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BOOK OF ABSTRACTS

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ADVANCES AND TECHNOLOGICAL INNOVATIONS IN NATION BUILDING AND ATTAINMENT OF SUSTAINABLE DEVELOPMENT GOALS

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Paper 13 - Application of Smoothing Techniques in Stream Flow Prediction of Semi-Arid Region: A Case of Hadejia River, Nigeria.

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ABSTRACT
This paper assessed the prediction capability of time series smoothing techniques in predicting the stream flow of Hadejia River. Four smoothing techniques were employed for the analysis of 36 years monthly stream flow data (1965 – 2000). The techniques are Moving Average (MAS), Holt and Winters (HWS), Simple Exponential (SES), and Fourier (FS) methods. The performance evaluation parameters used in assessing the suitability of the techniques were mean squared error (MSE), root mean squared error (RMSE), mean absolute percentage error (MAPE), coefficient of determination (R^2), and Nash-Sutcliff Coefficient of Efficiency (NSE). The predicting capability of stream flow using MAS, HWS, and SES was found to be inadequate (MSE, RMSE, MAPE, R^2, and NSE values are out of range) whereas the FS technique was found to be suitable. Aside the month of June where R^2 and NSE were 0.43, all other model's parameters of FS are good. The MSE was found to vary between 3.92 and 247.10, RMSE between 1.98 and 15.72, MAPE between 13.51 and 546.06, R^2 between 0.434 and 0.923, and NSE between 0.430 and 0.923. The study concludes that Fourier smoothing technique is the most suitable for predicting the stream flow of the study area among all the techniques assessed.

***KEYWORDS*:** Nash-Sutcliff, River, Smoothing, Stream flow, and Root Mean Squared Error

Paper 14 - A Space Vector Pulse Width Modulated Three Phase Inverter for An Improved Solid-State Transformer Design

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ABSTRACT
A Space Vector Pulse Width Modulation (SVPWM) technique is used for the implementation of a three phase DC-AC Voltage Source Converter (VSC). The VSC is used in design of an improved Solid-State Transformer (SST). Consequently, this paper discusses concept and operation of SVPWM as well as implementation of the technique to achieve a desired objective. VSC has been used to enable supply of variable voltages and frequency to AC drives and other areas of applications in the electric network. Several forms Pulse Width Modulation (PWM) Techniques to obtain variable voltage and frequency exist. Two of these PWM techniques are commonly used in the implementation of the VSC: SVPWM and Carrier-based PWM. Trend of use of SVPWM in the design of VSC is on increase due to its better utilization of DC bus and easier digital realization. Therefore, in this paper concept and implementation of SVPWM for VSC have been elucidated with the aid of MATLAB/Simulink environment. An LCL filter has been used in the design with the view to further mitigate harmonics. Performance of the VSC is evaluated in terms of Total Harmonic Distortion (THD).

KEYWORDS: THD, SST SVPWM, VSC, LCL filter

Paper 15 - Review of Geothermal Electricity Generation And Its Environmental Imparts In Nigeria

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ABSTRACT
This paper discusses the technologies involve in generating electricity through geothermal and its environmental impacts. The inability of the federal government of Nigeria to maintain steady power supply for the populace has necessitated the need to research in to alternative sources of power supply. The focus of this work is on geothermal energy as one of the renewable energy sources. In this work, the technology of geothermal was analyzed. The details of how electricity can be generated from geothermal technology were explained. A review of recent previous works by others researchers and the major components of geothermal energy system were discussed. Effort was made in this report to discuss the classifications of geothermal energy and the merits of using geothermal as source of electricity generation. The environmental impacts of using geothermal technology to generate electricity were also highlighted. The geological features and subsurface temperature data of oil and shallow water wells from both Northern and Southern part of this country shows the possible presence of geothermal energy due to the thermal gradient. If tapped, this will serve as alternative energy, as being utilized by several other countries since it can produce base load electricity which is reliable and sustainable unlike many other renewable energy sources that are affected by weather and seasonal variations.

KEYWORDS: geothermal energy, renewable energy, electricity generation, alternative energy and environmental Impacts

Paper 17 - Modelling Internet of Things Architecture for Accident Detection and Reporting for Emergency Medical Assistance

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ABSTRACT
This research work focused on accident detection system for emergency medical aid; the study identifies the society's slow response to medical emergencies as a major problem. In order to enhance and maximize the anticipated reaction time, this system aims to provide an early detection of accidents and transmit the information promptly to the emergency unit. The study was carried out in Benin city, Nigeria utilizing a test bed methodology that included a wireless embedded system, a cloud platform, and several electronic sensors and modules, including a Global system for mobile communications (GSM) module (SIM800l), a Global positioning system (GPS) module (NEO-6M), an accelerometer (ADX335), a shock sensor, an Atmega328p microcontroller, etc. The developed device was connected to the cloud platform via GSM module, which also served as the device's GPS receiver and shock sensor. The accelerometer and shock sensor were utilized to identify crashes. The detection rate provided by the created accident detection algorithm served as the metric for the system's accuracy. The response time ranges between 9 and 12 seconds was obtained as time taken to identify the accident and alert the closest hospital. This verifies the systems' degree of accuracy when used in real-time.

KEYWORDS: Cloud Platform, database, internet of things, web application, wireless system.

Paper 18 - Influence of Stator Slot Number on The Performance of An Electrical Machine

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ABSTRACT
The influence of stator slot number on the performance of a given double stator permanent magnet machine would be investigated in this study. The considered permanent magnet (PM) machines are classified as: Type I and Type II, having 6 stator slots and 12 stator slots, respectively. Finite element analysis (FEA) is adopted in the result estimations. It is observed that an increase in the number of stator slots would result to enhanced machine performances such as: higher induced voltage and torque outputs. Torque pulsations in the machine are significantly reduced by doubling the slot number; this reduction is in the ratio of 6:1, for the Type I and Type II machines. Nevertheless, Type I machine has higher machine efficiency at low operating speed than its Type II counterpart. Additionally, Type I machine exhibits superior speed range than Type II machine. The investigated machine types would be suitable in low speed direct-drive applications. By doubling the slot number of the analyzed machine from six (6) to twelve (12), its output torque and induced-voltage increased by 34.5 % and 31.7 %, respectively, at rated speed and load conditions. Consequently, output power of the machine also increased by 36.4 %.

KEYWORDS: Concentrated windings, Double stator, Efficiency, Loss, Slot number, Torque.

Paper 19 - Evaluation of the thermal environments of two single-span triple-layered greenhouses equipped with circular and horizontal airflow fans

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ABSTRACT
The microclimate of indoor production systems is highly dependent on the macroclimate of the ambient. As a result, the microclimate fluctuates with time with respect to the macroclimate and eventually making it have higher measurable climate parameters than the macroclimate. This study was carried out at Sangju Smart Farm Innovation Valley, Sangju-si to compare and analyse changes in the thermal environment in two adjacent single-span tunnel greenhouses covered with two layers of polyethylene films (200 μm thick) and a layer of thermal curtain (3.5 mm thick). While one greenhouse was equipped with five circular airflow fans (HUMITEM-GH), the other had five horizontal airflow fans (Conv-GH). The *Seolhyang* variety of strawberries was used as the test crop. The greenhouse temperature (T_a), relative humidity (RH), vapour pressure difference (VPD), solar radiation (SR), and carbon dioxide (CO_2) data were collected using standard methods and data was analysed using MINITAB software. The statistical tools used for data analysis were descriptive statistics, analysis of variance (ANOVA), and t-Test. The total yield and marketable yield in the HUMITEM-GH was higher than the Conv-GH by 116.33 kg and 97.69 kg, respectively. There were significant differences between the two greenhouses microclimate both in the daytime and night-time with the HUMITEM-GH having higher and near-optimal climate parameters. This result has shown that the newly developed HUMITEM air circulation fan has a superior air circulation and flow capability than the conventional air circulation fans. This information may be of interest to farmers, horticulturists, and researchers who are involved in protected vegetable production.

Keywords: CAF; HAF; HUMITEM; air-circulation; distribution; airflow

Paper 21 - High-Performance Concrete Incorporating Almond Leave Ash as Supplementary Cementing Material

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ABSTRACT
More strength and durability are possible with High-Performance Concrete (HPC) than with regular concrete. Almond leaves frequently clog areas where they are planted and have no recognized commercial value. In this research, Almond Leaf Ash (ALA) was included in HPC in percentages ranging from 0 to 20% as a cement additive. Concrete samples, with a designed minimum strength of 50 N/mm^2 were cast and cured in water for a maximum of 56 days. Using compacting factor and slump, the workability of the fresh concrete was evaluated. The density, compressive and split tensile strengths, and internal microstructure of the hardened concrete were evaluated. The workability tests revealed that the concrete stiffened as the proportion of ALA increased. Including 5% of the ALA in HPC resulted in higher strength of 56.56 N/mm^2 at 56 days of curing which is higher than the designed strength while 10% of the ALA reached the intended minimum strength of 50 N/mm^2. 15% and 20% of the ALA, however, fell short of the minimum strength. The HPC's split tensile strength followed the same pattern. The microstructure of the HPC supported these findings. As a result, using 5% ALA as a cement replacement produced an optimal strength.

KEYWORDS: Almond Leave Ash, Compressive strength, High-Performance Concrete, Split tensile strength

Paper 23 - Modification of Some Quality Attributes of Brown Rice-Bambara Nuts-Pineapple Peels Extruded Snacks Through Extrusion Conditions

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ABSTRACT
This study aimed to create ready-to-eat extruded snacks using underutilized broken brown rice flour, Bambara nuts flour, and pineapple peel powder as primary ingredients in a 50:45:5 ratio. The effects of extrusion exit temperature, feed moisture content, and barrel screw speed on protein, total phenolic content, 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity, and vitamin C were assessed and modelled using polynomial regression. The Pareto chart showed that protein and vitamin C were significantly influenced by the quadratic effect of barrel screw speed, while total phenolic content was significantly influenced by barrel screw speed, and DPPH radical scavenging activity was significantly influenced by extrusion exit temperature. The extruded snacks had protein content ranging from 12.87 to 16.36%, total phenolic content ranging from 14.17 to 18.02 mg GAE/g, DPPH radical scavenging ranging from 14.57 to 16.25%, and vitamin C ranging from 12.05 to 14.25 mg/100g. The developed regression model predicted the quality attributes well, with a coefficient of determination ranging between 0.99 and 1. The optimum extrusion conditions for maximizing quality attributes differed, and the development of extruded snacks from brown rice, pineapple peels, and Bambara nuts would promote sustainable food production and reduce food waste.

KEYWORDS: Bambara nuts, Pineapple peels, Brown rice, Extrusion, Ready-to-eat extruded snacks

Paper 24 - Application of Modified Hollow PVDF-Membrane System for Remediating Palm Oil Mill Effluent

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ABSTRACT
The objective of this work was to introduce advanced wastewater treatment technology, which is co-polymerized polyvinyl difluoride (PVDF)-polyethylene glycol (PEG) membrane system for anaerobically-pretreated palm oil mill effluent (POME) treatment. The co-polymerized hollow fibre membranes were fabricated using a wet spinning technique and then used to remediate POME as the feedstock. The physicochemical properties of the POME were analyzed before and after treatment with the hollow fibre. The analyzed parameters included chemical oxygen demand (COD), colour, total suspended solids (TSS), turbidity (TDS), and total nitrogen (TN). A preliminary test was carried out using distilled water before continuing with POME as a feed solution. The average permeate flux obtained by the PVDF-PEG membrane was 70 L/m^2.hr with a slight flux decline that is probably due to the attachment of foulants compounds on the membrane surface and pores. The synthesized modified membrane was reduced the COD, colour, TSS, TDS and TN by 92.1, 86, 97.89, 99.98 and 80.26 %, respectively. In conclusion, it can be said that the modified PVDF-PEG membrane demonstrated excellent performance in treating the POME to produce a permeate with better qualities.

KEYWORDS: Nano-MgO, PVDF-PEG Membrane, POME, Filtration, Contaminants Removal

Paper 25 - Leachate as A Powerful Precursor for Hydrogen Synthesis: Process Optimization

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ABSTRACT
Renewable energy is getting more concerned nowadays due to the depleting of non-renewable fossil fuels and its effects on global warming issues thus trigger the intense research in finding better alternative energy with low emission. The present work aims to study the potential of hydrogen gas production (for renewable energy) by electrocoagulation process from landfill leachate. The central composite design from response surface methodology (RSM) software was implemented to investigate the process variables in the hydrogen production system. The effects of three independent variables; namely pH (4-8) and voltage (3-9V), using different types of electrodes (Al, Fe, and Ni) were studied. At optimal condition of voltage 9V and initial pH 6 at 20 minutes, the Al electrode recorded an upturn maximum H2 yield of 697 ppm, while 554 and 551 ppm were obtained with Ni and Fe electrode, respectively. More so, a good correlation between the actual and the predicted data was observed as elucidated by the coefficient of determination (R^2).

KEYWORDS: H_2 Production, Electrocoagulation, CCD Response Surface Methodology, Electrodes

Paper 26 - Phytoremediation of Lead-Polluted Dumpsite Soils Using a Novel Hyper-Accumulant in Combination with A Biodegradable Chelating Agent

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ABSTRACT
The effects of toxic substances including heavy metals (HMs) in the human environment have become a significant source of worry for man's well-being and his dwellings**.** This work focused on the containment of HMs pollution in dumpsite soils through phytoremediation using Stinging Nettle (*Urtica dioica)* as macrophyte. The effects of macrophyte density (1 – 3 Plants/m^2) and bio-degradable chelating agent (Citric acid) concentration (3 – 9 mmol/kg) on the phyto-extraction efficiency of Pb was considered in the current work. In this vein, soil trials were taken from a municipal dumpsite (depth 0 – 20 cm) in Makurdi, North-Central Nigeria which was already found to contain elevated Pb concentrations (106.20 mg/kg) for the phytoremediation experiments. Control pots that received same treatment without the addition of citric acid were also set up and monitored for comparisons. The Bio-concentration factor for Pb was less than unity (BCF < 1), while the translocation factor was greater than one (TF > 1) at all macrophyte densities with the maximum occurring at macrophyte density of 3 plants/m^2. Overall, uptake of Pb by *Urtica dioica* increased with increment in the macrophyte density and at moderate lime concentration (6 mmol/kg).
Thus, *Urtica dioica* is an efficient natural hyper-accumulant for Pb pollution control in tropical soils.

KEYWORDS: Chelating agent, Dumpsites, Heavy metals, Soil, Phytoremediation, Stinging Nettle.

Paper 27 - Comparative Study Of Biological Degradation Of Crystal Violet By Microbial Mixed Cultures From Cow Dung And Soil

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ABSTRACT
The removal of dyes such as crystal violet (CV) from effluents is a major concern worldwide due to their toxic and carcinogenic nature. Recently, biodegradation through microorganisms has emerged as a potential method for eliminating these pollutants. This study was carried out to investigate the extent and the kinetic parameters of biological degradation of crystal violet by mixed-microbial cultures from cow dung and soil. A solution containing 100 mg/l of CV was prepared and added to a reactor inoculated with cow dung and another with soil. The reactors were stirred continuously for 300 mins with concentration of CV measured every 15 mins. For 1 g/l initial inoculum size, 92% and 75 % of CV degradation was achieved with cow dung and soil respectively. Adsorption test showed both cow dung and soil have negligible adsorption capacities. Kinetic parameters like maximum growth rate (μ_{max}) and half-saturation constant (K_s) were estimated to be 2.65 day^{-1} and 0.45 g/l for cow dung. However, 0.82 $day^{-1}$and 1.33 g/l as μ_{max} and K_s for soil were estimated respectively. These results showed mixed microbial cultures from cow dung and soil can effectively degrade CV. It also suggests that cow dung is a more efficient inoculum than soil in degrading CV.

KEYWORDS: Crystal Violet, biodegradation, kinetic parameters, microorganisms, cow dung, soil

Paper 28 - Mathematical Model for the Prediction of the Transport and Fate of Oil Spill

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ABSTRACT
The Mathematical Model (MT) was used to identify and predict Oil Spill (OS) movement. The MT was developed based on the solution governing the partial differential equations of flow to simulate the processes of spreading and advection of oil slick on the surface and the Oil Droplet concentration distribution in the H_2O column, respectively. The oil movement (OM) was estimated by the vector sum of the wind drift, the surface current, spreading and diffusion. The transport of the oil phases in the water (H_2O) column was computed using the advection–diffusion equation. The variables determined were: oil spread rate on the H_2O surface, concentration of oil per area of spread in the H_20 column, concentration of oil per time in the H_2O column and spreading area per time. The kinetic models were developed to determine the rate of OM on the H_2O surface and column. The result obtained indicated that the concentration of the OS on H_2O surface per surface area of spread decreases as the surface area increases while the concentration of the OS decreases with time. The concentration of the OS per unit area at an area of 100m^2 reduced from 0.06432 to 0.01114 kg/ m^3 at 200 m^2.

