used in road traffic monitoring.

Keywords: Airships; Aerodynamic efficiency; Blimps; Computational fluid dynamics (CFD); Drag coefficient; Wind tunnel experiments.

Potential of Sugarcane Ethanol as Fuel for Vehicles in Malaysia

Arisya Hannah Umaruddin[1,a)] and Mohd Faizal Fauzan [b)]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia.*

[a)] Corresponding author: arisyahannahumaruddin@sd.taylors.edu.my
[b)] mohdfaizalfauzan@taylors.edu my

Abstract. The threat of climate change is rapidly increasing due to the rise in global temperatures, which is largely due to emissions of harmful greenhouse gases. In many countries, including Malaysia, the transportation sector is the main contributor of these emissions as the majority of vehicles are still running on fossil fuels. Certain countries have already focused their resources into cultivating biofuels, with Brazil being the lead producer of sugarcane ethanol. Sugarcane ethanol is obtained through the process of sugarcane starch fermentation, and can effectively be used as an ethanol-gasoline blend or as 100% pure ethanol fuel, in spark ignition engine vehicles. Malaysia's suitable weather and agricultural capabilities allow for large yields of sugarcane, which may potentially lead to a lucrative alternative source of fuel that is both economical and environmentally responsible. This research aims to study the impact on the economy and environment caused by the production and the use of sugarcane ethanol, and conclude the potential of sugarcane ethanol as a fuel for vehicles in Malaysia with relevant justification. Literature and research previously done related to this topic were thoroughly researched and adapted to suit the scope of the project. Information and data regarding the topic were applied to mathematical equations to obtain results regarding the impact of sugarcane ethanol in Malaysia. The results had shown that the production and use of sugarcane ethanol positively impacts the economy, with the unit cost price of sugarcane ethanol being RM 0.22 per liter. The results also proved that the production and use of bioethanol positively impacted the environment, with total carbon savings increasing with the increase in concentration of the bioethanol. These results subsequently proved the positive impact it would also have towards society, with better economy and environmental factors directly and indirectly improving the quality of life. Overall, it was concluded that sugarcane ethanol has great potential as a fuel source for vehicles in Malaysia based on the evidence found and the justifications made.

Computational Study for the Improvement of Dual Inlet Hydrogen Battery using Different Flow Field Ratio Dimension Designs

Ashwin A/L Sekaran[1, a)] and Mohd. Hardie Hidayat bin Mohyi[1, b)]

[1]*School of Engineering, Taylor's University, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor, Malaysia.*

[a)]ashwin.sekaran@sd.taylors.edu my
[b)]hardie hidayat@taylors.edu.my

Abstract. It has turned out to be that humans have caused a large portion of the past century's warming by discharging heat-trapping gases as we try to improvise our modern life. Fossil fuel has been one of the biggest contributions to the rapid rise of greenhouse gas and pollution released to the environment which we call the result as global warming. Therefore, Proton exchange membrane (PEM) hydrogen fuel cell act as a global warming counter measure by moving away from fossil fuel and prioritize alternate renewable energy. The PEM fuel cell is a type of clean alternative energy that produces power through chemical reaction and released clean exhaust, which is water. Contribution in the PEM fuel cell research could further its development to produce more efficient and sustainable models thus replacing the dependent of fossil fuel. The performance of PEMFC depends on numerous factors, including transport phenomena inside the cell, operating conditions (temperature, pressure and relative humidity), MEA assembly and flow channel geometry. The flow channel geometry has significant impact on the performance and efficiency of the PEMFC since the distribution of pressure and velocity varies from one design to another. It is essential to develop an optimum design to avoid the accumulation of water within the channels that could create a blockage and limits the gas flow within it. This research investigates on the parallel flow field designs and merely focus on dual inlet. A three dimensional (CFD) model is applied to analyze the effect of different parallel flow field designs and dimensions of the geometry on the performance of PEMFC with an area of 40 x 30 mm^2 which consist 20 channels. Five parallel designs were modelled and simulated with the result showing that the 0.43 ratio is the best channel to rib ratio as it produces the most uniform pressure and velocity distribution of all the other designs.

Keywords: Fuel Cell, PEMFC, Parallel Flow Field, Dual inlet, Rib-to-Channel

Design and Fabrication of Novel Sound Insulator Using PLA-Fibre

Benjamin Earl Sinidol[a)], Mohammad Hosseini Fouladi[b)] and Satesh Narayana Namavisayam[c)]

School of Engineering, Taylor's University, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor, Malaysia.

[a)] corresponding author: benjaminsinidol@gmail.com
[b)] hosseini@taylors.edu.my
[c)] sateshnarayana namasivayam@taylors.edu my

Abstract. The research paper presents an experimental study in designing a composite material made from polylactic acid (PLA) and palm fibre. This study was done to evaluate the feasibility of developing a natural fibre polymer composite material to be used for sound insulation as well as determine the most effective PLA-Fibre ratio that would give improved mechanical or acoustical properties of the composite. The composite material was fabricated from its constituent materials using different methods such as extrusion and 3D printing. Multiple samples were created to be tested for their mechanical and acoustical properties across different fibre concentrations of 5wt%, 10wt%, and 15wt% with reference to pure PLA. The three mechanical properties which were tested included tensile strength, impact strength and hardness. Also, the sound absorption coefficient of the composite material was acquired. Based on the results obtained in this experimental study, the tensile strength of the composite material at 5wt%, 10wt% and 15wt% were 27.57 MPa, 27.97 MPa and 28.14 MPa respectively. This shows that there is a decrease in the tensile strength of the composite material when compared to pure PLA. With this observation, it is expected that as the fibre concentration starts to increase, the tensile strength of the composite material will decrease.

Design And Analysis Of Airborne Wind Energy System (AWES) For Microgeneration In Malaysia

Brandon Chew Chu Shyan[1, a)], Douglas Tong Kum Tien[1, b)], Shahrooz Eftekhari [1, c)]

[1]*Taylor's University - Innovation and Technology - Engineering - Petaling Jaya/Selangor - Malaysia.*

[a)] Corresponding author: brandonchew123@hotmail.com
[b)] DouglasKumTien.Tong@taylors.edu.my
[c)] Shahroozeftekhari@sd.taylors.edu.my

Abstract. Wind is one of the major providers of renewable energy resources for the world. Airborne wind energy system (AWES) is an alternative energy source provider, where its efficiency in generating energy may overshadow other energy source providers. AWES mostly have the mechanism or parts that allows them to stay airborne for long periods of time at high altitudes to harvest faster, turbulent wind energies. There are two types of AWES: Ground-Gen and Fly-Gen, where the location of the generators is relative to their type names. This paper elaborates on the feasibility of a scaled-down size AWES in Malaysia, where wind speeds are usually low, and serve as a pioneer to undertake AWES research in Malaysia. The research consists of two parts: experimental methods and empirical methods. A design of NFL(1)-0115 airfoil was chosen for the research due to its high lift and low drag coefficient properties. The coefficient of lift and drag were evaluated in relation to AOA. The results show that higher AOA leads to higher lift coefficient and significantly lower drag. It was discovered that wind test tunnel results are significantly better than simulation results. Better results can be obtained by decreasing the aspect ratio and increasing the Reynolds number.

Keywords: Airborne wind energy system (AWES), microgeneration, lift and drag coefficient

Reduction of Hygroscopicity of PLA Filament for 3D Printing by Introducing Nano Silica as Filler

Chin Tze Seng[a], Se Yong A/L Eh Noum[b*], Siva Kumar A/L Sivanesan[c]

[b] *School of Engineering, Faculty of Innovation & Technology, Taylor's University, Taylor's Lakeside Campus, No. Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia*

[b*]Corresponding author: SeYong.EhNoum@taylors.edu.my

Abstract. 3D (three dimensional) printing is also known as additive manufacturing technology that is one of the most rapid growing technologies in present world. It is able to materialize digital model into physical objects in a way lesser time and cost. However, 3D printing is quite dependable on the limited material choices and methods available in the market. One of the most popular choices of material usage in polymeric 3D printing via Fused Deposition Modelling method is Polylactic Acid (PLA). Studies have found that PLA is high in hygroscopicity (absorb moisture), it tends to absorb moisture from the surrounding even when exposed to ambient environmental conditions. This phenomenon is a great setback to 3D printing as it causes negative impacts to the material such as swollen effect of finished product, shortening shelf life and biodegrades as moisture breaks down the structure that causes bad quality print, poor bonding adhesion, bubbles forming and etc. Meanwhile, silica gel and fumed silicas are found to be frequently used as desiccant due to its excellence in repelling moisture that prevents spoilage of filaments. Therefore, the aim of this study is to reduce hygroscopicity of PLA filament in 3D printing by incorporating various type of silica, typically silanol treated and untreated nano silica, as a filler. Extruded samples of PLA nanocomposites were tested in moisture uptake test with tensile test to compare their performance to the plain PLA. The concentration of nano silicas were 0, 1, and 3 wt % (weight percentage) and were prepared using high speed mixer and subsequently extruded into filaments in a single screw extruder. Moisture uptake performance was then confirmed by TGA (thermal-gravitational analyzer). Incorporating treated nano silica at 1 wt % yield the highest reduction in hygroscopicity by 40 %. Furthermore, its thermal stability was found to be improved compared to pure PLA and other composition. Despite recording highest tensile strength, Young's modulus and elongation at break gains by the 3 wt % treated nano-silica filled PLA, specifically tensile strength increment by nearly 64 %, the fact that its lower reduction in hygroscopicity by just 19 % compare to 1 % treated nano-silica filled PLA at about 40 % in reduction of hygroscopicity has made the latter the best perform nanocomposite composition. This is due to excessive content of nano-silica that had accumulated within a certain area that did not segregate evenly within the matrix PLA. Therefore, causing agglomeration and void spaces which in turn could allow moisture or air bubble to reside in the sample. Nevertheless, untreated nano silica had shown improvements in tensile test but in terms of hygroscopicity was just about 10 % and lower. Scanning electron microscope (SEM) was conducted to further identify the dispersion of the nano particles within the matrix of PLA. As a conclusion, silanol treated nano-silica has successfully improve the PLA matrix, specifically for 1% treated nano-silica filled PLA which showing greatest improvement on hygroscopicity reduction while outperform plain PLA in tensile properties.