KEYWORDS: Oil spill, Wind speed, Oil slick, Time, Water column

Paper 29 - Achieving Quality of Experience in Telecommunication Service

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ABSTRACT
This paper presents a perspective view into network performance achievement via quality of experience (QoE) improvement of telecommunication service in Nigeria. Monitoring the Quality of experience undergone by mobile network operators (MNO) has become paramount for policy makers who need to ensure high quality levels to limit customer annoyance due to quality dissatisfaction. The components of QoE and mechanisms of analyzing and evaluating them are discussed. The paper also identifies the important key performance indicators (KPIs) for QoE achievement. Telecom operators have recently faced the need for a crucial change from technical quality requirements to user experience guarantees. An abstract framework for achieving end-to-end QoE provisioning is proposed and described in detail in terms of its design, its constituents and their interactions, as well as the key implementation challenges. An evaluation study serves as a proof of concept for this framework, and demonstrates the potential benefits of implementing such a quality management scheme on top of current or future generations of mobile cellular networks. The paper is concluded with recommendations on how to achieve and improve the QoE in telecommunication service of the country.

KEYWORDS – Quality of Experience (QoE), key performance indicator (KPI), Mobile network operator (MNO).

Paper 31 - Development of Two-Level Control Techniques for Load Frequency Control in Islanded Two-Area Multisource Microgrid

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ABSTRACT
Microgrid (MG) development has contributed to widespread connections among distributed generation (DG) units. In this paper, a developed two-area MG system comprises different micro sources. The dynamic nature of various renewable energy resources (RESs) wind power fluctuations, and changes in applied load are the significant challenges faced in an islanded microgrid (IMG) frequency control. With respect to this, two-level control technique-based load frequency control (LFC) was developed. The aim is to develop a control scheme that maintains zero steady-state errors for deviation in frequency and inter-area power flow within the acceptable limits in two-area IMG. The developed LFC was implemented using a PI controller at a lower level and a PID controller at a high level. Each controller measures and solve the integral of time multiplied absolute error (ITAE) to compute the optimal gain of the PI controller using the quasi-opposition Jaya algorithm (QOJAYA). At the same time, the PID coordinates the activities of the two-area and provides reference signals to the lower-level controllers. The feasibility of the developed scheme was verified through time-based simulations in MATLAB/Simulink environment. Its performances were compared with the Improved Salp Swarm Algorithm Type II fuzzy PID control scheme using settling time and maximum deviation as performance metrics.

KEYWORDS: Islanded microgrid, Microgrid, Load frequency control, Renewable energy Resources,

Paper 32 - Development of Hybrid Scheme to Improve Transient Stability and Fault Ride-Through Capability of Doubly Fed Induction Generator-Based Wind Turbine System Under Fault Conditions

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ABSTRACT
The rapid growth in the wind power market among other Renewable energy sources (RES) is attracting the attention of scientists and researchers because the integration of Wind Turbine Systems (WTs) with the grid to complement the conventional sources in meeting up with global electrical energy demand is becoming a challenging task. The Doubly Fed Induction Generator (DFIG) has become very popular due to its low converter rating and flexible control of its active and reactive power, higher power quality, and better dynamic performance. Consequently, protecting the DFIG-based WTs from grid faults turn out to be indispensable. In this study, a 2 MW grid-connected DFIG-based WT model with a Hybrid scheme for Fault Ride-Through (FRT) capability and stability improvement was developed. The design and simulation were performed in MATLAB/Simulink (R2019b) software. The test system was subjected to disturbances leading to High Voltage Ride – Through (HVRT) by applying three–phase balanced fault without any compensation device than with conventional R-type SSFCL and finally with the Hybrid scheme. The performance of the Hybrid scheme shows fault current limitation and voltage compensation improvement over the R-type SSFCL. The THD of supply voltages with the Hybrid scheme is lower than 5%. This indicates that the Hybrid scheme complied with IEEE519 for harmonics content in power supplies.
KEYWORDS: DFIG, DC Chopper, Energy Storage, Fault current limiter (FCL), Fault Ride-Through, R-type SFCL,

Paper 33 - Effects of Process Parameters on Oil and Biodiesel Yield from Sandbox (*Hura Crepitans*) Seed

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ABSTRACT
Multiple applications of vegetable oil for food, industrial applications and biodiesel production have necessitated the need to boost product yield. Process factors that influences oil and biodiesel yield were investigated. Factors studies for oil extraction were moisture content (%wb), roasting temperature (°C), roasting time (min), extraction temperature (°C) and time (min). Reaction time (min), reaction temperature (°C), catalyst concentration (%wt) and molar ratio were investigated for biodiesel yield. Central composite rotatable design of response surface methodology experimental design was used for the study. Results obtained were analysed at ($p =\leq 0.05$). The oil yield from the sandbox seed ranged from 20.9-53.6%. The maximum oil yield of 53.6% was obtained at the processing conditions of 10.0%wb moisture content, 95 °C roasting temperature, 15 min roasting time, 65 °C extraction temperature and 90 min extraction time. The biodiesel yield ranged from 80.00-96.12%. The maximum biodiesel of 96.12% was extracted at 72.0 min reaction time, 50.0 °C reaction temperature, 0.9%wt catalyst concentration and 1:6 molar ratio. Mathematical models to predict sandbox seed oil and biodiesel yields at varying process conditions were developed. Coefficient of determination (R^2) relating the oil extraction and biodiesel production were 0.81 and 0.74, respectively. The results from the study provide data for equipment and process designs for oil extraction and biodiesel production from sandbox and other oilseeds.

KEYWORDS: *Hura crepitans*, Oil extraction, oil yield, biodiesel production, biodiesel yield.

Paper 34 - Assessing the Feasibility of Exploiting Hydropower Resources of Underutilized Water Dam

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ABSTRACT

Nigeria's power sector faces significant challenges, with limited electricity access being a primary concern for stakeholders. Almost half of Nigeria's population has no access to electricity supply, notwithstanding the number of untapped energy sources in the country. However, integrating mini or micro hydropower plants into existing and underutilized water dams could help mitigate these challenges. This study evaluates the hydropower potential of the underutilized Eruwa (Opeki) dam to a 1MW mini hydropower plant. The Eruwa (Opeki) dam is a part of the Eruwa water scheme located at Eruwa a town in Oyo state, South West Nigeria. The methods adopted for the research are physical site inspection, data collection, engineering designs, and hydropower simulation. A 706.32kW theoretical power was achieved from the design with an annual energy generation of 4292.89MWh and projected investment and operation/maintenance cost ₦441,000,000 and ₦13,230,000/annum respectively. Annual revenue projection is ₦283,502,455.60, using the present electricity tariff of ₦66.04/kWh. The integration of mini hydropower plants into existing water schemes could increase electricity generation from renewable sources, reduce carbon footprint, and increase revenue for the scheme to prevent underfunding and facilities degradation.

KEYWORDS: Hydroelectric power, Renewable energy, Power generation capacity, Energy access, Energy economics, Dam infrastructure.

Paper 35 – Impact of Thermo-Fluid Modeling and Simulation for A Two-Spool Turboshaft Gas Turbine Configuration

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ABSTRACT
Gas turbines built in the tropics for power generation are made for other climate regions, thus their performance tends to be affected. This research aim to present the impact of thermo-fluid modeling for gas turbines on performance simulations of a two-spool turboshaft power generating gas turbine configuration. The variation of operating conditions (compression ratio, turbine inlet temperature (TIT), and ambient temperature) on the performance of gas turbine (thermal efficiency, shaft power delivered, specific fuel consumption (SFC), heat rate (HR) and fuel flow (FF)) were investigated. The analysis of the cycle has been carried out using GASTURB 14. The off-design simulation is carried out for ambient temperature between 288K to 318K and TIT between 1400K to 1600K. As the ambient temperature increases for a given TIT, the thermal efficiency, shaft power delivered, and FF decrease while the SFC and HR increase; this is due to decrease in mass flow rate to the compressor as a result of lower air density and a higher compressor work. There is a loss of 4.3% in thermal efficiency at TIT 1400K as ambient temperature increases from 288K to 318K, this loss decreases to 1.3% at TIT 1600K, which reveals that, as TIT increases percentage loss in thermal efficiency decreases on increasing ambient temperature. In addition to this, it was observed that there is increase of 0.05kg/kwh in SFC at TIT 1400K when ambient temperature rises from 288K to 318K which in turn decreases to 0.01kg/kwh. As the TIT increases for a given compression ratio (design point) or an ambient temperature (off-design point), the thermal efficiency, shaft power delivered and FF increase while SFC and HR decrease. The simulation results obtained were validated using industry data and those obtained from other experimental methods and it showed acceptable agreement.

KEYWORDS: Ambient temperature, compression ratio, design and off-design point, turbine inlet temperature.

Paper 36 - Flood Frequency Analysis of River Niger at Lokoja Gauge Station: A Morphodynamic Approach.

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ABSTRACT
Flood frequency analysis is used by water resources professionals to estimate the probability of exceedance associated with a flood of a given magnitude. The estimation of flood frequencies is important because they are used for the planning and design of hydraulic structures. This study was carried out to understand the flood-generating processes and establish the reliability of different probability distribution models in predicting the bank-full discharge for selected return periods based on the available hydrometric dataset. The designed bank-full discharge and experimental results of the sampled bed materials at different chainages along the river reach being used to characterize the river bed materials by comparing Eugelund & Hansen method, and Meyer-Peter & Muller method with their established criteria and finally obtain the sediment transport capacity of the River Niger at Lokoja. The results show that the flood magnitude is highly dependent on the sediment transport capacity of the river.

KEYWORDS: Bank-full discharge, Flood frequency, River Niger, sediment transport capacity, morphodynamics, Probability distribution models

Paper 37 - Assessments of Metal Particles In Ground Food

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ABSTRACT
Food processing encourages safe preservation and provides opportunities for production of several types of diets. In Nigeria, some foodstuffs are commonly processed in dried or wet form to powder or paste using an abrasive cutting process involving cast iron discs. Despite the popularity of this method, metallic and non-metallic contaminants including heavy metals such as cadmium and lead that are detrimental to human health are introduced. Consequently, this study systematically determined the presence of metallic contaminants in ground maize grains, which were processed under dry and wet conditions. Locally available grinding discs manufactured using different furnaces were used to assess the quantity and composition of these contaminants. Irrespective of the disc type, different quantities of contaminants were found in the ground food grains. The discs manufactured using pit and rotary furnaces generated the highest quantity under wet and dry grinding conditions, respectively. These metallic contaminants were found to contain heavy metals such as lead (≤ 0.316 mg/kg), cadmium (≤ 0.024 mg/kg), chromium (≤ 0.016 mg/kg), copper (≤ 0.880 mg/kg), manganese (≤ 0.624 mg/kg) and zinc (≤ 0.006 mg/kg).

KEYWORDS: contaminants, heavy metal, grinding, cast iron discs, metal particles, ground food

Paper 38 - A Survey of Power Amplifier Signal Linearization Techniques In Communication Networks

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ABSTRACT
Radio frequency power amplifiers are crucial components of communication networks. The inherent nonlinearity of these components causes in-band distortion, which worsens bit-error-rate performance, and spectrum regrowth, which causes interference in adjacent channels. Out-of-band emission requirements set by regulatory bodies are essentially violated by these distortions. At the output of the power amplifier (PA), crosstalk exists between the antenna branches due to mutual coupling and nonlinear distortion within the transmitted signal. Harmonic distortion is a result of the complexity of modern signal processing techniques and the nonlinear nature of PAs. For high spectral and power efficiency, PAs must operate linearly. Electronic isolators between PAs and antennas can prevent this crosstalk. However, they do not meet the design requirements of modern composite systems. They are rather avoided in order to achieve a suitable form factor. Very useful linearization strategies are therefore presented and discussed in this survey. The effectiveness of PAs, as well as the complexity and constraints of the system, are always taken into account while choosing the linearization approach. These are effective ways to linearize transmit signals from PA output. The techniques are found effectively suitable in all domains while maintaining the acceptable adjacent channel leakage ratio level.

KEYWORDS: Crosstalk, Distortion, Linearization, Massive MIMO, RF Power Amplifier, 3GPP.

Paper 40 - Seasonal Variation and Health Risk Assessment of Gaseous and Particulate Pollutants Around Traffic Hotspots of a Densely Populated African City.

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ABSTRACT
Episodes of urban air pollution in Africa have received less attention than the rest of the world. This study investigated the concentration variations of gaseous pollutants (CO, NO_2, SO_2, NH_3, TVOCs, and ground level O_3) and Particulate Matter (PM_1, $PM_{2.5}$, PM_{10} & TSP) during the rainy and dry seasons at 25 traffic intersections (TIs) within Ibadan. The daily rush and non-rush hour concentrations of pollutants were monitored. Cancer risks (CR_{inh}) and epidemiology based mortality estimates using Relative Risk (RR) and Attributable Fractions (AF) linked with $PM_{2.5}$ and PM_{10} exposure were evaluated. The non- cancer risks via inhalation for CO, NO_2, SO_2 and ground level O_3 were assessed using Hazard Quotient (HQ). The mean concentrations of PM_1, $PM_{2.5}$, PM_{10} & TSP in the dry season were higher than rainy season by 53.24%, 132.20%, 360.49% and 365.83%, respectively. The dry season had the highest ER and AF mortality estimates from $PM_{2.5}$ and PM_{10} exposures compared to estimates during rainy season. Health risk assessment over the study period showed that CR_{inh} of $PM_{2.5}$ was tolerable while HQ_{inh} of SO_2 was above 1 indicating significant non-cancer risks at TIs in Ibadan.

KEYWORDS: Gaseous Pollutants, Particulates, Traffic Intersection, Seasons, Rush and Non-rush hour, Health Risk.

Paper 43 - Unconfined Compressive Strength of Bacillus Sphaericus Induced Precipitate Treated Lateritic Soil

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ABSTRACT

This study evaluated the potential of Bacillus *sphaericus* (B. *sphaericus*) in microbial-induced calcite precipitation improvement of the unconfined compressive strength (UCS) of lateritic soil. The soil, classified as A-2-6 (1) in the American Association of State Highway and Transportation Officials (AASHTO) system and SC in the Unified Soil Classification System (USCS), was treated with stepped B. *sphaericus* suspension of various densities of 0, 1.5 x 10^8, 6.0 x 10^8, 1.2 x 10^9, 1.8 x 10^9, 2.4 x 10^9 cells/ml at varying concentration of cementation reagents of 0.25, 0.5, 0.75 and 1 M. The cementation reagent used contained 3 g of Nutrient broth, 20 g of urea, 10 g of NH_4Cl, 2.12 g of $NaHCO_3$ and 2.8 g $CaCl_2$ per litre of distilled water. Soil specimens were prepared using bacteria to cementation reagent mix ratio of 25 : 75 with stepped B. *sphaericus* suspension density and compacted using three energy levels, namely, British Standard light (BSL), West African Standard (WAS) and British Standard heavy (BSH). The treated soil specimens were air-cured at ambient laboratory temperature of 25 ± 2° C for 7, 14 and 28 days, respectively. Peak UCS values of 947.40, 989.28 and 1,240.82 kN/m^2 for BSL; 1,387.6, 1,481.72 and 1,743.43 kN/m^2 for WAS as well as 1,432.24, 1,598.34 and 1,835.98 kN/m^2 for BSH compaction were recorded at 7, 14 and 28 days curing periods, respectively, for treatment with mix ratio B. *sphaericus* suspension density of (1.2 x 10^9 cells/ml) : Cementation reagent (0.5 M). The UCS values of 1,743.43 and 1,835.98 kN/m^2 recorded for the specimens compacted with WAS and BSH energy at 28 days curing period meet the requirement for base material in the construction of low-volume roads.

Keywords: Bacillus *sphaericus*, Cementation solution, Lateritic soil, Unconfined compressive Strength

Paper 45 - Techno-Economic Modelling of Bioclarified Water Recovery from Petroleum Wastewater Using Aspen Software and Box-Behnken Design

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ABSTRACT
Published articles on application and efficiency of bio-coagulants for petroleum wastewater biocoagulation-flocculation-sedimentation (bioclarification) are still confined to laboratory proof-of-concept-practice. The scale-up process design of the bio-clarified water recovery from petroleum wastewater has been a major research lacuna as evidenced in the reported literatures. Thus, this study presents ASPEN Base Case Scale-Up Simulation (BCSUS) using optimum laboratory experimental data and techno-economic predictive models for bioclarified water production from petroleum wastewater. The BCSUS, process design and economics were performed in ASPEN Batch Process Developer V10 environment. Predictive models for predicting and optimizing techno-economic parameters: return on investment (ROI), payback time (PBT) and production rate (PR) were achieved in RSM via Box-Behnken Design (BBD) technique of Design Expert V13. The base case techno-economic model gave batch size, annual production cost, TCI, PBT and ROI of 406kg, $9195, $631484, 5.18 years and 17% respectively at the selling price of $0.225. The regression models gave R^2 values of 0.9984, 0.9920 and 0.8867 for return on investment, payback time and production rate, respectively. This study shows that petroleum wastewater bioclarification scale-up design is feasible.

KEYWORDS: Modelling, Simulation, bio-coagulation

Paper 46 - Need for Effective Evaluation of Water Resources Qualities for Sustenance and Attainment of Construction (Engineering) Development Goals

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ABSTRACT
Water that is good for drinking is also good for construction purposes. Consequently, the aim of this study is to evaluate the physico-chemical qualities of water resources and to access their impact on the selected mechanical properties of concrete for sustainability and attainment of construction development goals. The water resources of interest here is the groundwater whose samples were collected in five locations in Owerri town of Imo state, Nigeria. The physico-chemical parameters of the collected samples were analyzed in accordance with guidelines under the World Health Organization (WHO) standard. Thereafter, the analysed water samples were used to mix concrete where the compressive strength, flexural strength and split tensile strength were determined. The results from the quality analyses showed that the concentrations of the groundwater sampling fall within the WHO recommended standard. Similarly, the results of the compressive strength, flexural and split tensile strengths showed that analyzed water samples from the five locations which were used to mix concrete are capable of helping to produce concrete of excellent properties. Stakeholders are therefore advised to maintain the use of water resource that meet drinking standard as part of concrete ingredient to ensure sustenance of safety in the construction industry.

KEYWORDS: Water Resources, Physico-Chemical Parameters, Concrete, Compressive Strength, Flexural Strength and Split Tensile Strength

Paper 49 - A Survey of Load Balancing Schemes for Heterogeneous Networks

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ABSTRACT
Load balancing is a critical aspect of heterogeneous networks (HetNets) aimed at achieving optimal network performance, resource utilization, and improved user experience. This survey presents an overview of load balancing schemes in HetNets, categorizing them into reactive, proactive, and hybrid approaches. Reactive algorithms, such as Cell Breathing, User Offloading, Game Theory-Based, and Reinforcement Learning algorithms, focus on balancing load and enhancing network performance. Proactive algorithms, including Prediction-based, Proactive Handover, and Traffic-aware Resource Allocation algorithms, anticipate future network conditions and take pre-emptive actions to optimize resource allocation. Hybrid algorithms combine proactive and reactive strategies to achieve a balance between prediction-based optimization and real-time adaptation. The study highlights the performance metrics used to evaluate these algorithms, along with the challenges and future research directions for each category. Furthermore, it discusses the potential applications of load balancing in 5G networks, which includes edge computing, dynamic network slicing, multi-connectivity scenarios, and integration with machine learning and artificial intelligence techniques. Understanding and optimizing HetNet load balancing schemes are crucial for the successful deployment and operation of future 5G and beyond networks, contributing to enhanced network performance, improved user experience, and efficient resource utilization in diverse use cases.

KEYWORDS: load balancing, heterogeneous networks, algorithm, deployment, performance, metrics

Paper 50 - Effect of Curing and Treatment Method on Ultrasonic Pulse Velocity of Compacted Lateritic Soil Treated with *Bacillus Thuringiensis*

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ABSTRACT
The study used ultrasonic pulse velocity (UPV) to assess the integrity and apparent strength of compacted lateritic soil treated with Bacillus *thuringiensis* (Bt). The effect of treatment methods (mixing and injection methods) of cementation solution (C_s) applications and curing procedures (oven-cured at 30° C, wax-cured, and air-curing at 25 ± 2° C) on UPV were also investigated. Samples were treated with Bt suspension densities of 0, 1.5 x 10^8, 6.0 x 10^8, 12 x 10^8, 18 x 10^8 and 24 x 10^8 cells/ml and varying concentration of C_s of 0.25, 0.5, 0.75 and 1 M. Specimens were compacted using British Standard light, West African Standard, and British Standard heavy energies, extruded, and cured using the procedures listed before the UPV tests. Results showed that UPV values increased as the compaction energy, Bt suspension density, and C_s concentration increased. The mixing method recorded higher UPV values relative to injection method of treatment regardless of curing procedure used. Air-cured specimens recorded higher UPV values in comparison to oven-cured and wax-cured specimens. It is recommended that treatment with Bt (24 x 10^8 cells/ml) : C_s (0.75 M) by mixing method and air-curing at laboratory temperature can enhance strength of lateritic soil for embankment.

KEYWORDS: Bacillus *thuringiensis,* Curing method, Microbial-induced calcite precipitation, lateritic soil, Ultrasonic pulse velocity.

Paper 51 - Development of Sustainable Concreting Using RHA Blended Bio Self-Compacting Concrete Incorporating *Bacillus Subtillis* and Different Fillers

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ABSTRACT
Attaining a sustainable construction environment requires the use of readily available construction materials that are cheap and eco-friendly. This will make the attainment of the sustainable development goal of adequate mass infrastructure for all achievable. Self-Compacting Concrete is a special concrete that can be modified by the addition of fillers and supplementary cementitious materials to improve its overall properties and aid in its domestication in Nigeria. This research investigates the effect of the use of Rice Husk ash at 15% replacement of Portland Limestone Cement and incorporation of *bacillus subtilis* on the fresh state properties, durability, measured using sorptivity and water absorption as well as the strength characterization at 7 and 28 days. The results showed an improvement in all the properties measured with the incorporation of bacterial and RHA. The use of fillers affected the microstructural characterization with the Limestone powder, crushed rock dust filler and cement kiln dust all having a positive impact on the microstructural and permeation properties of the SCC. It is concluded that the introduction *bacillus subtilis*, into a RHA and LP, CKD or CRD ternary blended SCC improves its properties and its usage in concreting can impact positively on sustainability in the built environment.

KEYWORDS: *bacillus subtilis,* Fillers, Rice Husk Ash, Self-Compacting Concrete, Sustainable Concreting, Self-Compacting Concrete

Paper 52 - Characterizations of Shea Butter Leaf (Vittella Paradoxa) Powder

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ABSTRACT
The study investigated the phytochemical analysis, proximate composition, pH, and analytical enquiries of FT-IR, BET, and SEM-EDS of shea butter leaf powder. The leave was washed thoroughly under water to remove insoluble substances, later with distilled water, sundried for 14 days, ground and, sieved into powder by 60 um mesh size. The product was stored in an airtight container for further use. The qualitative analysis of the phytochemical study indicated 111.85mg/g flavonoid, 86.54mg/g tannins, 237.82mg/g phenol, 46.05mg/g alkaloids, and 535mg/g saponin. The proximate analysis shown 12.59% moisture content, 4.10% ash content, 12.34% crude fat, 12.25% crude protein, 17.80% crude fiber, and 40.92% carbohydrate content. The pH of the extract was 6.38. BET shown 182.5 area, 10.10cc/g pore volume, and 2.13nm pore size. FT-IR results indicated the presence of N-H, O-H, C-H, C N, C C, C O, C N, C C as functional groups present. SEM-EDS revealed the surface morphology. EDS shown the percentage in weight elemental compositions of the sample powder as 37.50% O_2, 29.64% Ca, 24.14% K, 6.07% Cl, and 2.65% Si. The results revealed the importance of Shea butter leave to process industries such as food processing industry, cosmetic and pharmaceutical industry, and as an adsorbent in waste water treatment.

KEYWORDS: Shea butter leaves, phytochemical screening, proximate analysis, and analytical studies

Paper 53 - Optimizing Geopolymerization Process of Metabentonite-Metakaolin Based Geopolymer Concrete Using Response Surface Method

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ABSTRACT
CO_2 emission from production of Ordinary Portland Cement (OPC) approximately contributed 9% to Green House Gases (GHGs) in the atmosphere that lead to global warming. Replacement of OPC in construction with Supplementary Cementitious Materials (SCMs) are suggested by many researchers. Geopolymer Concrete (GPC) strength characteristics for particular grade, mix proportion and suitable precursors are major concern in structural engineering. Optimum mix design of metabentonite/metakaolin-based geopolymer concrete is presented. Mix design for a target compressive strength of 25N/mm^2 with Design of Experiment (DOE) using randomized block factorial design and laboratory investigations was conducted. Response Surface Method (RSM) analysis employed for DOE and optimization of geopolymerization process. Research findings in materials science and engineering; A mathematical model was developed. Material was characterized using XRF & FTIR spectrums and the result of XRF indicates that chemical composition of the precursor conformed to BS EN 197: (2011) for natural calcined pozzolans (Q). FTIR result shows that polycondensation occurred at the end of reaction and accompanied with water vaporization process. However, GPC exhibits good compressive strength of 23.7 N/mm^2 with NaOH molar concentration of 14M and Na_2Si_3O/ NaOH ratio of 2.5 at 28 days curing period.

KEYWORDS: Geopolymer, Precursors, Alkaline, DOE, Optimization, Mathematical Model.

Paper 54 - A Review on Extending Network Lifetime of Wireless Rechargeable Sensor Networks: Current Trends and Future Perspectives

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ABSTRACT
Advancement in Wireless Energy Transfer (WET) has led to a significant development in Wireless Rechargeable Sensor Networks (WRSN), whose sensors are replenished via WET using a Wireless Charging Vehicle (WCV). One of the challenges in WRSN is how to ensure nodes remain alive using minimal energy by the WCV. Some schemes extend the lifetime of WRSN by using a mobile WCV that collects data from the network and replenishes the nodes based on the assumption the nodes are capable of simultaneous target monitoring and energy reception. Others only allow replenishing the energy of the nodes when they are not in the state of sensing and transmission. This paper reviewed about 40 recent research papers to determine the extent of development in extending the lifetime of WRSN. The analysis of the review shows that 25% of them allowed simultaneous energy replenishment with data gathering, consisting of 10% that employed a mobile sink. 7.5% prevents upsetting the low-cost requirement of the nodes by executing the two tasks at different time instances. 10% proposed partial recharging of nodes by the WCV as the best way to reduce the energy consumption of mobile data.

KEYWORDS: algorithms, clustering, energy recharging, mobile charger, review, and sensor nodes

Paper 57 - Analysis and Simulation Of A Rotor Flux-Oriented Control Scheme For A Three Phase Induction Motor At Variable Speed

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ABSTRACT
The performance of induction motor drives under variable speed conditions can be improved by computing the optimum flux that guarantees minimum loss and therefore maximum efficiency in the motor. In this paper, a method to optimize the flux and thereby minimize the losses in a three-phase induction motor under variable speed conditions was developed. Mathematical models for the conventional rotor flux-oriented control scheme, total power loss as a function of rotor flux and for optimum flux as a function of operating speed and load torque were analytically derived. A MATLAB/Simulink model of the proposed rotor flux optimization scheme was developed, as well, to verify the analyses set forth for a typical three-phase Induction Motor. The results of the proposed method were compared with those of the conventional rotor flux control method and direct torque control method in terms of loss reduction and efficiency for the same induction motor. The proposed rotor flux optimization scheme achieved significant improvements in efficiency and power loss compared to the conventional rotor flux control scheme. It also achieved 5.01% improvement in efficiency compared to the optimized DTC control scheme at a speed of 250 rad/s for a load torque of 3Nm. At a lower speed of 150 rad/s, power loss reduced by 17.2% while efficiency increased by 5.7% for the same load torque under the proposed scheme as compared to the optimized DTC scheme.

KEYWORDS: Induction motor, rotor flux, control, optimum, variable speed.

Paper 58 - Mitigating Dust Impact: A Comprehensive Overview of Solar Panel Cleaning Devices for Maximized Performance

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ABSTRACT
Solar energy usage is rapidly increasing as people become more aware of the limited availability of nonrenewable energy resources such as coal, wood, and gasoline. This review analyzes different solar panel cleaning systems, examining their technical aspects and efficiency. It explores challenges related to panel cleanliness, including dust accumulation, dirt deposition, and their effect on system performance. Thanks to technological advancements, solar panels can now be used in domestic and industrial applications. Rural areas that do not yet have proper electrical connections are now opting for solar panel installations and using solar panels on streetlights. This article gives an insight into the causes of the inefficiencies of solar panels. The main inefficiency was the system's inability to adapt to changes in the sun's position, for which solar tracking systems with solar panels were installed. Another issue that has caused some concern is the accumulation of dust clouds on solar panels. The accumulation of dust and dirt on these solar panels has been observed to reduce system efficiency by approximately 23-50%. This article highlights the performance of existing cleaning devices with their cleaning techniques and gives recommendations based on their design and efficiency improvement.

KEYWORDS: Cleaning Devices, Efficiency, Renewable Energy, Solar Energy, Solar Power

Paper 59 - Review on Mobile Radio Propagation

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ABSTRACT
The behaviour of electromagnetic waves in a wireless channel is usually random and highly unpredictable. Its efficiency depends on the physical constituents of the propagation environment obstructing the direct line-of-sight (LOS) of radio signal transmission. Hence, transmitted radio signals often reach targeted receivers through different propagation mechanisms in non-line-of sight (NLOS) scenarios called multipath resulting in path loss. Path loss is the signal intensity reduction that results from extensive fading throughout the transmission path. The placement of base stations (BS) requires the use of accurate path loss models. This paper describes the establishment of basic mobile radio propagation model which at first presents communication services offered by the cellular telephone system limited to voice, it has gradually expanded to services other than voice such as data, image/video, human to human, human to machine and machine to machine communication making the mobile technology indispensable of our daily lives. Then it makes extensive reviews among the old traditional models (empirical models), the new computational intelligence (CI) models and incidentally opens new research issues and future research directions. This review paper will serve as reference material for researchers in the field of radio propagation and in particular for research in path loss prediction.

KEYWORDS: Multipath, path loss, fading, traditional models, computational intelligence.

Paper 60 - Experimental Process Optimization and GC-MS Characterization of Bioactive Antioxidant Extract Production from Hyptis suaveolens Leaves

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ABSTRACT
Previous studies documented the biological and antioxidant activities of phenolic bioactive extract (phytochemical) from Nigerian *Hyptis suaveolens* leaves. However, optimization of solid-liquid extraction of the process for possible scale-up process design is seldom reported in the literature. Therefore, this investigation presents process optimization and characterization of bioactive extract recovery from *Hyptis suaveolens* leaves. Solid-liquid extraction experiment was designed at ranging extraction time (30 - 70 min), temperature (60 -75 °C) and substrate/solvent ratio (0.4 – 0.8 g/100ml) using Box-Benken Design (BBD) in Response Surface Methodology (RSM) of Design Expert software V13 with Total Phenolic Content (TPC), Total Flavonoid Content (TFC), and extraction yields as dependent variables. BBD desirability algorithm was used to perform optimum conditions that optimized TPC, TFC and extraction yield. At the optimized process conditions of 61.28 mins, 62.74 °C and 0.58 g/100ml, the extract obtained gave TPC (33.055 mg GAE/g d.w.), TFC (7.151 mg QE/g d.w.) and yield (18.203%). The Gas Chromatography - Mass Spectroscopy (GC-MS) analysis of extracts recovered was observed to have a wide array of compounds, dominated by methyl esters (about 43%), ethyl-oleate (about 16%), acids (about 13%) and many other components at lower levels. The Fourier Transform Infra-Red (FT-IR) analysis indicated the presence of functional groups, which are attributable to antioxidants.

KEYWORDS: Optimization, Bioactive, Antioxidant, Extraction, Hyptis suaveolens, GC-MS

Paper 61 - Mitigating Interference and Improving Resource Usage in A Downlink Mu-Mimo Transmission for B5G Networks

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ABSTRACT
In this paper, an Enhanced Mechanism for Downlink Multi-User Multiple Output Multiple Input (EMD-MU-MIMO) was proposed to improve the resource usage of the resource blocks and mitigate interference in a 5G and Beyond (B5G) network. The modified algorithm considered the mobility of users in the system to make the proposed algorithm adaptable to practical environmental settings. Simulation results showed that the EMD-MU-MIMO algorithm mitigated interference by 7.47% and 2.01% when compared with the conventional IEEE 802.11ax standard and the existing MD-MU-MIMO algorithm, respectively. Additionally, the EMD-MU-MIMO algorithm showed a mean percentage reduction in unnecessary resource usage by 26.13% and 4.67% when compared with the conventional IEEE 802.11ax standard and against the MD-MU-MIMO algorithm, respectively. Future works would delineate the impact of the modified algorithm in mitigating outage probability and showing the general improvement in the spectral efficiency of the system.

KEYWORDS: Outage probability, MIMO, MU-MIMO, Interference, Resource Usage

Paper 62 - Descriptive Analysis of Nasa Weather Data Using Machine Learning Algorithm

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ABSTRACT
Descriptive Analysis of National Aeronautics and Space Administration (NASA) weather data using machine learning algorithm is presented in this paper. NASA has provided a range of weather data capable of aiding in the prediction of various weather conditions. The paper looked at the prediction analysis of NASA weather data using 70128 entries from 2010 to 2017. Nine weather data was introduced and later scaled down to three namely Relative humidity, Temperature and Pressure. For temperature, the correlation coefficient between T2M and Next T2M, T2MWET and Next T2M, RH2M and Next T2M is 0.96, 0.82 and -0.72 respectively. For Relative Humidity, the correlation coefficient between R2M and Next RH2M, Next RH2M and T2M is 0.96 and -0,7 respectively. For Pressure, the correlation coefficient between R2M and Next RH2M, Next RH2M and T2M is 0.96 and -0.7 respectively. This paper presented some machine learning algorithms to analyze NASA weather data in determining which algorithm is better suited for weather forecasting or prediction. Ridge Regression, Lasso Regression, Decision Tree Regression, and XGboost algorithm were used to validate their performances. The result showed that XGboost algorithm performed better than the other algorithms with a root mean square error value (RMSE) of 0.26901and coefficient determination (R^2) value of 0.93385

KEYWORDS: Weather Forecasting, Machine learning, Algorithm, Performance, Temperature Prediction

Paper 65 - An Overview of Applications of Cognitive Wireless Communication Simulators

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ABSTRACT
Cognitive radio is proposed in the literature to address the ironical problem of spectrum scarcity owing to inefficient utilisation. This idea has recently gained popularity because it provides wireless users with the ability to detect and efficiently adapt operating parameters based on interactions with the surrounding radio environment. In the evaluation of cognitive radio networks simulators are used. The simulators differ in terms of platforms and technicalities. Thus making selection process difficult. In this review, attention is paid to cognitive radio network simulators such as Network Simulator 2 and 3 (NS-2) and (NS-3), Java Simulator (J-Sim), Operations Network (OPNET) and MATLAB. In the selection of literature covered in this review, attention was paid to publications not later than 2017 from reputable databases. This review of cognitive radio network simulators will provide useful insights to new researchers in this field. Furthermore, a case study is reported on the application of the Monte Carlo simulation method to the cognitive radio network.