Keywords: 3D Printing, Hygroscopicity, Moisture, Polylactic Acid, PLA Filament, Nano Silica

Development of a Novel Multilayer Sound Absorption Panel

Choh Calveen[1,a)] , Mohammad Hosseini Fouladi[1,b)] , Satesh Narayana Namasivayam[1,c)] , Wai Meng Chin[2,d)]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus*
No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia

[2]*Daikin Research & Development Malaysia Sdn Bhd*
D.E, Lot 60334, Persiaran Bukit Rahman Putra 3, Taman Perindustrian, Bukit Rahman Putra, 47000
Sungai Buloh, Selangor

[a)]Corresponding author: hoh.calveen@sd.taylors.edu.my
[b)]mfoolady@gmail.com
[c)]sateshnarayana namasivayam@taylors.edu.my
[d)]chinwm@daikin.com.my

Abstract. Noise pollution has always been the main issue in this modern era where technology has continuously improving. Therefore, development of a novel sound absorption panel is necessary in curbing radiated sound waves through visco-thermal effect. Noise pollution causes various harmful effects such as loss of hearing, hypertension, disturbance of sleep and also tinnitus. Hence, it is mandatory in fabricating a multilayered sound absorption panel which would provide maximum sound absorption as well as determining its capability in absorbing sound at various frequencies. Hole sizing and micro-perforated panel are studied while different layers affecting the coefficient of sound absorption is carried out. In this study, various layers of sound absorption panels were assessed through experiment by utilizing Two-Microphone Impedance Tube testing whereby the design is drawn by using Solidworks and fabricated by using 3D printers. Similar prototypes with increasing number of layer of panels were modelled in maximizing absorption of sound and results were obtained and will then be compared to the baseline design. The results will then be tabulated and plotted in a graph to determine the relationship of sound absorption with increasing frequencies for different amount of sound absorption layers. A sufficient number of layers which would provide a decent sound absorption coefficient will be selected as the new design. Optimization will be done to the sound absorption panel in maximizing its capability in absorbing sound. The outcome of this project is to determine the effectiveness of double layer sound absorption panel compared to single layer sound absorption panel which would provide maximum sound absorption coefficient. The key finding obtained from this study is that single layer sound absorption panel provides good sound absorption coefficient at medium to high frequency while double layer sound absorption panel provides good sound absorption coefficient at both low to medium frequency and also medium to high frequency.

Recycling of Polylactic Acid (PLA) Wastes from 3D Printing Laboratory

Wei Jean Choo[1, a)] Hui Leng Choo[1, b)] Thai Kiat Ong[2, c)]

[1]*School of Engineering, Taylor's University, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor, Malaysia*.
[2]*Tunku Abdul Rahman University College, Kampus Utama, Jalan Genting Kelang, 53300 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur, Malaysia.*

[a)] Corresponding author: weijeanchoo@gmail.com
[b)]HuiLeng.Choo@taylors.edu my
[c)]ongtk@tarc.edu my

Abstract. The School of Engineering 3D printing laboratory accumulates a large amount of 3D printing waste especially weeks before Engineering Fair. The main 3D printing process that is used is Fused Deposition Modelling process (FDM) process. It is a process that prints three-dimensional (3D) geometry object by depositing melted thermoplastic filament layer by layer. The laboratory mainly uses polylactic acid (PLA) filaments as the print material. This process generates wastes in the form of supporting base of the 3D printed model and the supports generated to aid printing, which are removed after the printing process. Occasionally, error in the printing means the whole part will be discarded as well. The objective of this project was to investigate the feasibility of recycling PLA wastes from Taylor's University's 3D printing laboratory in terms of properties of recycled PLA. The thermal properties of recycled PLA will be investigated using Differential Scanning Calorimetry, whereas mechanical properties via tensile, flexural and impact test. The mechanical testing showed that after the first cycle, it deteriorated significantly and was found to be not practical to be used where strength is needed. This lower quality of recycled PLA can be used for other models that do not need strength or durability. The tensile modulus, ultimate tensile strength and the elongation at break was found to have decreased 67% after the first cycle. The flexural modulus and flexural maximum stress was also found to have decreased from the first cycle by 24% and energy/area was found to decrease by 52%. For Cycle 2, the values decreased even more compare to Cycle 1. The decrease is due to the inconsistence in diameter during extrusion process which leads to specimen not fully filled during 3D printing. However, the decrease in flexural testing was less compare to tensile and impact test. This is due to inconsistence 3D printing. With the filament diameter being too small, there will be no filament extruding out from the nozzle and when diameter of filament is too big, it gets stuck at the nozzle. The recycled filament became more brittle, less rigid and weaker, therefore the recycled material is suggested to be used in applications where strength is not important, like for structural models or testing of the SolidWorks drawing.

The Impact Of Unilateral And Bilateral Landing In Vertical Jump Among Basketball Athletes

Darien Wong Wen Han [a)], Dr. Ku Pei Xuan[b)]

School of Engineering, Taylor's University, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor, Malaysia.

a)darienwong96@gmail.com
b)peixuan.ku@taylors.edu.my

Abstract. ACL injury is one of the most common lower extremity injuries that occurs among basketball athletes due to frequent jump-landing. Jump-landing can be categorized into unilateral and bilateral where joint kinematics of the dominant and non-dominant leg can be observed. The study was carried out with a sample size of six, three being normal individuals while the remaining three consisted of basketball athletes. A 5-camera Vicon motion analysis system as well as two Kistler force plates were utilized throughout the study. Each of the participants were required to perform several unilateral and bilateral jump-landing tasks. The sagittal plane kinematics of the hip, knee and ankle as well as the vertical ground reaction force were observed and recorded. Statistical analysis was carried out to identify if there were any significant differences between the dominant and non-dominant leg throughout all of the jump-landing tasks. From the results obtained, it can be said that there were no significant differences throughout all bilateral jump-landing tasks among both normal individual and basketball athletes. However, significant differences were seen between the knee flexion angle of the dominant and non-dominant leg during unilateral landing from normal individuals.

Preparation and Characterisation of Conductive Polymer Composite Made by Graphite Scrap

Dylan Tong Jia Yee[1], Koay Seong Chun[1a)], Pang Ming Meng [1], Ong Thai Kiat [2]

[1] *School of Engineering, Faculty of Innovation and Technology, Taylor's University Lakeside Campus, 47500 Subang Jaya, Malaysia.*
[2]*Faculty of Engineering, Tunku Abdul Rahman University College, 53300 Kuala Lumpur, Malaysia.*

[a)]Corresponding author: seongchun.koay@taylors.edu.my

Abstract. Conductive polymer composite (CPC) is a material that occupied characteristic of polymer and conductive filler, through control the filler amount addition, different range of conductivity, mechanical properties and thermal properties can be controlled to suit different needs. This research utilized the recycled graphite powder (rGP) as conductive filler to produce CPC material. The results shown that higher amount of rGP added to PP matrix given a lower tensile strength but higher tensile modulus CPC. Meanwhile, the electrical surface resistivity of the materials dropped over the increment of rGP, when content of rGP hits 50*wt*%, the surface resistivity came to a value of 10^5 ohm/sq, where the CPC is in the range of conductive plastic. Furthermore, addition of rGP also further improved the thermal stability of CPC due to highly thermal stable rGP properties, CPC starts to degrade in higher temperature and degrade slower when the amount of rGP is higher.

Design and Analysis of a Small- Scaled Compressed Air Energy Storage System (CAES)

Elisa Eustace Pereira[a)] Douglas Tong Kum Tien[b)]

School of Engineering, Taylor's University, Taylor's Lakeside Campus,
No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia

[a)] Corresponding author: elisaeustacepereira@gmail.com
[b)] douglaskumtien.tong@taylors.edu.my

Abstract. Renewable energy such as solar energy is known as an intermittent source of energy. Intermittent energy is defined as any source of energy that is not continuously available due to external factors. The production of renewable energy such as solar or wind energy and its consumption may not coincide. In this study, an energy storage system is developed to overcome this shortcoming. Excess energy captured during production can be stored using a small-scaled compressed air energy storage system (SCAES) for later consumption. At present there are two existing compressed energy storage system power plants mainly in Huntorf, Germany and McIntosh Alabama, USA. However, these were operated on a large scales and rather than for individual household usage. This study is carried out to design and analyse a small-scaled compressed air energy storage systems (S-CAES) for individual households who have solar panels installed. The design components of this study included selecting an appropriate compressor and designing the air storage tank that can provide sufficient energy storage capacity and is efficient and practical for an average household in Malaysia. The method used in the design and analysis of the SCAES is through employing theoretical analysis based on Thermodynamic theory. Simulations are also carried out using software's such as Matlab, Solidworks and ANSYS. The results showed that the process most suitable for the SCAES is isothermal process, the chosen compressor has a working pressure of 1200 kPa and the newly designed storage tank has a diameter of 0.750m, area of 0.442m^2 and the volume of the storage tank is 0.630 Litres.