KEYWORDS: Cognitive radio, network simulators, random numbers, Monte Carlo simulation

Paper 66 - Characterization of Aluminium-Matrix Composite with Acid-Treated Carbonized Coconut Husk Reinforcement

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ABSTRACT
Aluminium alloys have been widely applied in the automobile, aerospace, defence, and other engineering sectors but low strength and low melting point were always seeming problematic. Many researchers have made use of synthetic reinforcement such as SiO_2 and SiC to solve the problem, but expensive. In a similar way, many studies have been done on agricultural wastes as reinforcements with and without acid treatment. Considering the above, the effect of acid-treated carbonized coconut husk reinforcement on the properties of aluminium-matrix composites was studied. The stir-casting method was used to make composites with reinforcement ranging from 1.2 wt.% to 4.8 wt.% at a 1.2 wt.% interval. The mechanical, microstructural, thermal, and physical properties were investigated. The hardness and tensile strength of the composites increased from 9.40 BHN and 1200 MPa to 12.20 BHN and 1600 MPa in the sample containing 4.8 wt.% reinforcement, respectively. The newly developed aluminium metal matrix composite can find application in automobile parts production.

KEYWORDS: Reinforcement, carbonization, acid treatment, composite, coconut husk

Paper 67 - Experimental Study of The Pressure Drop and Flooding in A Rotating Packed Bed

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ABSTRACT
Embedded processes require compactness, low energy consumption, and insensitivity to gravity. Centrifugal processes respond to the last characteristic. Centrifugal force is used instead of the gravitational force with almost zero sensitivity to variations in the gravitational force. We studied a rotating packed bed (RPB)as a gas/liquid contactor for absorption. We focused our attention on the hydrodynamic behavior of this device. Previous studies on RPB flooding and operating limits dwelled on virtual observations and pressure drop variations. However, physical visualizations are subjective because RPB pressure drop variations are too inconsistent to be used to determine the upper operating limit during RPB operations. A robust quantitative method of obtaining RPB flooding limits based on the flow rate of the ejected liquid, supported by visual observation and pressure drop measurement, was presented. The aim was to identify, with greater accuracy, RPB hydrodynamic characteristics and provide a more standard method of identifying same.

KEYWORDS: Rotating packed bed, pressure drop, Flooding, Gas/liquid contactor, hydrodynamics

Paper 68 - Development of Activated Carbons from Pentaclethra Macrophylla Pods as High-Performance Adsorbent for Treatment of Azo Dye Wastewater

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ABSTRACT
This present study reports the preparation of activated carbons via facile pyrolysis using African oil bean (*Pentaclethra macrophylla*) pods as a potential carbon precursor. The experimental process parameters were optimized through a chemometric tool to produce activated carbons of high carbon yield and iodine numbers with H_3PO_4 and KOH as activating agents. The results indicated that the activated carbon obtained using KOH (KOH-$PMAC_{op}$) has a moderately higher surface area of 911.70 m^2/g than 527.59 m^2/g obtained using H_3PO_4 (H_3PO_4-$PMAC_{op}$) on almost the same set of optimum production parameters. It also exhibited the highest adsorption capacity of 148 mg/g for Congo red. Both activated carbons demonstrated evidence of extensive graphitic features from the analyses of the Raman spectroscopy and X-ray diffraction investigations conducted on them. The Fourier transform infrared (FT-IR) spectra of the KOH-$PMAC_{op}$ suggested a higher proportion of aromaticity than that of H_3PO_4-$PMAC_{op}$, which implies that it is likely to promote adsorption mechanisms like electrostatic and π-π interactions far better than that of H_3PO_4-$PMAC_{op}$. Both carbons, however, suggested their ability to support any rate-controlling chemisorption mechanism, as indicated by the Pseudo-second-order kinetic model obtained from the experimental data. Using African oil bean pods as a precursor of activated carbon offers another chance to develop sustainable and high-efficient adsorbents for wastewater treatment.

KEYWORDS*:* Activated carbons; Azo dye wastewater; Chemical activation; Chemometric tool; *Pentaclethra macrophylla* pods

Paper 69 - Optimizing Deep Learning for Medical Image Classification: A Comparison of Gradient-Based Methods

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ABSTRACT
Deep learning-based medical image classification has shown promising results in recent years with performance heavily reliant on choice of optimization schemes during training. In this paper, we present a comparative study of seven first-order stochastic gradient-based optimization schemes for a medical image classification task. A custom CNN architecture with convolutional layers and increasing number of filters followed by max-pooling and ReLU activation function with Dropout regularization were trained on a Tuberculosis Chest X-ray Database. The models were tested on a held-out test set to assess their performance in terms of accuracy, precision, recall, F1-score, and AUC score. Our experimental results demonstrate that Adamax achieves the highest accuracy and F1-score of 99.00% each and highest AUC score of 99.80%. Adadelta and Adagrad performed relatively poorly in comparison to other optimizers, achieving accuracies of 82.14% and 88.00% respectively. In terms of recall, both Adam and Nadam gave the highest recall scores of 98.86%. This suggests that the choice of optimizer plays a significant role in the performance of these models and provides valuable insights into the suitability of different optimizers for medical image classification. This will be beneficial for researchers and practitioners in the field of medical image analysis using deep learning.

KEYWORDS: Deep Learning, Convolutional Neural Networks, Optimizers, Medical Image Classification, Chest X-Ray Classification

Paper 70 - H-Infinity Mixed Sensitivity Function for The DC Motor Control

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ABSTRACT
This article presents an H-infinity mixed sensitivity function for the DC motor control. The main purpose of the DC motor is controlling the speed on a precise reference when uncertainties and disturbances act on it. Regulating the power supply of the DC motor in order to control the angular speed is a challenging task, this necessitates the use of H-infinity mixed sensitivity function, which is a robust technique to control the DC motor's speed in the presence of uncertainties and disturbances by the selection of appropriate weights for the plant. The DC motor was modelled, and simulation was done in MATLAB 2022b environment. The results showed that for the sensitivity function of the DC motor, the bode magnitude plot reduces from 35 dB to -35 dB with a frequency of 0.01 rad/secs to 1000000 rad/secs. Also, for the complementary sensitivity function of the DC motor, the bode magnitude plot reduces from 19 dB to -33 dB with a frequency of 0.01 rad/secs to 1000000 rad/secs. Taking the singular value plot into consideration, the magnitude of the DC servo motor reduces from -33 dB to -77 dB which showed good robust stability, performance and tracking capability when using H-infinity mixed sensitivity function.

KEYWORDS: DC Motor, H-infinity, Mixed Sensitivity Function, Robust Stability, Robust performance

Paper 71– Advancements in Composite Brake Pad Materials: A Review of Their Tribological Properties and Performance

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ABSTRACT
Composite brake pad materials have become increasingly popular due to their desirable properties; high strength, low weight, and excellent wear resistance. This review article provides a comprehensive overview of recent advances in composite materials for high-performance brake pads, focusing on their tribological properties and wear mechanisms. The article begins by introducing the importance of selecting suitable materials for brake pads. It then highlights the advantages and limitations of different composites used in brake pads, including ceramic matrix composites, carbon fiber-reinforced composites, and metal matrix composites. The article also discusses the mechanisms behind the wear and degradation of brake pads, such as abrasive wear, adhesion wear, and thermal degradation. Finally, the review concludes with a discussion of future research directions and potential improvements in the design of composite brake pads. This article provides a valuable resource for researchers and engineers in brake pad materials and tribology.

KEYWORDS: Brake Pad, Composite materials, Friction, Tribology, Wear

Paper 72 – Exploration of Global Renewable Energy Statistics for Electricity Generation: A Case Study of Nigeria

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ABSTRACT
In recent times, electricity has been the key driving factor in all aspect human life such as healthcare, transportation, entertainment and education. Providing this essential service to meet the ever growing universal energy consumption coupled with the fast exhaustion of fossil fuel reserves as well as the enormous environmental hazard associated with its consumption has necessitated substantial research consideration on clean energy sources. This study presents an exploration of global Renewable Energy (RE) statistics and its tendencies for electricity generation with particular emphasis on Nigeria. The exploration was based on the data obtained for all the various forms of RE data obtained from several RE data base. It also explores Nigeria RE potential, estimates the amount of electrical energy that can be generated from RE and the current status of their usage. Benefits and factors hampering the generation of electricity from RE sources were enumerated.The study unveils Nigeria RE potential with the annual average solar insolation ranging from 4.2kWh/m^2/day in the south to 5.9kWh/m^2/day in the north, wind energy ranging from 4.4 W/ m^2 to 35.2 W/m^2 (if the intensity is perpendicular to wind direction), and a hydro potential above 11,000MW.

Keywords: Electricity, Power generation, Renewable Energy

Paper 73 – Community Participation and Sustainable of Water and Sanitation Services in Musanze District, Northern Province of Rwanda

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ABSTRACT
Water-related diseases are closely linked to poverty and disproportionately affect vulnerable communities mainly in developing countries including Rwanda. Most development projects highlight community participation as one of the prerequisites for the improved performance of water and sanitation services. Three rural villages in Musanze District (Gataraga, Gitega, Rwinuma) in Rwanda were taken as a case study. Data were collected using questionnaires and analyzed using Statistical Package for the Social Sciences (SPSS). A total of 192 participants responded to the questionnaires of whom 189 were water and sanitation services beneficiaries. In addition, water and sanitation district and sectors officials were also interviewed. Our findings showed that sustainability issues were inadequately addressed at the planning and design stages, communities had no capacity to maintain the water and sanitation services and no sense of ownership. The study recommends the adoption and incorporation of the user centered design methodology at the initial stages of water and sanitation development programmes in order to produce interventions that fully solve community problems and to prioritize capacity building for operators and technical support at all levels for all other groups engaged in planning, implementation and maintenance of water and sanitation services.

KEYWORDS: Sustainability, Community Participation, User Centered Designs, user association, operation and maintenance

Paper 74 – Accurate Prediction of Quadcopter Dynamics Through Incremental Evolution of Grnn Model Development

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ABSTRACT
This paper discusses the use of incremental evolution of generalized regression neural networks (GRNN) in the development of dynamic models of quadcopter systems. 11,835 flight datasets comprising attitude and altitude data were collected using quadcopter model F450 fitted with a PIXHAWK flight controller. The data were normalized and 70% was used for training and testing, while 30% was used for model validation. The results obtained show that for an MSE threshold of 0.1, a 98% reduction in the size of the hidden layer of the network is achievable for the attitude (roll, pitch and yaw) and altitude identification. The MSE values of 0.0268, 0.0514, 0.1627 and 0.2033 for the roll, pitch, yaw and altitude models respectively also indicated that the networks have higher accuracy compared with the GRNN models. Also, the R2 values of 0.9732, 0.9484, 0.8373 and 0.7967 obtained for the validation of the roll, pitch, yaw and altitude models indicate that the models are well-fitted. The results showed that the incremental evolution-based GRNN algorithm reduces the size of the network's hidden layer by pruning neurons that do not contribute to error minimization between the actual flight output and the trained output, which results in higher accuracy compared to conventional GRNN models.

KEYWORDS: Quadcopter, GRNN, System Identification, Incremental Evolution

Paper 76 – Impact of Support Geometry on the Punching Shear Behaviour of Flats Slabs

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ABSTRACT
This study was carried out to assess the impact of support geometry on the punching behaviour of flat slabs using Abaqus Finite Element modelling software. The support geometrical constraint considered herein is strictly the column shapes. The first numerical specimen was developed using specifications of a previously tested experimental model and the simulation accuracy was validated by comparisons to experimental results. Three other variants of the validated model were developed by replacing the square column support with different shapes of column supports. The support shapes considered are L, T and Cruciform. The finite element analysis study showed that the influence of column geometry becomes visible only after the first initial crack had been developed in the slab. Although all simulated slabs indicated similar failure modes in the form of a sudden collapse at peak load signifying a typical shear failure. In conclusion, it was noted that the Cruciform shaped support column provided the highest shear resistance with a magnitude of 582.8 kN while 475 kN, 493.9 kN, and 502 kN were recorded in Square, L, and T-shaped support respectively.

KEYWORDS: Punching shear, Flat Slab, Column Shape, Finite Element

Paper 77 – Reconfiguration of Unbalanced Distribution Network for Improved Voltage Profile and Power Loss Mitigation

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ABSTRACT
The need for improved quality of services, and an increase in energy demand among others necessitated the urgent need for efficient utilization of the available energy via reducing technical losses in the network. This paper proposed a power loss mitigation scheme by developing an optimal reconfiguration for an unbalanced Distribution Network (DN) to reduce technical losses and improve system reliability. The various components that constitute the unbalanced networks were considered and the impedance of the line was modeled using modified Carson's equation. At the same time, a power flow based on the forward-backward sweep process was adopted to ascertain the base case losses. A composite load model was adopted. The optimal status of the switches in order to minimize the real power loss is found by Smell Agent Optimization (SAO) algorithm. The effectiveness of the proposed methodology is demonstrated on an unbalanced (123 Bus) radial distribution system. The active power loss in the base case of the IEEE 123 bus unbalanced network is 115.389KW whereas after reconfiguration the loss was reduced to 67.74kW representing a 41.30% reduction in power loss.

KEYWORDS: Active power losses, Forward-backward sweep, Radial distribution system, Smell Agent Optimization algorithm, System reconfiguration

Paper 83 – A Review of the Effect of Eggshell Powder on the Properties of Recycled Polymers

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ABSTRACT
Agricultural wastes have become a major source of environmental pollution as they have been implicated in the formation of greenhouse gases. Eggshell is a poultry waste that is available in large quantities and the disposal of has become a cause of pollution due to the generation of unpleasant odours and growth of microorganisms of which 6.4 million metric tonnes of eggshell waste are dumped globally in landfills. This paper reviews the effects of incorporating eggshell powder (ESP) on the properties of recycled polymers. It covers the preparation and characterisation of eggshell powder, its incorporation into recycled polymers, and the resulting changes in mechanical and thermal properties. In recycled low-density polyethene, a maximum tensile strength of 10.64Nm-2 was obtained at 10wt. % of ESP after which the tensile strength decreased at 12 wt%. For recycled High-density Polyethene/ethylene vinyl acetate (rHDPE/EVA) composite, a decrease in elongation at break and tensile strength were obtained with increasing ESP filler loading. However, the addition of a coupling agent (3-aminopropyltriethoxysilane) resulted in higher tensile strength and modulus. Another coupling agent (Benzyl Urea) was used on rHDPE/EVA composite and a significant improvement in tensile strength and modulus of elasticity was obtained.

KEYWORDS: Eggshell powder, Recycled polymers, Environmental pollution.

Paper 84 – Smart Farming for Sustainable Rice Production in Nigeria

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ABSTRACT
Agriculture plays a significant role in Nigeria's economy, with rice being a staple food for millions of Nigerians. However, rice production in Nigeria has been faced with several challenges. Smart farming, an innovative agricultural approach, integrates advanced technologies such as precision agriculture, the Internet of Things (IoT), and big data analytics to enhance agricultural productivity, reduce environmental impacts, and increase food security. This study aims to explore the potential of smart farming in enhancing rice production in Nigeria. The study reviews the current status of rice production in Nigeria, identifies the challenges facing rice farmers, and explores the role of smart farming technologies in addressing these challenges. The study also examines the policy and institutional frameworks needed to promote smart farming in Nigeria. The study reveals that smart farming has the potential to revolutionize rice production in Nigeria by enabling farmers to optimize their crop yield, reduce water and fertilizer usage, and minimize the impact of climate change.

KEYWORDS: Smart farming, sustainability, Rice production and Nigeria

Paper 85 – Development of an Improved Fibre Bragg Grating Sensor Sensitivity Model with Temperature Compensation for Structural Health Monitoring

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ABSTRACT
This research work presents an optimum Structural Health Monitoring (SHM) of composite structure using an improved Fibre Bragg Grating (FBG) sensor sensitivity model. Composite materials have been largely used in telecommunications, aerospace, marine, automotive, civil infrastructures, oil and gas, sports equipment, and in medical facilities due to their unique mechanical properties, namely strength and stiffness to weight ratios. However, these materials are subjected to deformation during loading and low velocity impact which may not be visible to the human sight and may lead to the failure of the composite structure. This poses a great challenge to manufacturing industries and presents a vital area of research. The improved FBG sensor sensitivity model eliminates cross sensitivity in the FBG measurement, determining the Poisson's ratio and the effective refractive index of the FBG sensor using a developed proportionality model to increase the FBG sensitivity to strain. Deploying the improved model will reduce fatigue failure on structures, network complexity and bulky sensor size due to the ability of the fibre optic cable to house several FBG sensors. The improved technique was implemented using MATLAB R2018a version. The result of the improved model was compared with that of the existing model. The simulation result shows that the improved FBG sensor sensitivity model performed better than the existing FBG model by 32.08% increment in sensitivity.