Development of Hierarchical Topographies with Benchtop Methods and Comparisons of Its Self-Cleaning Characteristics with Single-Layered Micro Topographies

Goeh Kar Jian[a)] and Dr. Felicia Wong Yen Myan[b)]

School of Engineering, Taylor's University, Taylor's Lakeside Campus
No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia

[a)] Corresponding author: karjian.goeh@sd.taylors.edu my
[b)] FeliciaYenMyan.Wong@taylors.edu.my

Abstract. This research is about presenting an alternative method to develop micro-sized surface topographies with the potential for antifouling applications. Single-layered and hierarchical topographies are compared to determine if the latter would potentially exhibit better antifouling potential than the former. Another objective is also to determine whether a consumer grade FDM 3D printer is able to produce hierarchical topographies with dimensions of not more than 500 µm. The research started with the design of the mould of hierarchical and single-layered topographies which was then fabricated using a 3D printer. The patterns on the 3D printed mould are replicated by pouring a mixture of Polydimehtylsiloxane (PDMS) with its curing agent onto the mould. Both PDMS mixture and mould were placed in an oven to cure the mixture. Once curing of the PDMS is complete, the cured PDMS sheet is peeled to reveal the patterned impression of the mould on the sheet itself. Laser Confocal Scanning Microscopy (LCSM) was the characterization tool used in this study. The surface roughness, Sa and structure height, Sz were obtained and analyzed to determine which one exhibits better self-cleaning properties. The cross-sectional view and readings of dimensions were also obtained from LCSM to analyze the ability of 3D printer to produce the desired dimensions. Upon completion of the experiment, it is found that the 3D printer is able to produce hierarchical topographies but with certain flaws. The Sz values also shows that the hierarchical topography is likely to exhibit better self-cleaning properties when compared to the single-layered topography.

Numerical investigation of the effect of spoiler shape and setting angle on the performance of racing car

Hesam Eftekhari*, Abdulkareem Sh. Mahdi Al-Obaidi

Department of Mechanical Engineering,
School of Engineering, Taylor's University, Malaysia.

*Corresponding Email: heseft@gmail.com

Abstract. This research aims to investigate numerically and experimentally the effect of the spoiler on the aerodynamic characteristics of a race car. Lift and drag coefficients of NACA 0012, NACA 4412 and S1223 on a self-generated car model which is named as ERC model that is inspired by Porsche 911, is simulated at the same Reynold number for all cases and found that S1223 is more optimum spoiler compared to the other two spoilers since it creates negative lift which helps for the stability and safety of the race car which is an important factor. Also, it is found that spoilers has to be set on negative angle in order to reduce the lift of the car and it was found that S1223 in setting angle of 0, -4 and -8 degrees will generate negative lift on ERC model with the lift coefficients of -0.018, -0.115 and -0.445 respectively.

Keywords: Aerodynamic, Race car, Spoiler, Airfoil, CFD

Densification Behavior and Mechanical Properties of ZTA

Kevin Chandra[1, a], Sivakumar Sivanesan[1,b]

[1] *School of Engineering, Taylor's University, 1, Jalan Taylors, 47100, Subang Jaya, Selangor Malaysia*

[a)] kev.chandra@gmail.com,
[b)] SivaKumar.Sivanesan@taylors.edu.my

Abstract. Testing an alumina-zirconia composite and its behavior under 2 different sintering processes. The study was to test ZTA behavior under 2 different sintering processes. Zirconia content ratio ranges from 5wt% to 20wt% in the composite. The samples then need to be sintered in either single-step sintering or two-step sintering with holding temperature ranges from 1400°C to 1550°C with two-step sintering another phase of dwell need to take place at 1000°C for 2 hours. Then samples are tested for fracture toughness, hardness, density and young's modulus. The results exhibit positive results in two-step sintering due to better grain size control during sintering. Two-step sintering produced the highest fracture toughness ($8.6MPam^{0.5}$) created in 1450°C with 10wt% zirconia in the samples and highest hardness (19.5GPa) created 1550°C sintering with 5wt% zirconia in the samples.

Computational Study for the Improvements of Proton Exchange Membrane Fuel Cell using Hybrid Flow Design

Kok Ewe Gin, Mr Mohd. Hardie Hidayat bin Mohyi[a)]

[1] *School of Engineering, Faculty of Innovation and Technology, Taylor's University Lakeside Campus, 47500 Subang Jaya, Malaysia.*

[a)]Corresponding author: hardie.hidayat@taylors.edu.my

Abstract. The Proton exchange membrane fuel cell (PEMFC) is an alternative source of clean energy that produces energy through the means of chemical reaction with water as its only exhaust product. However, in the conventional PEMFC, the pressure at the inlet of the channel is much higher than the pressure at the outlet. This subsequently causes water to overflow the flow channel due to the water capillary effect present in the tiny flow channels. This in turn short circuits and abruptly stops the entire process. In the conventional PEMFC systems, this problem is overcome with a pump. However, a pump requires electrical energy itself to be operated which means the net work output is low when a pump is used. The aim of this investigation is to improve the current flow field design of the PEMFC in order to remove the usage of the pump and achieve maximum efficiency and maximum power generation. We hope to integrate the current designs of flow fields, which are the serpentine design and parallel design to improve water management and prevent the water capillary action from flooding the system. The observations that this research aims to achieve is a low value of pressure difference between the channel inlet and channel outlet. The research methodology is a three step process where we do design modeling with SolidWorks, drawing out the hybrid design flow field. Next, ANSYS is used to do meshing, which creates small elements within the geometry domain of the channels. After the meshing is done, the ANSYS FLUENT program is used to do CFD simulation with boundary conditions of 3 x 10^7 set for the mass flow rate. The simulation data will be pressure in the unit of Pascal (Pa). The data will then be tabulated for different hybrid designs and compared to see which designs are yields the best results. The current parallel flow design produces around 60Pa of pressure at the outlet when 121Pa of water is enters the inlet. We intend to reduce the difference between this value as much as we can.

Properties of Zirconia Ceramics with Stainless Steel Additions

Lo Wei Liam[1], Kelvin Chew Wai Jin[1,a)], Ramesh Singh[2]

[1] *Department of Mechanical Engineering, School of Engineering, Faculty of Innovation and Technology, Taylor's University, 47500 Subang Jaya, Selangor, Malaysia.*
[2] *Centre of Advanced Manufacturing & Material Processing (AMMP), Department of Mechanical Engineering, Faculty of Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia.*

[a)] Corresponding author: kelvinwaijin.chew@taylors.edu my

Abstract. Yttria-stabilized tetragonal zirconia polycrystals (Y-TZP) is among the toughest advanced ceramic that had been developed. This ceramic material is also among the common choice of biomaterial in medical field. Moreover, zirconia ceramic had gained a lot of attention especially for doctors in the process of bone restoration since it has excellent mechanical properties and high biocompatibility. However, ceramic material itself has relatively lower toughness when compared to most metals used in engineering applications. Therefore, ceramic material had been study by doping with different type of metal oxide to overcome this weakness. Hence this leads to the birth of this research project which is to study the properties effect of Y-TZP doped with stainless steel 316L. In this research project, different weight percentage of stainless steel 316L was doped with Y-TZP within range of 0wt%, 0.1wt%, 0.5wt% and 1wt%. The results of the experiment focusing on determining the mechanical properties of sintered Y-TZP such as bulk density, Vickers hardness and fracture toughness. The experiment conducted by mixing both zirconia powder (Y-TZP) and stainless steel 316L powder together with ethanol as additions. The mixture will undergo bathing and taking to ball milling to become slurry conditions. The mixture powder will be processing with high pressure pressing for 10 seconds and cold isostatic pressing at room temperature. After cold isostatic pressing, the green samples undergo sintering with the temperature of 1200°C, 1300°C, 1400°C and up to maximum of 1500°C. Furthermore, the sample will be taken to grinding and polishing before taking into measurement and analysis. The results of the experiment were revealed that as content of SS316L increased proportional with sintering temperature, the Vickers hardness and fracture toughness improved while the relative density decreased.

Numerical Simulation and Modelling on Thermoelectric and Mechanical Performance of Thermoelectric Device

Lim Joon Hoong[a)] and Luqman Hakiem Bin Mohd Razib[b)]

School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia.

[a)]Corresponding author: joonhoong.lim@taylors.edu.my
[b)]luqmanhakiemmohdrazib@sd.taylors.edu.my

Abstract. In this study, the effect of geometric dimension of the thermoelectric device is investigated in order to determine the optimum structural for the enhancement of thermoelectric and mechanical performances. The results of parameters such as angle, length and width of thermoelectric module will be discussed and being compared in order to observe the performance and mechanical reliability of thermoelectric device. The purpose of this study is to determine the angular ratio and the slenderness ratio of annular thermocouples effects towards the mechanical reliability and thermoelectric performance. Based on this research, the angular boundary of 3° shows the highest heat transfer per unit area per time across the thermoelectric couple. As the angular boundary increases from 0° to 3°, the total heat flux also increases about 23.76 W/m^2 to 23.801 W/m^2. The total temperature difference between hot side and cold side surface will increases as well due to the heat loss because the thermoelectric legs become wider and the convection occurs. The higher temperature difference will help to improve figure of merit and increase the thermoelectric performance.