KEYWORDS: SHM, FBG, Sensitivity, Poisson's Ratio, Refractive Index

Paper 86 – Development of an Automated Plate Number Recognition and Identification System

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ABSTRACT
In this paper, an automated plate number recognition and identification system was developed to explore problems associated with many successful solutions in the field of computer vision. However, these solutions are typically tuned towards a particular environment due to the variations in the features of plate numbers across the universe. As such, a universal solution would be difficult to realize as the image analysis techniques used in developing this algorithm cannot generate a result with a hundred percent accuracy. Thus, this paper focuses on the development of an automated plate number recognition and identification system optimized for Nigerian plate numbers. The system comprises algorithms written in Python with the OpenCV library, canny edge detection, and feature detection techniques combined with the Tesseract optical character recognition engine to identify the characters on the plate. A Microsoft visual basic was used to develop a user interface for data presentation and MySQL server was used as a database. When a local image was tested using the developed recognition algorithm, the simulation result presented an accuracy of 90% at the localization stage and 70% for character extraction. This shows that the algorithm effectively localizes and extracts the characters on the plate number.

KEYWORDS: Plate number, OpenCV, canny edge detection, tesseract optical character recognition engine, MySQL

Paper 87 – Development of Fully Biobased Materials for Membrane Industry Transformations in The Light of Circular Economy

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ABSTRACT
Circular economy, a resource-efficient model emphasizes eliminating waste and making the entire economy more sustainable through waste reuse, reduction, and recycling. For economic and environmental concerns as well as to comply with the newly established reinforcements on green economy, circular strategies have been proposed in industrial sectors to realize the recovery of waste products that have potentials to be used as raw materials. The circular economy frameworks offer an opportunity for membrane technology innovation. Membrane technology has been applied across a broad spectrum of industrial and municipal installations and is currently popular for water treatment and reuse as well as water desalination, on account of its reliability, high-efficiency, and ease of operation. New membranes from renewable materials, including wood-based polymers (bio-based polymers) was innovated and it gave a membrane manufacturing by the green chemistry and green engineering principles and the life cycle analysis methodology realized green synthesis completely for membrane fabrications. This development solves seven out of seventeen of the sustainable development goal (SDG) No. 3, 6, 9, 12, 13, 14 and 15.

KEYWORDS: Circular economy, Green chemistry, Sustainable development goals, Wood-based polymers, Membrane technology, Life cycle analysis

Paper 88 – Effects of Surface Linings and Thickness of Lining on the Microbial Load of Stored Onion Bulbs (Allium Cepa L.)

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ABSTRACT
The study was done to investigate effects of surface linings (jute, foam and polypropylene) and thicknesses (single 2.1, 8.91 and 0.44mm, double 4.20, 17.82, 0.88 mm and triple 6.30, 26.73, and 1.32 mm) of lining on the microbial load of onions bulbs stored for 6 months in an instrumented wooden structure. Kano-Red variety of onions was used for the experiment. ANOVA was used to study the effects of types and thickness of lining layers on onion bulbs in storage. During storage, both the treated and the control onion bulbs showed a general rise in microbial load in storage. The control displayed a starting value of 10^3 CFU/g and a final value of 80.5 x 10^2 CFU/g. Polypropylene double had the lowest value of microbial load (11.5–54.75 10^2 CFU/g), while Jute single and Jute triple had equal values in the range of (10.75-71.75). Jute double had the highest initial and final values of (14.5 CFU/g -77.25 CFU/g). Conclusively, it can be said that despite the general increase in microbial load between the control and the treated, treated samples still had lower microbial load.

KEYWORDS: Onion bulbs, Storage condition, Surface lining, Lining thickness, Microbial load

Paper 89 – Structural Integrity Assessment of the Academic and Hostel Buildings at University of Ilorin Using Non-destructive Methods

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ABSTRACT

Quality and condition assurance assessment of concrete for structural adequacy have been performed by visual inspection and sampling by coring concrete using standard tests on specimens. They result in superficial local damage. Test methods that will not impair the function of structures and permit re-testing to measure their in-place properties at any time are, therefore necessary. Blocks 7-10 of the University of Ilorin, constructed with concrete walls and commissioned in 1980, were tested to determine the residual life of the buildings. The walls were subjected to non-destructive tests and a strength-Ultrasonic Pulse Velocity model in the form $a \ln x + c$ at R^2 of 96.5%. The resulting Pulse Velocities were then injected into the model to determine the residual life of the walls, and hence the buildings. The strength results were 21.81, 21.62, 21.65 and 21.35N/mm^2 for the blocks, respectively. These are less than 25N/mm^2 adopted for the structures at design stage, but greater than the expected remaining compressive strengths of 11.75N/mm^2 after 43 years of use, confirming that the conditions of the buildings are adequate. This method can be employed to identify dilapidated buildings to be demolished before sudden collapse to prevent loss of lives and properties.

***KEYWORDS*:** Concrete blocks, Quality assurance, Ultrasonic pulse velocity, Compressive strength, Residual life

Paper 90 – Optimization of Charcoal Briquettes Production Process from Raffia Palm (Raphia Hookeri) Epicarp Using Response Surface Methodology

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ABSTRACT

In this study, charcoal briquettes were produced from carbonized raffia palm fruit shells using synthetic gum and cassava starch as binders. Response Surface Methodology (RSM) using rotatable Box-Benkhen Experimental Design (BBD) was used to optimize the briquette quality. The briquette samples were made by compressing the carbonized raffia palm fruit shells in an existing briquetting machine. The factors considered in the study were particle size, binder-substrate ratio, and drying time while relaxed density and the calorific value of the briquettes were the response variables. Statistical models were developed to predict the various responses. Results of the study indicated that a combination of 1.05 mm particle size, 29.41 % binder ratio, and 3 days drying time of synthetic gum bonded briquettes was optimum. Under the optimum settings of factors, the synthetic gum-bonded briquettes had a relaxed density of 451.99 Kg/m^3 and a calorific value of 21535.2 kJ/kg. The results also revealed that a combination of 1.99 mm particle size, 10 % binder ratio, and 3 days drying time of starch-bonded briquettes were optimum. Under the optimum settings of the factors, the starch-bonded briquettes had a relaxed density of 474.02 Kg/m^3 and a calorific value of 20185.5 KJ/Kg. Validation of the models indicated that there was no significant difference between the predicted and experimental values which implied that the models could reliably predict the responses.

KEYWORDS: Briquettes, Box Benkhen Design, Response Surface Methodology, Modelling & Optimization, Raffia Palm Epicarp

Paper 91 – Physical and Mechanical Properties of Concrete Produced with Periwinkle Shell Ash and Quarry Dust

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ABSTRACT
The usage of plentiful raw waste resources in the manufacturing of concrete has proven to be a sustainable and environmentally beneficial method of making concrete for a variety of purposes. In this study, the physical and mechanical features of concrete made by partially substituting fine aggregates and ordinary Portland cement with periwinkle shell ash and quarry dust (5%, 10%, 15%, and 20%), respectively, were examined. The water-to-cement ratio utilized for the concrete mixture of 1:2:4 was 0.60. Investigated were the constituent materials' physical and mechanical characteristics. Fresh concrete underwent a slump test, and then 150 mm cubes of cured concrete were subjected to density and compressive strength tests. The results revealed that the increase in the partial replacements with periwinkle shell ash and quarry dust, the more the slump increased from 1.2% to 3%. However, the concrete without the waste materials gave optimum compressive strength of 22.9 N/mm^2 as against those that were partially replaced having, 18.8 – 15.1 N/mm^2. The study showed that in other to produce concrete for pavements and other low-strength applications, replacements with periwinkle shell ash and quarry dust of up to 20% can be utilized.

KEYWORDS**:** Concrete, Periwinkle shell ash, Quarry dust, Compressive strength, Partial replacement

Paper 92 – A Holistic Approach Towards Modelling, Synthesis and Fabrication of Organo-Inorganic Perovskite Solar Cell Module

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ABSTRACT
The quest in searching for new material(s) for harvesting abundant solar energy in our society lead to the discovery of a perovskite family which possesses a photovoltaic effect. Halide perovskite solar cells (HPSCs) have become the next-generation solar technology due to their outstanding characteristics. Despite considerable improvements in the HPSCs' efficiency, there have been concerns about the conceptualization of the holistic approach involved in creating PSC modules from scratch. The overall performance of the OIHP solar cell module significantly relies on the material composition of the thin layers making up the module, their synthesis techniques, and the fabrication method employed. This paper provides a pathway for modelling, synthesis, and fabrication of solar cell module. The paper emphasized on modelling of chemical compositions of the light-absorbing layer using Goldsmith factors, synthesis techniques, device architectural configuration, and method of fabrication. Hence this review serves as a guide to a novice in the field of solar cell research in generating PSC modules from scratch.

KEYWORDS: Perovskite, Photovoltaic, Synthesis, fabrication, Goldsmith

Paper 94 – Synthesis and characterization of CNTs/TiO2 nanocomposite for formulation of hybrid nanofluid for machining CFRPs

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ABSTRACT
Removal of heat from cutting zones raises concerns in machining carbon fibre reinforced plastics (CFRPs). Therefore, this has necessitated increased search for sustainable and cost-effective cooling agents. In this study, carbon nanotubes (CNTs) and TiO_2 were synthesised using sol-gel and Central Composite Design and characterised to form different compositions of TiO_2/CNTs (9:1, 7:3, and 5:5) nanocomposites. The nanocomposites were characterized using Brunauer-Emmett-Teller (BET), HESEM/EDX, XRD and FTIR to investigate their stability as suitable fillers in base-oils. The FTIR spectra for TiO_2/CNTs revealed that the composites have absorption peaks corresponding to C=C and Ti-O bonds; giving rise to peaks assigned to Ti-O-C and C-O bonds. The diffraction peaks of anatase are clearly identified and the diffraction peaks assigned to CNTs are barely seen as a result of overlapping of the main peaks of CNTs with the peaks of TiO_2. The study established that the challenges common to individual NCs are sufficiently addressed with hybrid NCs TiO_2/CNTs (5:5) NC offering an overriding advantage over other nanocomposites as heat removing agent owing to its largest surface area, pore volume and as the most stable nanosuspension. It can, therefore, be concluded that TiO_2/CNTs nanocomposites have high prospect for reinforcing base oils for effective machining.

KEYWORDS: Synthesis, Characterisation, Carbon nanotubes, Titanium oxide, Nanocomposites, Machining

Paper 95 – An Internet of Things (IOT) Based Precision System for Improved Irish Potato Production in Nigeria

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ABSTRACT
There is a global concern regarding the increasing food scarcity caused by the current severe climate change, which has sparked research efforts to enhance food production. The Internet of Things (IoT) has emerged as a valuable tool in revolutionizing agriculture and improving food production. Food scarcity will definitely abate with the possibility of automated greenhouse smart farms. This research is aimed at developing an IoT-based precision monitoring system for improved greenhouse Irish potato production in Nigeria. The project focuses on three key metrics for optimal Irish potato yield: soil pH, temperature, and humidity. To achieve this, a model was developed in MATLAB/Simulink environment to monitor the greenhouse changes considering optimal yield values of the considered metrics. Simulation results showed changes in these metrics. Soil pH changed from an environmental value of 4.8 to 6.0, resulting in a percentage change of 20%, the temperature changed from 25°C to 18°C, at 28% percentage change while humidity changed from 70% to 85% producing a change of 21.43%, all driven by IoT sensors.

KEYWORDS: Internet of Things (IoT), Greenhouse Smart Farm, Greenhouse Irish potato, Precision Monitoring, MATLAB/Simulink

Paper 102 – Material Sustainability in Nigerian Construction Organizations: A Pathway to Economic Sustainability

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ABSTRACT
Research on Material Sustainability in construction has been extended in literature to the public domain by examining how various constructs relate with the environmental dimension of sustainability Meanwhile, the current linear consumption of construction materials is economically unsustainable in the midst of growing financial fears. Given the crucial importance of construction firms in sustaining materials, this study aimed to examine the mediating effect of two extreme dimensions of organizational culture (OC) on material sustainability constraints (MSC) influencing the economic sustainability of construction projects (ESCP). A total of 359 responses from a cross-sectional survey from Nigerian construction firms were analyzed using Partial Least Squares-Structural Equation Modeling (PLS-SEM). The proposed research model was formulated largely under the premise of the Circular Economy (CE) theory. The main contribution of this study is to confirm the hypothesis that Hierarchical Culture (HC) diminishes the relationship between MSC and ESCP. This substantiates the need for construction firms to develop and adopt a more innovative culture, such as the Development Culture (DC), in order to drive circular practices and eventually contribute to the economic sustainability of Nigerian construction projects. The study also makes valuable contributions with regard to understanding the behavioral disposition of construction firms towards attaining sustainable outcomes.

KEYWORDS: Material Sustainability, Sustainable Material Management, Organizational Culture, Circular Economy, Economic Sustainability, Nigeria

Paper 103 – Modelling of VOCs Emission and Transport in Indoor Environment Using Finite Element Analysis

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ABSTRACT
The concentration of Volatile Organic Compounds (VOCs) in an indoor environment like beauty depends on its emission rate and transportation. Consequently, a better understanding of the dynamic behaviour of this pollutant in the indoor environment improves estimates of human exposure to indoor air pollutants**.** This study systematically evaluated the influence of four computational parameters on pollutant dispersion in a beauty shop. The computation parameters include turbulence models, grid resolution, and discretization of time step size and length of the sampling period. For concentration simulations, the Large Eddy Simulation (LES) and Detached Eddy Simulation (DES) models did not give any result because it had limitations in areas near the source, whereas the realizable k-ε turbulence model did gave a desirable result. An increase in the emission rate did not change the general dispersion characteristics, but it still affected the concentration distribution in the areas near the source and resulted in a larger polluted area. The findings of this study are intended to give a better understanding of the dynamic behaviour of VOCs in a beauty shop using CFD simulations, which will help develop a suitable control strategy.

KEYWORDS: Volatile Organic Compounds, indoor, beauty shop, ANSYS FLUENT, CFD, Modelling

Paper 104 – Value-Added Sesame (*Sesamum indicum*) Seed Candy Quality Prediction

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ABSTRACT
Sesame seed candy is a confection of sesame seeds and sugar or honey pressed into a bar or ball. This study focuses on the prediction of value-added sesame seed candy quality. Statistical design of experiment (DOE) method and response surface methodology (RSM) were adopted, mixture-process optimal design (I-optimal) was utilized to systematically vary the level of ingredients and processing parameters to identify the optimal combinations that leads to the highest quality of sesames seed candy. The proportion of ingredients (independent variables) taken were sesame seed (40 – 70%), ginger (10 – 30%), cinnamon (10 – 30%), and honey (10 – 30%) while the processing factor were roasting temperature (100 – 150ºC) and roasting time (10 – 30mins). Quality indexes of candy and sensory evaluation panels were used to evaluate the quality of the candy. Design Expert Software was used for the design and analysis of the experimental data. The qualities of the sesame seed candy are optimum at 62.133% sesame seed, 10% ginger, 15% cinnamon, 17.867% honey, 100ºC roasting temperature and 17.092 minutes of roasting time, the result obtained indicate that response surface methodology can accurately predict the quality of sesame seed candy.

KEYWORDS: Sesame seed candy, Quality prediction, Optimization, Quality indexes, Fortification

Paper 105 – Adsorption of Phenols from Tannery Wastewater Using Manganese Dioxide-Albizia Lebbeck Composite

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ABSTRACT
This study investigated the removal of phenols from Tannery wastewater by batch adsorption process using MgO-modified adsorbent synthesized from *Albizia lebbeck* pods, which is an agricultural waste. Brunauer–Emmett-Teller (BET), scanning electron microscopy (SEM), energy dispersive X-ray spectrometry (EDS) and X-ray diffraction (XRD), characterized the unmodified Albizia lebbeck (ALC) and modified Albizia lebbeck (MAL) adsorbents synthesized. The BET surface area of the ALC and MALC were 221.5 and 255.8 m^2/g, respectively. The batch adsorption studies were conducted to investigate the effect of contact time, temperature and adsorbent dosage on the uptake of Phenol from tannery wastewater onto the adsorbents. The adsorbents showed maximum adsorption efficiencies of 79.01 and 81.21% for ALC and MALC respectively. The result from this study showed that the synthesized adsorbents were found to be effective for the treatment of tannery wastewater as the residual concentration of phenolic of the treated wastewater was very low and falls within permissible limits for effluent discharge.

KEYWORDS*:* Adsorption, Tannery wastewater, Manganese dioxide, *Albizia lebbeck*, Composite

Paper 106 – Influence of Storage Duration and Packaging Material on the Quality of Value-Added Sesame (*Sesamum indicum*) Seed Candy

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ABSTRACT
Sesame seed candy is a type of candy that is made by combining sesame seeds and either sugar or honey. These ingredients are then formed into a bar or ball shape through pressing. This study aimed to investigate the effect of storage duration and influence of three packaging material on the quality of value-added sesame seed candy. Sesame seed candy samples were packaged in different materials, including Aluminum Foil Laminated Pouches (AFLP), Low Density Poly Ethylene (LDPE, 400 gauges), High Density Poly Ethylene (HDPE, 700 gauges) and stored for 60 days at room temperature. Proximate analysis, sensory analysis and microbial analysis of the samples were carried out every 5 days. The storability analysis of the sesame seed candies shows that both storage duration and packaging material has influence on the total plate count with p-value less than 0.0001. The longer the duration of storage the more the growth of bacteria. The mold count is only affected by the packaging material. Based on the experimental result, aluminum foil laminated pouches are the best material to package the candy and it will still maintain some of its vital qualities over a period of time.