Study On The Effect Of Different Oxidants Used For Dyes Removal From Wastewater

Mogana Vishnu Uthrapathy*, Norhabibah Mohamad

School of Engineering, Taylor's University, Taylor's Lakeside Campus,No.1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia

*Corresponding Author: moganavishnuuthrapathy@sd.taylors.edu.my

Abstract. To our knowledge, water is a scarce resource around the world and nevertheless it is being polluted widely by chemicals and other pollutants which cause so many environmental issues and when this happens it's called wastewater. Some wastewater can be treated and others might not be able to. There are many factors that account to treatment of wastewater. The polarity like intermolecular forces that bond between water molecules and chemicals or pollutants is the far most important study of treatment of wastewater. This research of study is proposed to prepare a monomer (pyrrole) together with three oxidants namely iron ferric chloride hexahydrate, ammonium peroxodisulfate and iron ferric chloride anhydrous. The waste solution is prepared manually by using methyl orange as a dye solution. There are four batches of dye solutions; 5ppm, 10ppm and 15ppm which have been diluted from standard stock concentration which is 20ppm. Initial dye concentration of 15ppm will be used to mix with the monomer and oxidant composite while other concentrations are left to obtain the standard curve equation. In order to determine the percentage removal of dyes from wastewater, there are certain variables that needed to be observed which are mole ratio of monomer to oxidant and adsorbent (yield) dosage. UV spectrophotometer is used to acquire the wavelength absorbance of the final mixture whereby the after treatment of dyes solution is done. The results showed that there is a trend of increase in percentage of dye removal when mole ratios of monomer to oxidants decrease. The optimum or highest percentage dye removal can be seen at its peak at a mole ratio of 1:1. Moreover the highest percentage removal can be identified by the usage of ferric chloride anhydrous with the monomer (pyrrole). As for the major contribution of this whole experiment of dye removal experiment that has taken place, final method of characterizations were done by using FT-IR to further analyze the functional group and bonding present in the wastewater and resulting mixture of reactants. Also, TGA was done to determine the important stages of thermal degradation for the conducting polymer sample that has resulted in highest percentage dye removal.

Keywords: Monomer, Oxidants, Parameters, Percentage, Characterization

Investigation on Rheological Behaviour of Chrysanthemum stem fiber filled Polylactic Acid (PLA) biocomposites

Koay Seong Chun[1,a)], Muhamad Syafiq Aiman Mohamed Kaberi[1], Chou Pui May[1], and Ong Thai Kiat[2]

[1]*School of Engineering, Faculty of Built Environment, Engineering, Technology and Design, Taylor's University Lakeside Campus, 47500 Subang Jaya, Selangor*
[2] *Department of Materials Engineering, Faculty of Engineering And Technology, Jalan Genting,Kelang, Setapak, 53300 Kuala Lumpur.*

[a)]Corresponding author: SeongChun.Koay@taylors.edu.my

Abstract. Polylactic acid (PLA) is one of the thermoplastic polymers that is derived using renewable resources such as corn starch or sugar cane. Usage of PLA in plastic production is very popular as it is cost-efficient and also biodegradable material. However, its high application cost limits its market potential. Therfore, biocomposite consists of PLA and natural filler is introduced to reduce the cost of PLA. In this research, the chrysanthemum stem fiber is use to act as the natural filler for the biocomposite. This paper focus on investigation on rheological behaviour of the biocomposite. The composites with varying filler loading from 0 phr(part per hundred resin) to 40phr were analysed with and without Ultra-Plast XP519 processing aid using a Brabender Plastograph torque rheometer. The composites were run at three different rotor speed which is 40rpm, 60rpm and 80rpm to investigate how the rotor speed will affect the processing torque produce. The torque rheological data found that the processing torque increased as the rotor speed and filler content were increased as well as to addition of processing aids.

Development Of A Visualization Software For Visualizing Computational Fluid Dynamics Results Based On Mesh-Free Method

Muhammad Amirul Hakim[1, a)] and Dr Ng Khai Ching[2, b)]

[1] *Department of Mechanical Engineering, Taylor's University, 47500 Subang Jaya, Selangor, Malaysia*

[a)]hakim135xz@gmail.com
[b)]KhaiChing.Ng@taylors.edu.my

Abstract. Analyzing the flow of fluid is very important in our lives. There are a lot of structure that was built to handle huge amount of water flow such as a dam. Failing in properly analyzing the fluid flow impact on the dam structures will results in a catastrophe that could take millions of lives. Most engineers will resolve in using meshing method or computational modelling of physical system to solve problems in partial differential equations ie. Laplace equations to analyze the fluid flow. The system uses numerical method which discretize a space into grids, or meshes, such as finite element methods (FEM). FEM has limitations when it comes to dealing with operations that involves large deformations which causes it to have severe mesh distortion. Smoothed Particle Hydrodynamics (SPH) is a famous numerical method to analyze fluid flows. It is the most popular alternative compared to the traditional mesh-based method when it comes to simulating flow of large interfacial/boundary deformations and fragmentations. SPH simulation however requires boundary treatments when interacting with solid boundaries. With no treatment, the SPH particles can penetrate or cross the solid boundary as it has big isentropic stencil that is truncated when it is near a solid boundary. The way to solve is by treating the solid boundary using the fixed ghost particle. The main purpose of the paper is to develop a MATLAB user friendly coding software to generate the fixed ghost particle for SPH. Creating a user-friendly software to generate fixed ghost particle will decrease the time needed for Engineers to perform SPH. To place the fixed ghost particle, a function is going to be modelled according to the solid boundary particles and then keep reusing the function to generate more lines of fixed ghost particle in the solid region. The function will be implemented in MATLAB computer programming software. The second part of the study will be generating particles in the fluid region opposite to the particles in the solid region, this is required in order to use SPH analyzation. The research will be a success if 3 or more lines of fixed ghost particles are developed. The fixed particles also have to be equally spaced.

An Economical Approach To Detect Cervical Cancer Through PAP Smear Test

Muhammad Bilal Ahmed [1, a)], Mohammad Hosseini Fouladi [1, b)], Chong Pei Pei [2, c)] and Satesh Narayana Namasivayam [1, d)]

[1]*School of Engineering, Taylor's University, 47500, Subang Jaya, Selangor, Malaysia*
[2]*School of Biosciences, Taylor's University, 47500, Subang Jaya, Selangor, Malaysia*

[a)] muhammadbilal.ahmed@sd.taylors.edu.my
[b)] mfoolady@gmail.com
[c)] PeiPei.Chong@taylors.edu my
[d)] SateshNarayana.Namasivayam@taylors.edu.my

Abstract. This article provides the research work on designing 3D printed plastic material spinning top whose objective was to rotate at least 3500 rpm along with four microcentrifuges containing cervical cancer cells. The aims were to perform theoretical calculations as well as obtain experimental results to compare the difference in readings. The results of theoretical calculations of spin angular velocity was 9167.32 rpm and for experimental result 3715 rpm was obtained. The error percentage between these results is 59.47%. This error can be rectified by reviewing the calculations and reliable operating tachometer. Moreover, the results from microscope demonstrated that designed spinning top needs only one run (1.02×10^6 cells/ml) which can deliver good cells image and less number of dead or damaged cells as compared to three times run of the same sample (1.635×10^6 cells/ml). Designed spinning top proved good stability on flat surface and smooth rotation between 2-2.5 minutes. Time period varies from the strength of pulling the string.

Potential Of Waste To Energy In Malaysia

Muhammad Syafiq Mohd Fadli [1, a)] and Mohd Faizal Fauzan [b)]

[1]*School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia*

[a)] muhammadsyafiqmohdfadli@sd.taylors.edu my
[b)] Corresponding Author: mohdfaizalfauzan@taylors.edu.my

Abstract. The study was aiming to find out the potential of applying the process of Waste to Energy in Malaysia. Incineration and Anaerobic Digestion are the two methods that is studied to assess the feasibility to be run in Malaysia. The calorific value of the waste and the amount of waste generated was sought after before the energy calculations could take place. The waste generated was found to be 33,000 tonnes/day for the whole Malaysia while only 45% of the waste, which are the food waste, can be used for AD. Incineration can make use of most of the waste to produce energy while for AD, the methane that was produced from the food waste were used for energy generation. Thus, the calorific value of waste for incineration and the amount of methane was calculated. From those calculations, the electrical energy that could be generated using the total waste produced in Malaysia using Incineration was found out to be 68 GWh while for AD was 16 GWh. The results showed good potential to apply the processes in Malaysia as these wastes can provide value when, at the moment, it is being thrown away. Comparatively, Incineration is better than AD based on this research.

Preparation of Nanocellulose via Enzymatic Extraction

Naviin Munusamy[1, a)] and Chou Pui May[2, b)]

[1, 2] *School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia*

[a)] Corresponding author: naviin.munusamy@gmail.com
[b)] PuiMay.Chou@taylors.edu.my

Abstract. The aim of this research is to extract nanocellulose from kapok husk via enzymatic hydrolysis. Enzymatic hydrolysis uses less energy for heating and mechanical fibrillation. Nanocellulose will be extracted from the kapok husk via enzymatic hydrolysis. Kapok husk were cleaned and dried before ground into powder form. Kapok husk were treated with chemical treatment using sodium chloride (NaCl) and potassium hydroxide (KOH) to remove the lignin and hemicellulose from the kapok husk. The enzymatic hydrolysis of kapok husk was carried out for 24 hrs,48hrs,72 hrs and 96 hrs. The nanocellulose was examined under FTIR spectroscopy analysis to determine its hydrogen bond and functional group. Field emission scanning electron microscope was done to study the morphology of the nanocellulose. Three samples were chosen to carry out this analysis which are enzymatic hydrolysis for 48 hrs,96 hrs and 96 hrs without pre-treatment. The nanocellulose that were extracted from this method were microcrystalline cellulose because microcrystalline cellulose has diameter and length more than 1000 nm. Pre-treatment of kapok husk produces more microcrystalline cellulose which are small and thin. Enzymatic hydrolysis for 96 hrs has the most amount of nanocellulose produced. From this study, it shows that the chemical pre-treatment enhances the enzyme accessibility to liberate the cellulose because of the removal of lignin and hemicellulose within the cellulose. Nanocellulose that were extracted were different in size due to the method and condition when carrying out the experiment.

Keywords: Nanocellulose, microcrystalline cellulose, enzymatic, hydrolysis, kapok husk,extraction

Simulation of Discomfort from Combined Noise and Vibration in Vehicle

Rony Khong[1, a)] and Ir. Mohd Farid Bin Aladdin[2, b)]

[1)]*School of Engineering, Taylor's University*
[2)]*Department of Mechanical Engineering, Taylor's University*

[a)]ronykhong77@gmail.com
[b)] Corresponding author: MohdFarid.Aladdin@taylors.edu.my

Abstract. A research was conducted to simulate the total discomfort in a vehicle cabin environment while from the effects of vibration and combined noise towards the discomfort. This was performed by placing various sensors across the seat pan, back rest and feet locations to obtain the raw noise and vibration data in three distinct Malaysian vehicles driven across multiple increasing speeds during a field test. Upon collecting the data, the stimuli (combined noise and vibration) were extracted into the MATLAB software to obtain the weighted root mean square acceleration, a_{wrms}, Vibration dose, VDV values as well as sound exposure, L_{AE} values. The simulation was further evaluated in terms of their differences with the current existing standards of ISO 2631-1:1997 and BS 6841:1987. Two separate models for predicting discomfort from combined noise and vibration established by previous research were used to develop the total discomfort across the different speeds and three separate vehicles. The results, which were verified by comparison with available experimental data, revealed that the total discomfort levels, vibration and noise magnitudes increases with the increase in vehicle speeds. Model 2 is expected to overestimate overall discomfort levels from combined noise and vibration than Model 1 as the range of stimuli of noise and vibration to develop the model is not within the range of data obtained from the current research. Finally, the evaluation with BS 6841:1987 standard slightly underestimates the total discomfort compared to ISO 2631-1:1997 due to the influence of weighting factors.

Keywords: Vibration, Discomfort, Combined Noise, ISO 2631-1, BS 6841, Vehicles

Polymer-Based Adsorbents For Dyes Removal From Aqueous Solution Using Polypyrrole-Polyethylenimine (Ppy-Pei) Composite

Said Abdallah Al-Ashkhari*, Norhabibah Mohamad

School of Engineering, Taylor's University, Taylor's Lakeside Campus, No:1 Jalan Taylor's, 47500, Subang Jaya, Selangor DH, Malaysia

*Corresponding Author: sa_alask@hotmail.com

Abstract. The textile industry requires using dyes for colouring. These dyes are complicated chemicals which upon releasing to main water stream could cause hazards to human health and environment. The removing of the dyes can be performed by several methods; however, in this study, absorbent of polypyrrole (PPy) and polyethyleneimine (PEI) were used as an absorbent to the dyes from wastewater. PPy and composites of PPy and PEI were tested by adding oxidant of anhydrous $FeCl_3$ and the two systems were tested before and after adding the dye of methyl orange at 1:1 mole ratio, and 5 hours reaction time. The available data so far is presented in this work which includes PPy and oxidant treated with methyl orange and tested before and after using FTIR and TGA. For PPy and oxidants, FTIR shows the vibrational modes of C=C (605-1000 cm^{-1}), C-O (1075-1290 cm^{-1}), and C-H (2000-210 cm^{-1}). As the solution of PPy and oxidant is treated with 10 ppm of methyl orange, extra vibrational modes were detected belong to C-Cl (894 cm^{-1}), S=O (1030 cm^{-1}), N-O (1577 cm^{-1}), and C=C=N (2000 cm^{-1}). Both systems show C≡C (2205 cm^{-1}). The TGA spectra show three stages of different rate of mass loss of the two systems appeared at 30-120 ℃, 120-270 ℃, and 270-550 ℃. the total mass loss of adsorbed nitrogen is significantly different at 2.8 mg and 1.2 mg for the same substrate after treatment with methyl orange. This means that the methyl orange was removed by approximately by the difference of the total losses of 1.6 mg. TGA results agree with the FTIR results where vibrational modes belong to methyl orange were detected on the substrate.

Keywords: Polypyrrole, Polyethylenimine, Adsorption, Dyes, Methyl Orange, Wastewater

Production and Characterization of Nanocellulose Produced from Kapok Husk via Acid Hydrolysis

Tang Mooi Lian[1, a)] Chou Pui May [1, b)] and Koay Seong Chun [1, c)]

[1] *School of Engineering, Taylor's University, Taylor's Lakeside Campus, No.1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia*

[a)] liantang09@hotmail.com
[b)] Corresponding authors: PuiMay.Chou@taylors.edu.my
[c)] SeongChun.Koay@taylors.edu.my

Abstract. Nanocellulose refers to cellulose in nanometer range has wide application due to its unique properties and can be obtained from agriculture waste. In this study, nanocellulose was extracted from kapok husk via acid hydrolysis with different hydrolysis parameters. The hydrolysis contact time and reaction temperature used in the extraction of nanocellulose were varied. The nanocellulose produced were characterized by Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA). The FTIR analysis shows that the lignin and hemicellulose were removed after the bleaching and acid hydrolysis process. TGA and DSC shows that nanocellulose produced by acid hydrolysis with higher reaction temperature and lower hydrolysis contact time tends to have better thermal stability and degree of crystallinity.

Preparation and Characterization of Corn Husk Fiber Reinforced Epoxy Composites

Tengku Maimunah Binti Tengku Iskandar[1], Koay Seong Chun[1, a)], Chou Pui May[1], Ong Thai Kiat[2], and Chan Ming Yeng[3]

[1]*School of Engineering, Faculty of Innovation and Technology, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia*
[2]*Faculty of Engineering and Technology, Tunku Abdul Rahman University College, Jalan Genting Kelang, Setapak, 53300 Kuala Lumpur, Malaysia.*
[3]*Centre of Engineering Programmes, HELP University Fraser Technology Park Campus, 3.01, Level 1-7, Kompleks Metro Pudu, 1 Jalan Metro Pudu 2, Fraser Business Park, 55200 Kuala Lumpur, Malaysia*

[a)]Corresponding author: seongchun.koay@taylors.edu.my

Abstract. Natural fiber reinforced composites are widely used in engineering applications. Corn husk is a non-fruit part of the sweet corn and it is a waste agricultural material. As the harvesting process of corn increases, the corn husk wastes also increase. In general, corn husk is rarely being used and most of it will be sent to landfills. Therefore, this study will cover the preparation and characterization of corn husk fiber reinforced epoxy composites. Corn husk fiber was extracted using water retting method for approximately 15 days at room temperature. Then the corn husk fiber underwent fiber treatment and was made into fiber mats with 15 mm fiber length using water laid method. The corn husk fiber and epoxy matrix were made into composites using resin infusion technique with fiber-to-matrix content ratio of 70/30. Treatment of fiber was implemented using 5% of sodium hydroxide (NaOH). The effects of fiber treatment on tensile, water absorption and morphological properties of corn husk fiber reinforced epoxy composites were investigated. Instron® Universal Testing Machine was used to test the tensile properties of corn husk fiber reinforced epoxy composites according to ASTM D638 standard while Scanning Electron Microscope (SEM) and Fourier-Transform Infrared Spectroscopy (FTIR) were used to investigate the morphological and chemical properties of the composites, respectively. With treatment of fiber, the tensile properties are higher than untreated composites. However, the water absorption of the composites is higher after undergoing alkali treatment.

Assessment Of Automobile Flywheel By Using Finite Element Analysis

Tham Zi Bin*, Ku Pei Xuan

School of Engineering, Taylor's University, Taylor's Lakeside Campus,
No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia

*Corresponding Author: PeiXuan.Ku@taylors.edu my

Abstract. Flywheel is a rotating mechanical device that use moment of inertial to store kinetic energy temporary and release energy when needed. For automobile application, the flywheel will temporary store the rotational energy during engine's power stroke and release when energy supply is suspending, it will reduce and smoother the angular velocity fluctuations. Other than act as a temporary energy storage system, automobile flywheel also uses to transfer rotational energy from engine to transmission gearbox by using clutch system. Purpose of this study is to understand the effect of centrifuge force, frictional force, normal force and temperature factor affect the fatigue life of automobile flywheel. With better understanding the relationship between centrifuge force, frictional force, normal force, temperature factor and fatigue life, design of flywheel can be improving to have better fatigue life. To perform this study, computer aided design (CAD) drawing of automobile flywheel will be generating by using SolidWorks and simulation will be run by using ANSYS Finite Element Analysis (FEA). To perform the simulation, boundary condition will be applied, such as frictionless support, force, rotation per minute of flywheel and temperature on flywheel. For this study, equivalent stress, total deformation and fatigue life will be record and analyses. From obtained result, the maximum von mises stress on flywheel without temperature factor is around 96 MPa, but the maximum von mises stress with temperature factor is around 2.0 GPa, which has significant increase. Through this, the effect of temperature factor on automobile flywheel is obvious and need to be concern. After analyses the data from ANSYS FEA, different variables and factor are taking into consideration to design a flywheel with better fatigue life and this will benefit all the automotive flywheel used in manual transmission. For this study, future improvement of analysing new flywheel design and testing on prototype flywheel can be done to obtain more accurate result.