***KEYWORDS*:** Sesame seed candy, Storage duration, Quality indexes, Deterioration, Packaging materials

Paper 107 – Energy Analyses of Briquettes Produced from Torrefied Locally Sourced Groundnut Shell

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ABSTRACT
In this work, the energy analyses of Briquettes produced from locally sourced Groundnut Shell was determined and the proximate and ultimate analysis of the torrefied Groundnut Shell was carried out. In the preparation of the Briquettes (Groundnut Shell Briquette), cassava starch was used as a binder. The concentration of the binder was varied between 20 – 60 wt% while 70g of the sample was used throughout the experiment. The Calorific Values of the produced Briquettes were done using the Oxygen Bomb Calorimeter. Design Expert Central Composite design tool was used in the Design and Response Surface Methodology was used to optimize the Calorific Values of Groundnut Shell Briquettes. The Groundnut Shell Briquettes with optimized conditions were produced using 39.525 wt% binder concentrations, 57.512 seconds dwelling time and 4.316 MPa compaction pressure. The result showed that the Groundnut Shell Briquette gave 17.869 MJ/Kg Calorific Value. The Groundnut Shell Briquette gave the water boiling test and burning rate of 15.82 min and 0.22 g/min respectively. Therefore, Groundnut Shell briquette will be a good source of alternative energy since it is within the range of 17.00 MJ/kg – 24.00 MJ/kg.

KEYWORDS: Briquettes, Calorific Value, Water Boiling Test, Burning Rate, Dwelling Time.

Paper 108 – Impact of Fish Farming on The Water Quality of River Chanchaga, Minna

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ABSTRACT:

This study aimed to assess the impact of effluent discharge from aquaculture fish farm on the water quality of a nearby receiving River Chanchaga Minna (9° 35′ 00" N, 6° 35′ 00"E) in Niger State. Some physiochemical water quality parameters of the effluent receiving stream were determined at seven selected sites, above and below the effluent discharge point into the stream to assess the effluent impact on the water body. The water quality parameters investigated include (water temperature, true color, turbidity and transparency), chemical parameters (pH, conductivity, TDS, total alkalinity, total hardness, ammonia and DO), major ions (Ca^{2+}, Mg^{2+}, $Na+$, $K+$, $Cl-$, $SO4^{2-}$ and HCO^{3-}), nutrient compound and heavy metals. Water samples were collected for: both rainy and dry season and analyzed in the laboratory using standard analytical methods. The effluent discharge from the investigated fish farm had a significant negative impact on the water quality of the receiving River and the indicator parameters comprised of ammonia, color and alkalinity.

KEYWORDS: Aquaculture, water quality, nutrients, river, wastewater, environment

Paper 110 – Design and Simulation of Hybrid Power Supply for Residential Consumer

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ABSTRACT

Hybrid Power System (HPS) is a combination of different renewable resources such as wind, solar, biomass, hydrogen fuel, hydro, with fossil fuel powered diesel generator to provide electric power. The objective of this work is to propose a methodology for designing a stand-alone hybrid PV/diesel/battery system minimizing the Cost of Energy (COE) and the CO_2 emission using HOMER (Hybrid Optimization of Multiple Electric Renewables) for a residence at Marcus Poli Estate Gwarinpa, Abuja, Nigeria. The capital cost, cost of energy, Net Present Cost (NPC) for different types of resources are determined from the load demand and optimized configuration of hybrid system are obtained. The analysis results show that, among five hybrid systems for supplying electrical requirements, the most economical is the PV - diesel -battery hybrid system, which has a total net present cost of US$118,771 and a cost of energy of US$0.340/kWh. The action plan is formed on the basis of cost-effective modelling that is minimization of energy production cost in a near future.

KEYWORDS: Cost of Energy; Hybrid Power System; MPPT; Net present Cost; Power Demand; Renewable Energy.

Paper 111 – Design of A Leukemia Detection System Using Digital Blood Smear Images

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ABSTRACT

Leukaemia is a fatal blood cancer that occurs due to the formation of abnormal and excessive increases in white blood cells in the bone marrow or blood. The traditional approaches used to diagnose the disease involve the manual analysis of blood sample images obtained from a microscope. This approach is tedious, slow, time-consuming, and prone to errors. Therefore, automatic detection of leukaemia based on the counting of the two blood cells is paramount for diagnosis and increasing the patient's survival rate. This paper presents a system that can detect each of the two blood cells needed through image processing, segmentation, and classification. The detection, classification, and counts are only limited to two of the cells present in the digital blood smear which are the white blood cells (WBCs) and red blood cells (RBCs). The model was evaluated with a collection of confirmed cases and normal cases to test its effectiveness in predicting the presence of Leukaemia by computing the ratio of WBC to RBC. The suggested model exhibits good performance results and can be utilized to make a reliable computer-aided diagnosis detection of leukaemia cancer.

KEYWORDS: Leukaemia, White Blood Cells (WBCs), Red Blood Cells (RBCs), Detection, Machine Learning, Blood Smear.

Paper 112 – Sustainable Solid Waste Management at Gregory University Uturu

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ABSTRACT

As man carries out his daily activities, waste is generated leading to pollution; and the associated challenges in the proper and sustainable management of the waste. The universities are in no wise exempted from the rapid pollution from municipal solid wastes. In this study, the wastes generated at the Gregory University Uturu campus were quantified and classified according to standards, and possible strategies suggested for sustainable waste management. During the study, an average of 449.8 kg/day (0.45 tons/day) were generated, with plastics and polythene wastes having the largest proportions of 35% and 25% respectively. Whereas other waste categories which include paper, organic, metal, e-waste, medical waste, textile, and others resulted in 15%, 12%, 4%, 2%, 1%, 1%, and 2% respectively. The campus generates waste at approximately 0.21 kg/capita/day and about 82% of the waste can be recycled. Using the waste-to-energy approach, a minimum of 22.kWh of electricity can be generated per day. The study recommends the adoption of the waste management hierarchy (reduction, reuse, anaerobic digestion, incineration, and landfilling) as a sustainable approach to managing waste in the University.

***KEYWORDS*:** Solid waste management, Pollution, Sustainable approach, Universities

Paper 113 – Solid Waste Management in A Nigerian University Hostels

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ABSTRACT
Waste generation rate and characterization are prerequisites for developing a sustainable solid waste management system. This study presents the generation rate and characterization of solid waste within the hostels in University of Ilorin Campus. The study was aimed to determine the amount of waste generated and propose better disposal method. Structured questionnaires were administered both physically and online with 400 and 157 respondents obtained respectively. Data was analyzed using statistical tools. Quantification and characterization were also carried out in the 38 hostels within the campus. A total of 1528 Kg/day were generated in the hostels out of the 3255 Kg/day generated in the University. Methods of disposal observed were open burning (32.7%), open dumping (26.2%), Incineration (20.3%), burial in a pit (14.5%), others (6.3%). Food, polythene, plastic, glass, and metal wastes were major categories found. The study revealed 100% recyclable materials. It is therefore recommended that University of Ilorin school management take immediate action by educating the entire populace within the school premises on the concept of 7R's or creating awareness and/or other waste to wealth initiatives in their solid waste management system. It is also recommended that there should be sanction(s) for mismanagement of solid waste within the hostels on campus.

***KEYWORDS*:** Waste generation, Waste characterization, Hostel, waste disposal/ end point, Ilorin

Paper 114 – Disturbance Observer for Harmonic Suppression of a Z-Source Inverter Fed Three-Phase Induction Motor Drive

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ABSTRACT
To minimize the detrimental effects of the pulse-width modulated (PWM) voltage and harmonics of a non-linear load, a second-order inductor-capacitor (LC) low-pass smoothing filter is usually added between the inverter and the drive. However, the output voltage drop via the filter inductor and resonance frequency effects are taken into consideration while designing the filters, as a result, baseband harmonics, which make up the majority of the harmonics produced by the frequency converter, are not completely removed. This paper proposes a control system for an impedance source inverter (ZSI)-driven three-phase induction motor drive to minimize AC-side voltage and current harmonics. The control system uses an observer-based output feedback servomechanism controller designed using linear quadratic techniques and linear matrix inequalities, which ensures closed-loop stability and asymptotic tracking regulation regardless of disturbances. A speed adaptation mechanism is added to the observer to enable speed-sensorless operation. The controller is evaluated using several MATLAB/Simulink simulations, which demonstrate perfect tracking, good disturbance rejection, and low voltage and current total harmonic distortions (THD).

KEYWORDS: Linear Matrix Inequality, Induction Motor, Robust Servomechanism, Observer, Harmonics, Stability

Paper 115 – The Design of Engine with Reduced Emitted Pollutants on the Environment

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ABSTRACT

Two major emitted gases from the combustion engines which pollute the environment are nitrogen oxide (NO_X) and Carbon iv oxide (CO_2). In this study, a redesign engine is presented which extract nitrogen from the air before combustion and Carbon iv after combustion. The components of the redesign engine include the nitrogen extractor chamber, the combustion chamber, the cyclone and the carbon iv oxide absorption chamber will be modeled in order to obtained the relationship between the input and output parameters in each section. These parameters which will be the basis for designing the model include the airflow rate, pressure, temperature, as well as the chemical combustion of the gases at each stage. For the absorption of nitrogen Al_2SiO_5 was use while KOH was used at the exhaust end to absorb the carbon iv oxides. For the four stroke petrol engine used for the experiment, the exhaust temperature at normal working condition using oxidant containing nitrogen was 200^oC, but when the air was bubbled through Al_2SiO_5 at a concentration of 40g/dm^3 the exhaust temperature increased to 300^oC which is about 50% increase. At the exhaust the CO_2 produced was 6.66 but upon passing the exhaust gas through KOH after using the redesign engine, the percentage reduction at 67% KOH was 64%.

KEYWORDS: Pollution, gases, combustion, re- design engine.

Paper 116 – Probabilistic Modelling of Flood Flow Along Mgeni River at Table Mountain, South Africa

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ABSTRACT

Accurate flood prediction is indispensable for effective environmental protection. This study establishes best-fit probability distribution models for estimating annual maximum flows at Table Mountain along the Mgeni River. Six probability distribution functions (Normal, Log-Normal, Pearson III, Log-Pearson III, Gumbel and Log-Gumbel) were fitted to the annual maximum flow series of the river. Reliability of raw data was verified using the Spearman-brown reliability check. The non-parametric Chi-square goodness-of-fit statistical test was employed to determine the suitability of the functions in representing the observed data at a specified level of significance. The Kruskal-Wallis non-parametric H-Test was employed to determine if there were significant differences in the performances of the models. Finally, a test score statistics was used to establish the most appropriate model for application in the study area. It was found that the Log-Pearson III probability distribution function, which is a 3-parameter model taking cognizance of a skew coefficient in estimation, is the most suitable model. The Log-Normal and Pearson III models were also found suitable while the Normal, Gumbel and Log-Gumbel models were not suitable at the tests' level of significance. The models found suitable are recommended for predicting flood flows in the study area.

KEYWORDS: Annual maximum flow, Probability distribution function, Flood prediction, Goodness of fit test, H-test, Test score

Paper 117 – Affordable Housing Using Indigenous Building Materials

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ABSTRACT

Provision of Housing in Nigeria has been overwhelmed by many challenges over a long time. These setbacks have been categorized as both qualitative and quantitative. The challenges have continued to become a nightmare which has affected the socio-economic aspect of Nigerian, even though some efforts have been made to curb these lapses such as the Presidential Executive Order No. 5 to improve local content in public procurement with science, engineering and technology components. One of the major challenges is the high cost of building materials. These high cost of building materials has become a bottle-neck to developers trying to make profit off their investments thereby increasing the cost of the houses being constructed for the masses. It has become paramount for the Nigerian government to curtail the crisis resulting to the high cost of housing in Nigeria which calls for innovative solutions, and more funding for research institutes to drive the Research and Development sector to develop and improve an indigenous building technology to ease housing development in Nigeria. This paper therefore tends to explore indigenous building materials and technologies that are cheap and readily available in order to ease housing construction in Nigeria.

KEYWORDS: Affordable, Indigenous Materials, Housing Deficit, Sustainability.

Paper 118 – Hydrogen Economy: Panacea to Air Pollution Problems and Prospects for a Cleaner Planet Earth

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ABSTRACTS

One of the biggest issues facing planet Earth is environmental degradation brought on by human activities. Studies have shown that 89% of the pollution that exists on Earth today is due to the use of fossil fuels. In order to green the world and provide clean, sustainable energy, engineers and scientists have been looking for a pollution-free, readily available fuel choice for the transportation and industrial sectors. The hydrogen gas economy has been chosen as the greatest solution. This hydrogen economy has the potential to displace the need for fossil fuels. This review study discourses the possibility of using hydrogen gas as an energy source to create a cleaner planet through decarbonization. The role of hydrogen as the foundation for greener and cleaner energy in the industrial and transport sectors, utilizations on its zero emissions, increasing electrification through fuel cell technology, and profits of hydrogen economy on the environment were substantially discussed. With a hydrogen economy, planet earth will reach its natural state of equilibrium

KEYWORDS: Climate Change: Cleaner Earth: Clean Energy: Clean Environment: Pollution Free

Paper 119 – Maximum Power Tracking of Photovaltaic Under Partial Shading with Spring Search Algorithm Integrated with Perturb and Observe

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ABSTRACT
Solar power generation is perfectly suited for clean energy and meeting the increasing energy demands owing to its abundance and easy maintenance. However, it has low efficiency as maximum power is not extracted from the photo-voltaic panel due to solar irradiance obstruction causing partial shading condition. This condition creates multiple power peaks of which the maximum power peak is selected for maximum power utilization. To achieve this, a tracker based on spring search algorithm integrated with perturb and observe algorithm (SSA-PO), and operationally tied with DC-DC boost converter was developed for maximum power point tracking of the photovoltaic system at constant solar irradiance and during partial shading conditions. This generated a tracking efficiency of 97.8% at PSC1, 96.3% at PSC2 and 96.9% at PSC3, therefore, yielding an improvement of 0.15% and 2.29% during constant and partial shading conditions, and tracking time was 6.8% and 2.5% improvement when compared with the result of artificial bee colony algorithm with perturb and observe (ABC-PO).

KEYWORDS: Boost converter, MPPT, Partial shading, Photovoltaic, Tracking efficiency.

Paper 120 – Short-Term Load Forecasting for Microgrid System Based on Artificial Intelligence Techniques

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ABSTRACT
Microgrids are becoming increasingly popular as a means of providing localized and reliable electricity supply, particularly in remote or isolated areas. Accurately forecasting short-term electricity load demand is essential for effective microgrid management and optimal resource allocation. In this study, we present a short-term electricity load demand forecast for a microgrid system with an 11 kV dedicated feeder of the University of Jos, Plateau State, using three machine learning techniques: Adaptive Neuro-Fuzzy Inference System (ANFIS), Particle Swarm Optimization-ANFIS (PSO-ANFIS), and Support Vector Machine (SVM). The study utilizes five years of historical load demand data obtained from the Jos Electricity Distribution Company (JEDC) and weather data, including temperature, humidity, wind speed, and solar radiation, obtained from NASA for January 2018 to January 2022, with data distribution of 80%, 10%, and 10% for training, testing, and validation. The results show that PSO-ANFIS outperforms, ANFIS and SVM, with RMSE, MSE, and MAPE of 3.0372, 8.2478, and 1.7868 for PSO-ANFIS,3.1663, 10.0254, and 3.1511 for ANFIS, while SVM yields an RMSE, MSE, and MAPE of 6.9721, 24.4407, and 4.6789 respectively. This study demonstrates the effectiveness of PSO-ANFIS in forecasting short-term electricity load demand for microgrid systems, providing valuable insights for energy management and decision-making.

KEYWORDS: Energy, Forecasting, Load demand, Management, Microgrid, and Optimal

Paper 122 – Extraction and Characterization of Keratin Protein from Chicken Feathers using Alkaline Hydrolysis Method: Effects of Sodium Sulphide Concentration and Shelf-life Evaluation

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ABSTRACT
This study investigated the extraction of keratin protein from chicken feathers through alkaline hydrolysis using sodium sulphide as a digesting agent. The protein was precipitated using hydrogen chloride and confirmed through biuret test, solubility test, sulfur test, and FTIR analysis. The effect of varying sodium sulphide concentrations (0.5 M, 0.75 M, and 1 M) on the extracted keratin was evaluated. Results showed that a higher concentration of sodium sulphide produced a higher yield of keratin, with 1 M producing 65.8% yield. However, the shelf-life of wet keratin extracted using 1 M concentration was four weeks, compared to six weeks for 0.5 M and 0.75 M concentrations. The dried keratin was unaffected after six weeks. The study suggests that a higher concentration of the reducing agent produced a higher yield of keratin protein but with a shorter shelf-life if drying was not carried out. The utilization of abundant waste generated by poultry industries is crucial in reducing pollution and creating opportunities for valuable product development. The extraction of keratin from chicken feathers provides an eco-friendly approach to waste management and creates opportunities for product development.