Keywords: Automobile flywheel, ANSYS Finite Element Analysis, Von mises stress, Fatigue life

Effects of Two-Step Sintering on MnO_2-doped Zirconia Ceramics

Thevan Raj[1, a)] and Kelvin Chew Wai Jin[2, b)]

[1, 2] *School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia*

[a)] Corresponding author: thevan10.tr@gmail.com
[b)] KelvinWaiJin.Chew@taylors.edu my

Abstract. Zirconia has been identified as the closest ceramic related to the replacement of bone tissues in the medical field, particularly in bone and teeth replacement procedures. However, pure zirconia in its original form shows some serious limitation in terms of weak mechanical properties, thus causing failures of the implants. Conventional or single step sintering is one of the initial methods incorporated in the strengthening the mechanical properties of the zirconia ceramic. The single step sintering, although increases the density of the ceramic, it does not prevail in terms of suppressing the grain size to nanometric qualities, thus, falling out on the fracture toughness and hardness of the ceramic due to large-sized, uneven grain size obtained from the sintering method. The study on two step sintering has shown the sintering methods abilities to increase the quality and mechanical properties of the ceramic which may provide the solution in creating an improved ceramic compatible to be used in medical transplants benefitting the medical world. This study aims to display the effect of two step sintering in comparison to the single step sintering and how it affects the quality of the manganese oxide-doped zirconia ceramic in terms of mechanical properties, namely, relative density, Vickers hardness and fracture toughness. This research was conducted by mixing the powder of each sample in accordance to the content with ethanol. The powders were the pressed and cold-pressed again with a cold isostatic pressing method, CIP. The samples undergo two different type of sintering namely, single step sintering and two step sintering. In the single step sintering, the samples were heated to 1500℃ at a heating rate of 10℃ per minute from room temperature. It was then held for two hours and cooled to room temperature naturally. As for the two step sintering process, the samples were heated to 1200℃ from room temperature at a heating rate of 10℃ per minute. It was then held for 30 minutes at 1200℃ then heated once more at 10℃ per minute to 1500℃. It was held at 1500℃ for 1 hours then cooled down to room temperature. The samples underwent a grinding and polishing process post sintering. The results of the sintering process indicated that the two step sintering process produced a ceramic with higher relative density and fracture toughness but lower Vickers hardness value due to high heating rate in comparison to the single step sintering process.

Keywords: Zirconia, Y-TZP, mechanical properties, single step sintering, two step sintering, heating rate

The Effect of Glucose Concentration Sample 0 – 1.5% on the Quality Factor of Microring Resonator

C. Julian[1], L. Hasanah[1], A. Aransa[1], R. Sumantri[1], H. S. Nugroho[1], A. Aminudin[1], S. K. Sahari[2], A. B. D. Nandiyanto[3], A. R. Md. Zain[4], R. E. Pawinanto[5], and B. Mulyanti[5a)]

[1]*Department of Physics Education, Universitas Pendidikan Indonesia, Dr. Setiabudhi St. No.229, Bandung 40154*
[2]*Faculty of Engineering, Universiti Malaysia Sarawak, 94300 Samarahan, Sarawak*
[3]*Department of Chemistry Education, Universitas Pendidikan Indonesia, Dr. Setiabudhi St. No.229, Bandung 40154*
[4]*Institute of Microengineering & Nanoelectronics, Universiti Kebangsaan Malaysian, 43600 Bangi, Selangor*
[5]*Department of Electrical Engineering Education, Dr. Setiabudhi St. No.229, Bandung 40154*

[a)]bmulyanti@upi.edu

Abstract. In this work, we present a study of the effect of glucose concentration on the quality factor of the Silicon-On-Insulator (SOI) ring resonator based on the refractive index sensor made by ion exchange technique. The effect of glucose concentration on the quality factor of the microring resonator is presented. The calculation has been done using the FDTD method for glucose concentration in range 0 – 1.5% as analytes. Previous studies have shown that glucose concentration has a linear relationship with resonant wavelength and shown that quality factor would decrease by increasing the wavelength. The results show that glucose concentration affects the quality factor of the resonator microring. Increased glucose concentration causes an increase in wavelength resonance so the quality factor will be decreased.

Keywords: Microring resonator, quality factor, ion exchange, FWHM, and wavelength resonance

Adsorption Isotherm of Mesopore-free Submicron Silica Particles

R. Ragadhita[1], A.B.D. Nandiyanto[1, a)], W.C. Nugraha[2], A. Mudzakir[1], B. Mulyanti[3]

[1]*Departemen Kimia, Universitas Pendidikan Indonesia*
Jl. Dr. Setiabudhi no. 229, Bandung, 40154, Indonesia
[2]*Pusat Penelitian Kimia, Lembaga Ilmu Pengetahuan Indonesia*
Jl. Cisitu Sangkuriang, Bandung, 40135, Indonesia
[3]*Departemen Teknik Elektro, Universitas Pendidikan Indonesia*
Jl. Dr. Setiabudhi no. 229, Bandung, 40154, Indonesia

[a)]Corresponding author: nandiyanto@upi.edu

Abstract. The purpose of this study was to evaluate adsorption isotherm of mesopore-free submicron silica particles. In this study, mesopore-free submicron silica particles were prepared from acid-base extraction of rice husk ash under a surfactant-free condition. The adsorption isotherm analysis was done in the borosilicate batch reactor system under constant pH as well as room temperature and pressure. Then, the results were compared to the Langmuir and the Freudlich models. As a model of adsorbate, curcumin was used. To support the adsorption analysis, several characterizations were conducted, including electron microscope, x-ray diffraction, and Fourier transform infrared. The experimental results showed that the present mesopore-free submicron silica particles were effectively adsorbing curcumin molecules. The adsorption isotherm test showed that the equilibrium adsorption data of the present silica particles were fit to the Freundlich isotherm model, confirming the adsorption occurs on heterogeneous surfaces with multilayer adsorption. There are molecule-molecule interaction happens on the adsorption layers. Although low adsorption rate is found, which is due to the existence of mesopore-free structure on the silica adsorbent, this study gives information for the importance of a critical variable influencing the adsorption capacity.

Keywords: Silica, adsorption properties, rice husk, isotherm Langmuir and Freundlich.

Simulation Of Hemoglobin Detection Using Surface Plasmon Resonance Based On Kretschmann Configuration

R. Sumantri[1], L. Hasanah[1], A. Aransa[1], C. Julian[1], C. Wulandari[1], A. Aminudin[1], R.E. Pawinanto[2], P.S. Menon[3], S. K. Sahari[4] and B. Mulyanti[2,a)]

[1]*Departement of Physics Education, Faculty of Mathematics and Science Education, Universitas Pendidikan Indonesia, 40154, Bandung, West Java, Indonesia*
[2]*Departement of Electrical Engineering, Faculty of Engineering and Vocational Education, Universitas Pendidikan Indonesia, 40154, Bandung, West Java, Indonesia*
[3]*Institute of Microengineering and Nanoelectronics, Universiti Kebangsaan Malaysia, 43600, Bangi, Malaysia*
[4]*Faculty of Engineering, Universiti Malaysia Sarawak, Jalan Datuk Mohammad Musa, 94300, Kota Samarahan, Sarawak*

[a)]Corresponding author: bmulyanti@upi.edu

Abstract. Research on detecting hemoglobin has been carried out because many anemia sufferers in developed and developing countries. The hemoglobin concentration is not only influenced by sex, but is influenced by other factors such as age, and environmental conditions of residence. Therefore, the study of sensor that can detect hemoglobin concentrations with high sensitivity, free labels and high resolution is needed. We studied sensor simulations by varying the hemoglobin concentration using Lumerical FDTD. The simulation results show a different decrease in reflectance in each different hemoglobin concentration. Analysis of simulation results using the graph method to determine the sensitivity value. The analysis showed that the sensitivity of the hemoglobin sensor was 0.2765^{o}/dL with a large Signal to noise ratio of 0.6875, the size of the sensor resolution obtained was $0.28x10^{-3}$ and the value of Full Width at Half Maximum was 5.11^{o}. However, the obtained FWHM is still high so that further research needs to be done. Configuration and sensor material are believed to be able to improve sensor performance in measuring hemoglobin concentration. Therefore, this sensor model can be used to detect hemoglobin in the concentration range of patients with anemia.

Keyword : Surface Plasmon Resonance, Kretschmann Configuration, Hemoglobin, Biosensing, FDTD

Effect of pH Condition on the Production of Well-Dispersed Carbon Nanoparticles from Rice Husks

A. Sukmafitri[1], R. Ragadhita[1], A. B. D. Nandiyanto[1, a)], and W. C. Nugraha[2]

[1]*Departemen Kimia, Universitas Pendidikan Indonesia*
Jl. Dr. Setiabudhi no. 229, Bandung, 40154, Indonesia
[2]*Pusat Penelitian Kimia, Lembaga Ilmu Pengetahuan Indonesia*
Jl. Cisitu Sangkuriang, Bandung, 40135, Indonesia

[a)]Corresponding author: nandiyanto@upi.edu

Abstract. Researches on the preparation of carbon nanoparticles have been well-documented, however information regarding the reports on how to make them well-dispersed in a facile way is still lack. Therefore, the aim of this study was to investigate the simple method to produce well-dispersed carbon nanoparticles in the aqueous solution. In this study, carbon nanoparticles were produced using rice husk. Then, the produced carbon nanoparticles were dispersed in the aqueous solution by manipulating pH solution. To ensure the effect of pH solution on dispersing carbon, we varied pH in the range of between 2 and 12. Several characterizations were also done to confirm the successful dispersion process, including Fourier Transform Infrared Spectroscopy, X-Ray Diffraction, Electron Microscope, and Energy Dispersive Spectroscopy. The results showed that carbon nanoparticles can be produced by burning and grinding rice straw ash. And, dispersion process was successful in the certain range of pH. pH can affect the formation of well-dispersed carbon nanoparticles through the formation of OH functionalization on the surface of particle. This is confirmed by the observation that low pH can create less dispersion, whereas high pH can bring advantages in the formation of well-dispersed particles. The other possible reason is because the use of high pH can extract silica component from the rice straw ash, in which this silica can coat the carbon particle. Indeed, this covering can act as the waster dispersing agent of carbon nanoparticles. The analysis was also completed with the proposal mechanism illustration for the dispersion process. This study brings new ideas for informing a facile way in the dispersing process of carbon nanoparticles and can be used for further development in the dispersing process.

Keywords: Carbon, Well-dispersed, Nanoparticles, Rice Husks, pH.

Simulation Microring Resonator Based on Racetrack-Shaped Configuration for Glucose Sensing

A. Aransa [1], L. Hasanah[1], C. Julian[1], R. Sumantri[1], H. S. Nugroho[1], A. Aminudin[1], R. E. Pawinanto[2], A. R. Md. Zain[3], S. K. Sahari[4] and B. Mulyanti[2, b)]

[1]*Department of Physics Education, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudhi no.229, Bandung 40154, Indonesia.*
[2]*Department of Electrical Engineering Education, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudhi no.229, Bandung 40154, Indonesia*
[3]*Institue of Microengineering and Nanoelectronics, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia*
[4]*Faculty of Engineering,, Universit Malaysia Sarawak, Jalan Datuk Mohammad Musa, 94300 Kota Samarahan, Sarawak*

[a)]Corresponding author: bmulyanti@upi.edu

Abstract. The aim of our study is to increase the sensitivity of microring resonator using racetrack-shaped configuration for glucose sensing. We used glucose with various concentrations in 0-180 g/l range as analytes. Numerical mode solutions used to simulate device. We obtained the sensitivity of racetrack-shaped resonator 79,7 nm/RIU. Basic add-drop configuration was used as the comparison, the sensitivity of racetrack-shaped resonator (79,7 nm/RIU) higher than basic add-drop resonator (70,32 nm/RIU). Coupling length reduces cavity loss, so that increase the performance of microring. The racetrack-shaped resonator configuration is suitable for glucose sensing and shows better performance than basic add-drop resonator.

Keyword: Glucose, Racetrack-shaped configuration, Sensitivity

Adsorption Characteristics of Submicron Porous Carbon Particles Prepared from Rice Husk

M. Fiandini[1], R. Ragadhita[1], A. B. D. Nandiyanto[1, a)], and W. C. Nugraha[2]

[1]*Departemen Kimia, Universitas Pendidikan Indonesia*
Jl. Dr. Setiabudhi no. 229, Bandung, 40154, Indonesia
[2]*Pusat Penelitian Kimia, Lembaga Ilmu Pengetahuan Indonesia*
Jl. Cisitu Sangkuriang, Bandung, 40135, Indonesia

[a)]Corresponding author: nandiyanto@upi.edu

Abstract. This study aims to investigate adsorption properties of submicron porous carbon particles prepared from rice husk. In the experimental procedure, to produce porous carbon particles, the following steps were done: (1) washing rice husk, (2) burning rice husk through two stages of heating process at temperatures of 200 and 600°C, (3) saw-milling process of the burned rice husk to obtain submicron sized carbon particles, and (4) porous structurization by dissolving the silica component from the saw-milled product using natrium hydroxide solution. Then, to analyze the adsorption properties, the prepared porous carbon particles were put into the curcumin solution (as a model of organic molecule) under various conditions (i.e. initial amount of carbon, curcumin concentration, and adsorption time). To support the analysis, several characterizations were done, including electron microscope, Fourier transform infrared, and x-ray powder diffraction. Experimental results showed that although the prepared carbon particles were agglomerated, having sizes of about 800 nm, they were efficient for being used as an adsorbent. The analysis confirmed that the adsorption phenomena followed the Freundlich adsorption isotherm, describing the characteristics of multilayer and heterogeneous adsorption types. This is because of the existence of porous structure in the carbon adsorbent. This study demonstrates the importance of porous structures in the adsorption process, making the more adsorbate diffusion into the surface site and better adsorption efficiency.

Keywords : Porous carbon, rice husk, adsorption, and isotherm Langmuir and Freundlich

The Performance Comparison Between Commercial Automatic Voltage Stabilizer And Programmable Automatic Voltage Stabilizer

D. F. Ramadhan [1], I. Mustagisin [2], S. Sriyono[1], A.G. Abdullah [2], A. Solehudin [1], I. Hamidah [1,*)]

[1] *Dept. of Mechanical Engineering Education, Indonesian Education University, Jl. dr. Setiabudi No. 229 Bandung 40154, Indonesia*
[2] *Dept. of Electrical Engineering Education, Universitas Pendidikan Indonesia, Jl. dr. Setiabudi No. 229 Bandung 40154, Indonesia*

* Corresponding Author: idahamidah@upi.edu

Abstract. This paper compares the performance of AVS (Automatic Voltage Stabilizer) that has been on market with PAVS (Programmable Automatic Voltage Stabilizer) designed by researchers. In practical terms, the AC power used in electronic devices experiences variations over time. This can cause major damage to electronic devices. To avoid this, it is necessary to stabilize the power voltage, minimize the output wave rate. To control the entire system automatically, a microcontroller is used with several protection devices to detect error detection and implementation. The circuit in this system is simple and flexible than conventional analog control circuits. Simulations for circuits and programs have been done using the PIC IDE language. The results of the study show that PAVS is better performance and lower cost than comersial AVS

Keywords: AVS, PAVS, microcontroller, input voltage, output voltage.

Assessment of Student Competence Using Electronic Rubric

Ana A[1, a)] C Yulia[1,] Y Jubaedah[1,] M Muktiarni[2,] V Dwiyanti[2,] and A Maosul[2]

[1]*Department of Home Economics Education, Faculty of Engineering and Vocational Education, Universitas Pendidikan Indonesia, 40154, Bandung, West Java, Indonesia*
[2] *Postgraduate Vocational Education, Universitas Pendidikan Indonesia, 40154, Bandung, West Java, Indonesia*

[a)]Corresponding author: ana@upi.edu

Abstract. This study was concerned with the use of electronic rubrics in the assessment of students' competence. The fourth industrial revolution have brought with it a lot of changes on how the world operate including in the area of education. The fourth industrial era is characterized by the usage of ubiquitous information and computer technology. In systematic review, only research articles published during the period 2009 to 2018 were considered. This study focused on how to evaluate learning programs using rubrics. It specifically dwelt on how e-rubrics could be used in education to assess students' skills and performance. The study was based on the premise that electronic rubric can be used effectively as an evaluation tool in education and could help to improve the quality of the learning process and learning outcomes. The study provided a specific analysis of e-rubrics and briefly reports on the characteristics of practically using e-rubrics in the education sector, especially during the evaluation processes. Electronic rubrics produce sufficient quality information if certain conditions are met, especially when having clear and focused criteria. Evidence about the effects of using electronic rubrics on overall performance results is positive feedback.

Keyword: electronic rubric, evaluation, student competence.

Competency Based-Assessment: Implementation on Manual Polishing Practice in Housekeeping Department

Yoyoh Jubaedah, Nenden Rani Rinekasari, and Neni Rohaeni

Family Welfare Education Study Program
Universitas Pendidikan Indonesia

Abstract. This research explored whether the competency of manual polishing practice in housekeeping department was evaluated by diversity of assessment tool. The standart operating procedure is essential part of this tool. The purpose to be achieved from the study is to produce: 1) implementation competency-based assessment on manual polishing practices in housekeeping department; 2) competency achievement of manual polishing practices in housekeeping department; and 3) a quality of competency based-assessment on practices manual polishing practices in housekeeping department. To this end, a desctiptive method was conducted. Among the proces, the intern also internal and external examiners were involved as a primary data. The data were collected by interviews, observation and competency assessment. The data were analyzed both qualitatively and quantitavely depend on the data. Finding of this reserach are as follwos. First, competency based-assessment on manual polishing practices accordance with Standard Operating Procedure have three phases includes preparation, proses and result of practices. Second, the competency achievement on this practices show that most interns was declared as competent based on the result from internal and external examiners through moderation process. Finally, this assessment tool have a inter rater reliability value of alpha as 0,943, it mean this tools have a good qualities. This result can be recommended to policy makers as a decent reference implemented at briefing pre internship and at a process of industrial practices in housekeeping department in hotel.

Keywords: competency, assessment, housekeeping

Water Quality Monitoring in Citarum River (Indonesia) Using IoT (Internet of Thing)

L. Fenjano[1)], B.Mulyanti[1)], R.D.Purnomo[1,a)], A.B.Pantjawati[1)], R.E. Parwinanto[3)], and A.B.D. Nandiyanto[2)]

[1]*Education Department of Electrical Engineering, Universitas Pendidikan Indonesia, 40 154, Bandung, West Java, Indonesia*
[2]*Department of Chemistry, Universitas Pendidikan Indonesia, 40 154, Bandung, West Java, Indonesia*
[3]*Institute of Microengineering and Nanoelectronics (IMEN) Universiti Kebangsaan Malaysia (UKM) 43 600 UKM Bangi, Selangor, Malaysia*

[a)]Corresponding author: *rizkipurnomo@student.upi.edu*

Abstract. This study aims to design an IoT system to obtain the data of Citarum River water quality real time and analyze the water quality based on the World Health Organization (WHO) standard. The two-point locations around the factory sewer passed by Citarum River were monitored using the Internet of Things (IoT) system. The IoT system for water quality monitoring was integrated with pH, turbidity, and TDS sensors. The results show that before the factory sewer, the average value of pH, turbidity, and total dissolved solids (TDS) are 5.281, 1118.768 NTU and 134.44 ppm for pH, respectively. While after the factory sewer locations, the average values were obtained of 2.435, 900.65, and 247.625 for pH, turbidity, and TDS, respectively. It can be concluded that the IoT system can be used to monitor the water quality in the Citarum River and also integrated with real-time monitoring. Although the TDS was found lower than standards, the water quality in Citarum River has not met the standard clean water before as well as after factory sewer location.