KEYWORDS: Keratine, Chicken feathers, Shelf-life, Yield, Drying, Hydrolysis

Paper 123 – Development of a Keratin-based Hair Cream Formulation for Replenishing Damaged Hair: A Response Surface Methodology Approach

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ABSTRACT
This study aimed to develop a hair cream formulation that can replenish damaged keratin in hair caused by various hair treatments and activities. The active ingredient used in the hair cream was keratin extracted from chicken feathers. The hair cream formulations were designed and optimized using simplex lattice response surface methodology. Ten samples were produced by varying the percentage of distilled water, keratin protein, and emulsifier, while keeping all other ingredients constant, and the responses were pH and viscosity. The optimal percentage of the varied ingredients was determined as 54.54% distilled water, 2.59% keratin protein, and 7.87% emulsifying wax, with a pH of 6.0 and viscosity of 21,222cps. The selected optimal solution had a desirability value of 0.92. Stability assays were conducted to study the organoleptic properties, pH, phase separation, and spreadability of the hair cream formulations. The formulations exhibited great stability at room temperature (25°C) and -5°C, but were unstable at 50°C. The pH range of the formulations was adjusted to be within the isoelectric pH range of the hair. Therefore, the use of keratin extracted from chicken feathers as the active ingredient has a high potential to replenish damaged hair and provides a sustainable approach to hair care.

KEYWORDS: Hair, Keratine, Isoelectric pH, Viscosity, Chicken feathers, response surface methodology

Paper 124 – Optimal Siting and Sizing of D-STATCOM for Power Loss Reduction in Distribution Networks using Bacterial Foraging Algorithm

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ABSTRACT
This paper describes the optimization operation of a distribution network for the purpose of reducing operational expenses and increases the performance of the entire system. The objective of this research is to optimally allocate and size the required kVAr for a Distributed Static Synchronous Compensators (D-STATCom) for a distribution network in order to improve the voltage profile and reduce the total line losses. D-STATCom is a shunt compensating device which is connected to voltage control converter. Bacterial Foraging Algorithm (BFA) was deployed for allocating and sizing of the D-STATCom. BFA is a natural inspired Algorithm that allow bacterial to search for food and avoid harmful substances. The proposed algorithm was demonstrated in IEEE 33 bus and Irrua Distribution Network (IDN). It was observed that the proposed algorithm sited D-STATCom at bus 14 with kVAr value of 3350 and reduces the kW and kVAr losses by 56.61% and 54% respectively for IEEE 33 bus and sited D-STATCom at bus 38 with kVAr value of 5090 and reduces the kW and kVAr losses by 46.7% and 43.4% for IDN. The proposed algorithm was compared with other existing algorithm; the proposed algorithm gave a better result in term of power loss reduction. The optimal siting of D-STATCom devices and proper sizing was able to reduce the total line losses and improve the voltage profile of the networks.

KEYWORDS: D-STATCom, power loss, distribution network, and voltage profile.

Paper 125 – Analysing Gene Expression Data of Patients with and Without Ovarian Cancer Using Dynamic Mode Decomposition

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ABSTRACT
Machine learning (ML) algorithms have been deployed in recent years as models for the analysis of complex data. The ubiquity of ML algorithms stems from their ability to learn the patterns and structures inherent in data. In addition, they are adaptable to a wide range of data types, irrespective of size, which allows them to learn and predict the future pattern of data. In this work, dynamic mode decomposition (DMD), an ML algorithm, is deployed to analyse the pattern of gene expression data from patients with and without ovarian cancer. Ovarian cancer is one of the deadliest gynaecologic cancers in the world. The obscure nature of the symptoms makes early detection of ovarian cancer difficult. If the disease is diagnosed early, the chance of survival increases for patients. In this work, DMD is applied to analyse gene expression data from patients with and without ovarian cancer to understand the spatiotemporal patterns of the data. The DMD modes captured the prevalent structures and predicted the future state of the data. The results obtained show that DMD is a promising algorithm that can predict the features inherent in gene expression for patients with and without ovarian cancer. The DMD modes can further be applied as features to train detection and classification models that can assist health practitioners in the quest for early detection of ovarian cancer through gene expression data.

KEYWORDS: DMD, eigen decomposition, eigenvalues, eigenvectors, ML, ovarian cancer, SVD

Paper 126 – Production of Biogas from Anaerobic Co-Digestion of Pineapple Crown and Cattle Dung in A Batch Digester

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ABSTRACT
Biogas production from agricultural waste is gaining more attention from researchers in the biofuel industry. However, many of the findings from biogas production have not been implemented, especially in the rural area wherethe agricultural waste is mostly available. This study was aimed at the determination of the influence of biochar (BC) on biogas yield from anaerobic co-digestion of pineapple crown (PC) and cattle dung (CD) using a domestic batch digester. Thefeeds where characterize to determine moisture content, ash yield, total solid, volatile solid, fixed solid content, and pH. The nanoparticle size of biochar was determined using Dynamic Light Scattering (DLS) instrument. In the first experimentalsetup, biogas was produced from anaerobic co-digestion of PC and CD in the fabricated batch digester, while biogas was also produced in the anaerobic co-digestion of PC and CD in the presence of BC. Biogas was collected at 30- and 45-days hydraulic retention time (HRT). The gas analyzer revealed the major composition of the incombustible biogasfrom PCCD at 30 days HRT to be CH_4 (50.38 %), while PCCDBC has CH_4 (40.38 %). At forty five days HRT, a combustible biogas was produced from PCCD with 59.42 % CH_4 and 54.2 % CH_4 as major gas composition in PCCDBC. Forty five days HRT is more suitable for the production of combustibles biogas from both PCCD and PCCDBC using locally fabricated batch domestic co-digester. The biogas produced in this study is suitable for domestic cooking.

KEYWORDS: Agricultural wastes, Biochar, Biogas, Cattle dung, Co-digestion, Pineapple crown

Paper 129 – Mathematical modelling of welding parameters and their effects on energy consumption in welded Cr-Mo metal

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ABSTRACT
This study examined the mathematical modelling of the effects of heat flux on welded Cr-Mo flat steel bars using the TIG arc welding method (ASTM A304). The TIG method employed was a double-sided half V-groove welding process with heat moving source while varying welding parameters such as material thickness, number of passes, electrodes' types and electric current in the process of welding. The mathematical transient heat transfer equations generated were run on Autodesk CFD 2018 software with welding parameters as inputs. The software was used to generate the 3-D model heat (temperature) profiles of the welded metal from the point of welding through the heat-affected zone to the parent metal. The temperature fields of the process produced by the software were distinguished by colours with the high intensity of heat being the welding zone (red) and the least at the parent metal (light blue). The temperature fields obtained were compared with the experimentally obtained values and found to be very close in values with the modelled values being slightly higher. The study demonstrated that modelling welding heat flux even before undertaking the process is a reliable tool to adopt in the welding of the Cr-Mo flat steel bar.

***KEYWORDS*:** modelling, welding parameters, heat flux, electrodes.

Paper 134 – Experimental Evaluation and Optimization of Organic Materials for the Development of Free-asbestos Brake Pads

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ABSTRACT
This study presents evaluation and optimization of locally available organic materials for the development of asbestos free brake pads. Some eco-friendly materials for automobile brake pads selected locally are rice husk fibres, gum Arabic, graphite, quartz and steel dust were processed and evaluated for possible asbestos replacement in comparison with the commercial brake pad materials. The material were processed and characterised for elemental composition, microstructural analysis phase presents and observe chemical properties. Using scanning electron microscope (SEM) equipped energy dispersive x-ray spectroscopy (EDX), x-ray diffractometer (XRD) spectrometer and Fourier transform Infrared Spectrophotometer (FTIR) respectively. Commercial brake pad XRD spectrum consist of three compounds exhibit a sharp, tight peak and wagging movement to attest that, the compounds are crystallite and amorphous. While, all the selected materials are also crystallite, excluding gum Arabic and rice husk that are amorphous. Characterization of SEM-EDX shows that, the commercial brake pad has similar element composition with the selected reinforcement materials, except barium oxide find out to be the based materials in the commercial brake pad that was alternatively replaced by rice husk in the new laboratory formulation. Also, it was determined that FTIR analysis of the commercial brake pad has common functional group of 1, 3 – disubstitution (meta) (C-H), alkyl-substituted ether (C – O) stretch, skeletal (C-C) vibrations aromatic tertiary amine (CN) stretch and vinyl (C-H) in-plane bend molecules with the selected materials for new laboratory formulation. Hence, this is accentuating that, the materials can be alternative use for production. It can be finally concluded that the locally available raw materials selected has been evaluated with higher quality than the existing properties of the commercial brake pad which can definitively leads to its low cost of its production.

KEYWORDS: Brake pad; Microstructure; Rice Husk; Scanning Electron Microscope; Asbestor

Paper 135 – A Brief Review of Water Pumps Category and Their Power Sources

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ABSTRACT
Water is the driving force of nature, without it, life will mean nothing. Ground water provides about half of the water requirements for human existence. This paper presents a review of different groundwater pump categories and their power sources available from literature. The review covers positive displacement pumps and centrifugal pumps. The power sources for the groundwater pumps reviewed includes manual, electric and fuel sources. The merits and de-merits of the different category of pumps reported by different authors was also highlighted. It was concluded that manually powered borehole water pumps are the cheapest and the most widely acceptable water pumps especially in rural communities of developing countries while the fuel powered pumps is the most expensive power source.

KEYWORDS: *Borehole, Ground water, Manual power, Pumps*

Paper 136 – Characterization of Pit Sand Obtained from Selected Locations in The South Western Zone of Nigeria

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ABSTRACT
Sand is about the commonest fine aggregate available in South Western Nigeria. Of the various types of natural sand, pit sand is the most readily available and most widely used. However, not all available Pit – sand is fit for concreting works. This study focusses on the characterization of Pit sand obtained from selected locations across the South Western zone of the Country. From the values obtained the conformity with relevant standards and the suitability for concreting works was determined. Samples of Pit – sand were collected from three different locations from each of the five states in the zone. Sieve analysis test were carried out on all the samples and the values of fineness modulus (FM), coefficient of uniformity (Cu) and coefficient of curvature (Cc) were determined. Other properties considered are specific gravity (SG), water absorption (WA), and percentage silt content (SC). These values were compared with values stipulated in British standards and other relevant literatures. The range of the values of FM, Cu and Cc SG, WA, and SC are 4.16 – 4.68, 2.63 – 10, and 0.53 – 2.56 2.67 – 2.86, 0.67 – 2.04 and 5.4 – 18.18 respectively. Conclusively, while some of the samples are suitable, some are not.

KEYWORDS: Characterization, Pit – Sand, Selected, Locations

Paper 137 – Computational Development and Aerodynamic Analysis of a Single-Stage Launch Vehicle to Subdue Post-Launch Risk

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ABSTRACT
The aerospace industry has prioritized reducing fatalities and failure rates after the launch of a vehicle resulting from system or engine failure. Rocketry has been difficult over the years, and international players in the industry are constantly attempting to learn from any failures. This paper aims to decrease material, resource, and payload waste while ensuring crew safety by focusing on the computational modelling and aerodynamic analysis of a single-stage launch vehicle. CATIA V5 was utilized to create the computational model of a triggered nose cone rocket booster while ANSYS was used to analyse the trigger nose cone at different angles of attack and determine how the trigger nose cone will behave in case of emergencies such as system or engine failure, which could lead to the complete explosion of the launch vehicle. Based on the current findings, the trigger nose cone is not in the safe zone when ejected at an angle of attack greater than 20° due to the shockwave's effect on its surface when ejected from the main body of the launch vehicle.

KEYWORDS: Post-launch, Engine failure, Single-stage launch vehicle, Trigger nose cone, Combustion chamber.

Paper 141 – Communication Range Assessment of Lora-Based IOT Sensor Node for Smart City Applications

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ABSTRACT
In this paper, communication range assessment of LoRa-based IoT sensor node for smart city application is presented. Specifically, the effect of Degree of Urbanisation (DoU), payload size and bit error probability (BEP) on the sensor node communication range are considered. Semtech SX1272 LoRa transceiver operating in the EU868 (863–870/873 MHz) frequency band with spreading factor of 12 and transmitter power of 13 dBm, was used for numerical computations using Visual Basic for Applications (VBA) as implementation tool. The results show that for rural area with building coverage of 3 %, the communication range are 16.854 km and 16.338 km while BEP are $5.186x10^{-04}$ and $1.307x10^{-04}$ at payload size of 5 bytes and 51 bytes respectively. Similarly, DoU corresponding to urban area with building coverage of 16 %, gave communication range of 4.994 km and 4.841 km with BEP of 5.186E-04 and 1.307E-04 at payload size of 5 bytes and 51 bytes respectively. Specifically, based on the results, a minimum payload size of 26 bytes was selected and it has transmission range of 16.519 km for PB of 3 %, 8.100 km for PB of 8 % and 4.895 km for PB of 16 %. In any case, although the lower payload size gives higher communication range, small payload size requires higher percentage of overhead bits and also has higher bit error rate which leads to lower data delivery success ratio. As such, in practice, careful compromise is required between payload size and communication range.

KEYWORDS: Bit Error Probability, Communication Range, LoRa, Sensor node, Internet of Things, Smart City Application

Paper 142 – Synthesis and Characterization of Zeolite a From Aloji Kaolin Via Hydrothermal Method

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ABSTRACT
This study focused on the synthesis and characterization of Zeolite A from Aloji kaolin via the hydrothermal method. The effect of short crystallization times (0.5h, 1h, 1.5h, 2h, and 3h) and high crystallization temperature of 115℃ on the formation of Zeolite A as the final product was investigated. The characterization of the synthesized Zeolite A was conducted using Scanning electron microscope (SEM), X-ray diffraction (XRD), and Brunauer- Emmett- Teller **(**BET) analysis. The results showed a well-developed Zeolite A with cubic morphology and a crystallinity of 78.12%, as well as a surface area and pore size of 18.8832 m^2/g and 178.461 Å respectively was successfully synthesized using high alkali concentration (5 mol/L) and a crystallization time of 3h. The findings provide a valuable insight into the synthesis of Zeolite A from kaolin and its potential application in various fields.

KEYWORDS: Kaolin, Zeolite, Crystallization, Temperature, Hydrothermal.

Paper 143 – Parameters Characterization of Wireless Technologies: An Indoor Localization Perspective

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ABSTRACT
The persistent rise in demand for affordable indoor localization systems and technologies capable of accurately predicting the real-time location of targets has been observed. While the Global Navigation Satellite System (GNSS) has proven its reliability in outdoor, it falls short of the required accuracy for indoor environments. In response, multiple wireless technologies have been proposed as potential alternatives to deliver location-based services in indoor settings with minimal errors. However, studies that comprehensively analyze and evaluate the parameter characteristics of these evolving technologies in indoor applications remain rare. In this regard, this paper assesses and characterizes different wireless technologies based on six parameters. Our study examines four short-range including WiFi, BLE, Zigbee and UWB, and the two long-range wireless technologies such as LoRa and WiFi Halow. The selected technologies are characterized using available information and distance-dependent models in terms of frequency band, data rate, coverage area, power consumption, signal-to-interference-plus-noise ratio, smartphone availability and deployment cost, and application. Result indicates that UWB is suitable for small indoor environment because of wide frequency band, this is followed by WiFi, BLE and Zigbee while LoRa is ideal for large indoor environment. LoRa has the least energy consumption followed by BLE. The energy consumed by Zigbee and UWB are considerably low while WiFi consumes the most energy. WiFi, BLE and UWB are smartphone accessible, hence they have the lowest cost while other technologies need extra hardware for deployment. These findings can be used as a guideline in selecting a wireless technology for an indoor localization system based on application requirements.

KEYWORDS: Indoor localization, WiFi, BLE, Zigbee, UWB, LoRa and WiFi Halow

Paper 144 – Assessment of The Significance of Gis-Based Watershed Analysis for Effective Water Resources Management

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ABSTRACT
Traditional techniques have been used over the years for the determination of watershed characteristics and runoff. Technological advancements in the area of remote sensing and Geographic Information Systems have proven to be more effective techniques that can produce more accurate results, save time and remove most human errors. The efficiency of using GIS-based techniques for watershed analysis was explored in this study, using the Galma River catchment as a case study. Characteristics such as Area, perimeter, time of concentration, length of overland flow, longest flow path, time to recession, and peak discharge amongst others were determined using traditional manual techniques and GIS-Based techniques. The results from both methods were compared using the student's t-test. In addition to a strong correlation of 0.98 observed for results from both methods, the results showed that the difference in the estimates from both techniques was not statistically significant at a 95% confidence level since the *t stat* (1.528) is less than the *t critical-two tail* (2.120) and the *P (T<=t) value* of 0.266 is greater than 0.005. It was concluded that the GIS-Based techniques for watershed analysis are reliable, accurate, and time-saving methods that should be explored in Water resources studies.