Keywords. water quality, Citarum River, Internet of Things (IoT), Total dissolved solids (TDS), pH, Turbidity

Design and Fabrication of Fiber Optic Chemical Sensors (FOCS) System for Salinity Detection of NaCl Solutions

E. Rifaldi[1) a),] B. Mulyanti[1),] G. Sugandi [2),] A. B. Pantjawati[1),] L. Hasanah[3),] R. E. Pawinanto[1),] and A. B. D. Nandiyanto[4).]

[1]*Department of Electrical Engineering Education, Faculty of Engineering and Vocational Education, Universitas Pendidikan Indonesia, 40154, Bandung, West Java, Indonesia*
[2] *Research Centre of Electronics and Telecommunication, Lembaga Ilmu Pengetahuan Indonesia (LIPI), 12710, Jakarta, Indonesia*
[3]*Department of Physics Education, Faculty of Mathematics and Sciences Education, Universitas Pendidikan Indonesia, 40154, Bandung, West Java, Indonesia*
[4] *Department of Chemistry Education, Faculty of Mathematics and Sciences Education, Universitas Pendidikan Indonesia, 40154, Bandung, West Java, Indonesia*

[a)]Corresponding author: eris111213@student.upi.edu

Abstract. The research aims to design and fabricate fiber optic chemical sensor (FOCS) system which can be used to detect the salinity concentration of NaCl solution. The system can transmit data signals from the transmitter to the receiver using LED of the SFH 756 and SFH 250 as transmitter and receiver, respectively. The signal can be sent via optical fiber cable intermediary that has been made into a sensor by removing the cladding of the fiber optic cable. and utilized the influence of placing the liquid on top of the sensor, so that a signal change appears as a result of the liquid. The results of measurements depend on the concentration of salinity placed on the sensor of the fiber optic cable. The signal transmitted can be detected using an optical power meter. The value of each intensity received by an optical power meter depends on the salinity concentration of the NaCl solution. The higher the salinity in the NaCl solution the higher the intensity received, with the rate of increase in the salinity of a substance proportional to the rate of intensity of the light sent by the sensor. According to linear regression the graph can be made as equation and the results $Y = 30.7012083 + 0.010275X$ with X is the salinity of NaCl and Y is the intensity in dB.

Keyword: Fiber Optic Chemical Sensor, Salinity, NaCl solution

Speed Adjustment Simulation Using Voltage Divider Circuit

I. Mustagisin[1], D. F. Ramadhan[2], Sriyono[2], A. G. Abdullah[1], A. Solehudin[2] and I. Hamidah[2, a)]

[1]*Departemen Pendidikan Teknik Elektro, Universitas Pendidikan Indonesia*
Jl. Dr. Setiabudi No. 229 Bandung, 40154, Indonesia
[2]*Departemen Pendidikan Teknik Mesin, Universitas Pendidikan Indonesia*
Jl. Dr. Setiabudi No. 229 Bandung, 40154, Indonesia

[a)] Corresponding author: idahamidah@upi.edu

Abstract. The purpose of this study is to make a motor speed control circuit using a voltage regulator circuit. Making this series follows several steps as follows: (1) making a voltage regulator circuit using the gating block in the PSIM application (2) giving a load to the resistor voltage regulator circuit to analyze the output voltage generated (3) the voltage regulator circuit connected to the motor so that it can analyze motor speed. From the experiments that have been done, the increasing limiting angle given to the gating block will make the motor rotation decrease. Motor speed reduction results in a significant and less significant decrease in speed. this is caused by the gating block which limits the voltage out of the circuit. So that from this experiment it can be implemented into a simple circuit in regulating load speed.

Keywords: Induction motor, Voltage limiting, Gating block.

Teaching Basic Mathematics and Technology to Elementary Student

Dyah Triwahyuningtyas[1)], Muhammad Nur Hudha[1a)], Tyas Diyah Ayuning [2)], Isma Widiaty [3)], Asep Bayu Nandiyanto [3)] and Ida Hamidah [3)]

[1]*Kanjuruhan Malang, Jl.S . Supriadi No.48, Bandungrejosari, Sukun, Malang, East Java 65148, Indonesia.*
[2]*Muhammadiyah 9 Elementary School, Malang, Indonesia.*
[3]*Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi no 229, Bandung 40154, Indonesia.*

[a)]Corresponding author: muhammadnurhudha@unikama.ac.id

Abstract. This study aims to describe mathematics fraction learning for autistic children in the elementary school environment. The research participation was four fourth grade students of SD Muhammadiyah 9 Malang with autistic type, mentally disabled and slow leaner. The research instrument was in the form of IQ test results of students and pretest students to find out the students' initial abilities and interviews with teachers. This study resulted in a conclusion that fraction learning concepts could be taught for autistic children in class 4. This study produced a finding that learning basic mathematical concepts (fractions) could be taught for autistic children with the help of media and IT devices. This really helps students to think quickly.

Establishment of Biological Nitrogen Removal Process for Drinking Water Treatment in Malaysia

E.C. Wong[1], Y.H. Ong[1,a)] and Y.S. Ng[1]

[1]*Department of Chemical Engineering, Lee Kong Chian Faculty of Engineering and Science, Universiti Tunku Abdul Rahman, 43000 Kajang, Selangor D.E, Malaysia.*

[a)]Corresponding author: ongyingh@utar.edu.my

Abstract. Eutrophication arises from human activities has been recognized globally as an environmental issue. Human activities have greatly increased the input of phosphorus and nitrogen, the culprit of eutrophication, into the water bodies which place a heavy pressure on clean water resources. There are limitations in the conventional water treatment processes, where phosphorus and nitrogen could not be removed effectively. For nitrogen removal, biological method emerges as a sustainable and economically feasible alternative in recent years. Though the biological nitrogen removal method is widely recognized in developed countries, knowledge and expertise on the application of this treatment process is relatively limited in developing countries, so as Malaysia. Thus, this research aims to provide a fundamental knowledge on the establishment of the BNR process for water treatment in the local context. A lab scale SBR seeded with fish pond sludge and activated sludge in the volume ratio of 1:1 was operated for BNR process. The development of BNR characteristics were monitored throughout four weeks. After four weeks of reactor operation, characteristic of simultaneous nitrification-denitrification was observed. The removal of TN was found exceeding 60% and little NO_3^--N concentration was observed at the end of the acclimatization period. The nitrification was noticed in the process as the decrease in NH_4^+-N concentration throughout the period while decrease NO_3^--N concentration from 1st to 3rd week indicated denitrification was occurred in the system along with nitrification. Besides, the reduction in PO_4^{3-}-P concentration in a BNR system has indicated the process was able to perform nitrogen and phosphorus removal simultaneously as well. These findings suggest that the establishment of BNR is feasible to be implemented in Malaysia.

Keywords: Biological nitrogen removal, Nitrification, Denitrification, Activated sludge

Performance analysis of stand-alone triple effect single basin solar still with evacuated tubes

[1]Hitesh Panchal, [2]Nishant Thakar, [1]Patel Kush, [1]Patel Saurin, [1]Patel Uday, [1]patel Valmik

[1]Mechanical Engineering Department, Government Engineering College patan, Gujarat, India

[2]Mechanical Engineering Department, Satsangi Saketdham Ram ashram predit Group of Institutions, Gujarat, India

Corresponding Author email address : Engineerhitesh2000@gmail.com

Abstract. Drinkable water is a basic requirement for humanity, and the raise in human population growth has lead to water pollution to the river and underground water reservoirs. To fulfill the need of potable water, researchers was developed so many technologies to complete this target. Solar distillation is the simple and cost effective technology for changing of contaminated water to potable water. In this research paper, attempts are made to make a triple basin solar still. Evacuated tubes are used to increase the distilled output. Several experiments have been done in the various climatic conditions in Gujarat. Here, the two weather conditions was used to determine the efficiency of triple basin solar still with evacuated tubes.

Keywords: evacuated tube collector; yield; enhancement; multi-basin; fresh water; economic analysis

Internal cathodic protection for above ground storage tank using sacrificial anodes

Muhammad N. Jawad, Ghafour Amouzad Mahdiraji*, Mohammad Taghi Hajibeigy

School of Engineering, Taylor's University, 47500, Subang Jaya, Selangor, Malaysia

*Email: ghafouram@gmail.com

Abstract. The purpose of the study is to propose a new method that can allow controlling the current of the sacrificial anode and the potential of metallic structures. The main issue in conventional sacrificial anode system is the high current that is delivered by the sacrificial anode causing overprotection, coating defect and short lifetime of the CP system. A proposed cathodic protection (CP) system for internal shell and tank bottom composed of controlled high potential magnesium anodes. The experiments were conducted in saline water at specific TDS of 5661ppm. The result of the internal system shows that the sacrificial anode lifetime can be extended about 35.55 times compared to the conventional SA systems. The expected anode lifetime has been prolonged and higher anode efficiency of magnesium anode was achieved.

Keywords: Corrosion, Corrosion control system, Cathodic protection, Anode current control, Petroleum tank, Sacrificial anodes.