KEYWORDS: Discharge, Flood, Gamji catchment, GIS, Watershed analysis, Water resources

Paper 147 – Storage Stability of Optimized Foam-Mat Dried Tomato-Pepper-Onion Powder Under Different Packaging Conditions

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ABSTRACT
The storage stability of optimized foam-mat dried tomato-pepper-onion powder was evaluated under different packaging conditions. The powder was prepared using a foam-mat drying technique and optimized using response surface methodology. The levels for various input variables were tomato (5 – 76%), pepper (5 – 78%), onion (5 – 80%), egg white (2 - 15%), carboxymethyl cellulose (0.15 - 0.75%) & Drying temperature: 50-80^{o}C. Laminated aluminium foil, high density polyethylene and medium density polyethylene were three distinct packaging types used to package the optimized powder. Every five days, the storage stability of the powders was checked while they were kept at room temperature for 30 days. The amount of MC, lycopene, protein, and microbial growth were assessed in the powder sample. The findings demonstrated that, in comparison to the control group, all packing options considerably increased the powder's storage stability. The LAF was the most effective in keeping moisture from entering the package and was also able to preserve the most lycopene content (10.40%) as compared to the control value of 10.21%, while also having the lowest moisture content over the course of storage at 4.39 percent.

KEYWORDS**:** storage stability, foam-mat drying, tomato-pepper-onion powder, packaging conditions, compositional changes, viable load

Paper 148 – Expert System for Troubleshooting and Repair of Computer Engineering Laboratory Equipment

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ABSTRACT
Technologists and Technicians in Computer engineering Laboratories have been conducting practicals for students with a number of equipment, maintenance of such equipment and detection of faults on them are being carried out with a conventional approach. However, with advancement in Computer Technology and Artificial Intelligence, there exists few or no expert system that can be used in troubleshooting and repair of equipment in Computer Engineering Laboratories. This research proposed expert system for the maintenance and repair of equipment in the Computer Engineering Laboratories. Data was collected on five (5) equipment in the three (3) Computer Engineering Laboratories namely Computer Technology Laboratory, Control Engineering Laboratory and Basic Electricity/Measurement and Instrumentation laboratory from three (3) higher educational institutions in southwestern areas of Nigeria. The data was encoded into If-then -rules, programmed with Python programming language and My Sql. A user interface was designed to guide users through the use of the system and display appropriate outputs. A test was carried out by four (4) users in one of the institutions to get their remarks and feedback on the Expert System. It was concluded that the expert system can be used to troubleshoot, repair and maintain computer engineering laboratory equipment by the Technologists and Technicians.

KEYWORDS: Computer Engineering, Equipment, Expert system, Laboratory, Technologists

Paper 149 – Temperature and Relative Humidity Distribution Analysis of a Poultry in Subtropical Area of Nigeria

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ABSTRACT
The design of the ventilation system to ensure microclimate conditions are optimum in poultry houses in the Nigerian context requires knowledge of the microclimate parameter distribution, which is lacking in the literature. This study investigated the patterns of temperature and RH distributions in a typical local poultry house. The specific objectives were to analyse the vertical and horizontal distributions of the microclimate parameters in battery cage poultry housing and deep litter poultry housing, identify whether the distribution is homogeneous or heterogeneous, and identify the data spread of parameters. An experimental intensive naturally ventilated local poultry house was used for this study. It consisted of deep litter (DL) and battery cage (BC) poultry housing systems partitioned by an air wall. Day-time, night-time, rainy, and dry season temperature and RH distributions in the BC and DL poultry housing were analysed. Approximately 1.2 °C temperature difference was recorded between the poultry house and the ambient environment during the day and night. The temperature and RH distributions in the poultry housing were heterogeneous. Approximately 5% and 67%–73% of the day-time and night-time temperature data, respectively, and 37%–41% of daytime RH fell within the optimum values.

***KEYWORDS*:** Temperature, relative humidity, distribution, poultry, microclimate, heat stress

Paper 152 – A review of water absorption in water hyacinth reinforced high density polypropylene (HDPP) composite

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ABSTRACT
Natural plant fibre-reinforced composites have been in use as engineering materials in recent times. They are advantageous because of their light weights, biodegradability, cost and are environmentally friendly. In this paper, a composite of size 75mm x 3.77mm x 20.65mm was developed from 55 grammes of high density polypropylene (HDPP), 35 grammes of water hyacinth, and 10 grammes of aluminium powder used as a binder. A second sample was produced in the same quantity but was coated with 0.05 micron-film of zinc primer (which weight is negligible). The weights of the composites were initially weighed in the dry forms and recorded. Each of the samples was immersed in same quantity of distlilled water for 35 days while the differences in weight percentage in their dried forms and wet forms were noted at intervals of five (5) days by a weighing/timing sensor attached to immersion apparatus for the period. It was noted that the sample with zinc primer weighed less at each measuring interval than the one without; this suggested that water absorption can be minimized with the application of zinc primer or other materials that are water-proofed. Fibre loading was also varied in the composites at 10, 15, 20, 25, 30, 35 and 40 weight percentage (Wt. %) to investigate water absorption as the loading was increasing; water absorption increased as the load increased but less in the sample with zinc primer.

***KEYWORDS*:** Fibre-Reinforment, Water Hyacinth, Water Absorption, High-Density Polypropylene (HDPP), Composites, Zinc Primer.

Paper 154 – The Implications of Low Short-Circuit Capacity on The Strength of Power Grid: A Nigerian Case Study

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ABSTRACT
The quest to integrate renewable energy sources (RES) into power grids arises from the need to adopt a sustainable source of energy while achieving energy security. RES such as solar photovoltaic (PV) and wind energy systems are also called inverter-based generators (IBGs) because of their inverter-interfaced connections with the grid. The inverter's quick dynamic response and low short-circuit capacity (SCC) can cause distress to the grid and potentially result in power system stability problems. This paper has assessed the SCC and system strength of the Nigerian grid based on proposed IBG integrations in the northern part of the country. A short-circuit study was conducted, system strength was evaluated using the Network Response Short Circuit Ratio (NRSCR), and a dynamic voltage stability analysis was performed. These studies revealed that most of the proposed points on the grid have low SCC but suitable for the size of IBG integration; however, some identified weak points may affect the stability of the grid. The results of this investigation provide valuable insights on the impact of IBG integration in renewable energy-rich, SCC-deficient areas of a grid.

KEYWORDS: Renewable energy resources; Inverter-based generators, Short-circuit capacity; Solar PV; System strength; Wind energy system; Voltage stability

Paper 155 – Bamboo Availability and Land Use Pattern in the Surrounding Six Local Government Areas to Ibadan land Metropolis, Nigeria

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ABSTRACT
Quests for mitigating wood scarcity in Nigeria is further promoting the use of bamboo as substitute in the production of wide range of products while its short gestation period is a cash-in for its sustainable uses. This study investigated bamboo status cum land-use patterns in six of the eleven Local Government Areas 'LGA' outside Ibadanland metropolis in Oyo State, Nigeria to generate baseline data. With Graphics Peripheral Interface Standard 'GPIS' tool, Landsat imageries for year 2000, 2015 and 2020 were generated for the study locations. Bamboo species identification, characteristics cum sample collection were carried out during on-the-spot assessment. The common land-use in the six LGAs are built-up-areas, thick-vegetation, farmlands and sparse vegetation. In year 2000, 2015 and 2020 the built-up-areas, thick-vegetation, farmlands and sparse vegetation covered 20.02%, 30.07% and 30.39%; 10.74%, 25.72% and19.19%, and, 30.78%, 12.19% and 30.39%, respectively, while bamboo covered 1189.59 km^2 (36.46%), 990.49 km^2 (32.02%) and, 1003.63 km^2 (32.45%), respectively. Open farmland exists for bamboo cultivation across the six LGAs while existing bamboo stocks, grows naturally, matured, intact, harvested with little royalty payment or free. This study established that a species of bamboo: *Bambusa vulgaris* Schrad grows in abundance with wide distribution across Akinyele, Egbeda, Ido, Lagelu, Oluyole and Ona-Ara LGAs in Ibadanland.

KEYWORDS: Bamboo species, Availability, Distribution, Land-use pattern, Ibadanland

Paper 156 – Prediction of NOx Emission in Gas Turbine Power Plant with Harris Hawks Optimized Artificial Neural Network

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ABSTRACT
Predictive emission monitoring systems (PEMS) are critical instruments for verifying and strengthening the reliability of costly continuous emission monitoring systems used in gas-turbine power facilities. PEMS is built on the premise of predictive models that are trained on historical data to estimate emission components. The availability of a relevant and environmentally friendly dataset for gas turbine processes has prompted an investigation into the efficacy of models derived from different machine learning techniques. This inquiry aims to develop a predictive model for CO and NOx emissions based on both ambient variables and technological process parameters. In the present study, a new machine learning-based model is proposed for the prediction of NOx emissions in natural gas turbines. The model utilizes an Artificial Neural Network (ANN) that is optimized with the Harris Hawks Optimizer (HHO). The model is trained and validated on a dataset obtained from the University of California at Irvine (UCI) open data repository. The effectiveness of the proposed algorithm was evaluated by comparing it with conventional ANN. The proposed model obtained R^2 = 90.36%, RMSE = 3.9276, and MSE = 15.4260. The results showed that the proposed approach is effective and demonstrates competitive performance over ANN.

KEYWORDS: NOx emissions, exhaust emission prediction, Intelligent emission monitoring, Harris hawk optimizer, Gas turbine combined cycle

Paper 157 – Effect of Roasting Time on The Proximate and Anti-Nutritional Compositions of Delonix Regia Seed Flour

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ABSTRACT
This study aimed at investigating the effects of roasting time on proximate and anti- nutritional compositions of *Delonix regia* seed flour. The seeds were divided into four samples (A-D) of 1kg each. Sample A served as the control (not roasted) while samples B, C and D were roasted for 30, 60 and 90 minutes respectively at a temperature of 150ºC. All the samples were afterwards dehulled and milled into a coarse particle size of about 3mm. The proximate and anti-nutritional properties were determined using standard analytical procedures. The results showed that the moisture and ash contents were reduced to 5.90% and 6.26% respectively with an increase in roasting time. The protein content of the flour increased with roasting time with the highest value of 31.52% recorded at 60 minutes. The highest value (10.70%) of fat was observed at 30 minutes roasting time while for crude fibre and carbohydrate contents, roasting reduced their values when compared with the control sample. All anti-nutritional properties evaluated (tannin, phytate, saponin, cyanide and oxalate) reduced with an increase in roasting time. Roasting of *Delonix regia* seeds can therefore help to reduce the anti-nutritional factors while enhancing some proximate qualities of the flour which in turn, can be explored as a protein source for animals' feed.

***KEYWORDS*:** *Delonix regia*, roasted seed flour, proximate composition, anti-nutritional composition

Paper 158 – Influence of Watershed Delineation on Hydrological Processes Upstream Watershed of Asa Dam River, Ilorin, Kwara State, Nigeria

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ABSTRACT

This study assessed the impact of watershed delineation on the estimation of water quality parameters in the Asa River in Ilorin, Nigeria. MAP Window GIS interfaced with soil and Water Assessment Tools (SWAT) and was used to pre-process the spatial data. The model was used to simulate water quality parameters such as organic phosphorus and nitrate at subbasin level of the study area. The watershed was delineated into 5, 9, 13, 15, 17, and 29 sub-basins, and each delineated sub-basin was modelled for 19 years (January 2001 to December 2019). The results showed that predicted values of organic phosphorus and nitrate concentrations ranged from 731607.04 mg/l to 6764932.7mg/l and from 1441992.79 mg/l to 3575204.59 mg/l respectively. The lowest annual predicted values of sediment yield, sediment concentration, and streamflow were obtained for a watershed delineation into 5 sub-basins. The highest predicted values, however, were obtained when the watershed was delineated into 29 sub-basins. The number of sub-basins however, had little or no influence on the average monthly predicted values of water quality parameters in the watershed. It could be inferred from the result that the number of sub-basins delineated in the watershed directly influence the predicted values of water quality parameters.

KEYWORDS: Asa Dam River, Hydrological process, Soil and Water Assessment Tools (SWAT), Sub-basins, Watershed delineation and Water quality parameters

Paper 159 – Effect of Calcination Parameters on Chemical Composition of Beans Pod Ash for Pozzolanic Activity

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ABSTRACT

Beans Pod Ash (BPA) can be utilized as partial replacement of cement for the production of cement pozzolanic concrete, due its pozzolanic characteristics. This will significantly lower construction cost and environmental pollution connected with the usage and production of cement. This study aims at modelling the effect of calcination parameters (burning temperature and dwelling time) on the chemical composition of BPA for optimum pozzolanic properties. The central composite design (using 2-factors, 5-levels) of response surface method was adopted. The two (2) factors considered include burning temperature at 500^{o}C, 600^{o}C, 700^{o}C, 800^{o}C, 900^{o}C, and dwelling time at 1, 2, 3, 4, 5 hours. Responses were obtained from the resulting chemical properties of BPA. The results of chemical analysis which include Silicon oxide (SiO_2), Aluminum oxide (Al_2O_3), ferric oxide (Fe_2O_3), Calcium oxide (CaO), Magnesium oxide (MgO), Potassium oxide (K_2O) and lots more and loss on ignition (LoI), were modelled and optimized. The optimum combined composition of silica, alumina and ferric oxide (54.14%), signifying a good pozzolanic property, was obtained and an optimum loss on ignition of 6.16%, at a burning temperature of 738.38^{o}C and a dwelling time of 3.45-hours, conforming to ASTM C618-12a Class C pozzolan.

KEYWORDS: Beans Pod Ash, Calcination, Temperature, Dwelling Time, Pozzolanic Properties

Paper 161 – Statistical Optimization of The Synthesis of Calcium Oxide from Dolomite for Carbon Dioxide Capture

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ABSTRACT
Dolomite is a double carbonate mineral of calcium and magnesium that can serve as raw material for the synthesis of calcium oxide. In many industrial chemical processes, carbon dioxide (CO_2) is an undesired by-product that is required to be removed for the smooth running of the process. X-Ray Diffraction (XRD) analysis revealed that dolomite ore collected in Okere, Kwara State has the major mineral phase of dolomite with 94 % purity. Following the dissolution of dolomite in hydrochloric acid, calcium hydroxide [$Ca(OH)_2$] precipitation using ammonium hydroxide (NH_4OH) was optimized. For the precipitation study, the temperature was varied between 10 to 50 ^oC, the time between 2 to 10 Minutes, and volume ratio of the filtrate to NH_4OH between 1:0.8 to1:3 ml:ml. $Ca(OH)_2$ obtained at optimum conditions (40 ^oC, 2 minutes and Vol:Vol of 1:2.5 ml:ml) was calcined at 700 ^oC to obtain CaO. Dynamic Light scattering of CaO shows an average particle size of 49.46 nm, FTIR was used to confirm CaO at wavelength of 1394 cm^{-1} and 872 cm^{-1}. CO_2 capture was done by exposing the synthesized CaO at room conditions for 30 days. XRD analysis shows the new mineral phase of 78 % calcite and 9.42 % lime. This is an indication that the synthesized CaO is suitable for CO_2 capture.

KEYWORDS: Calcium oxide, Calcite, Carbon dioxide, Dolomite, Optimum

Paper 162 – Effect of Resampled Digital Elevation Model (Dem) On Flow and Sediment Loading Prediction Upstream of Oyun River Catchment in Kwara State

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ABSTRACT
This study investigates the effect of resampled Digital Elevation Model (DEM) on the prediction of flow and sediment loading upstream of Oyun River catchment in Kwara State. To delineate the watershed, a DEM of 90-meter resolution was sourced from the space Shuttle Radar Topography Mission (SRTM), and the ASTER global DEM data sources. The 90-meter resolution was resampled to four different resolutions which are 75-meter, 60-meter, 45-meter, and 30-meter resolutions. The watershed and streamline were delineated, and the hydrologic simulation was performed using Soil and Water Assessment Tool (SWAT). The results show an insignificant effect on flows for all the resampled DEMs as against the results obtained with the prediction of sediment concentration. The 90-meter resolution DEM has the lowest predicted value of sediment concentration 228,899.70mg/l while the 30-meter resampled DEM has the highest predicted value of 521,246.94 mg/l. Similarly, the sediment yield (SYLD t/ha) for 90-meter resolution DEM has the least value of about 528.90 t/ha while the 30-meter resampled DEM has the highest value of 2145.57 t/ha. Results obtained in this study can be a decision support tool for researchers when selecting an appropriate DEM resolution to simulate sediment loading in the watershed.

KEYWORDS: Resampled DEM; Sediment Concentration; Sediment Yield; SWAT; Model; Flow.

Paper 163 – Grey-Based Taguchi Analysis for Triple Objective Optimization of Tig Welded Low Carbon Steel

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ABSTRACT
The welding process remains one of the most value-adding techniques in the industry, especially for fabrication and repair purposes. Present scenario report that increasing hardness reduces ductility and percentage elongation properties which are equally essential for structural integrity. Against this backdrop, this study adopts the grey base-Taguchi method to investigate the process parameters combination that results in an optimum balance of tensile strength, hardness, and elongation at break point for the Tungsten Inert Gas welding of low-carbon steel joints. L9 Taguchi matrix is adopted towards maximizing the triple functions. A single grade for the responses was established, followed by ANOVA and signal-to-noise ratio analysis. A confirmatory test followed by a repeat showed a 0.257 improvement in the grey relational grade which validates the effectiveness of the method in achieving the triple-objective functions. The study benefits the scientific and industrial bodies by providing the process window for maximizing the tensile strength and hardness properties of welded joints in a way that the increased hardness properties do not compromise the elongation at break hence making the joint susceptible to brittle failure.

KEYWORDS: Grey-based Taguchi, Triple objective optimization, Tensile strength, Hardness and Percentage elongation

Paper 164 – Grey-Based Taguchi Analysis for Triple Objective Optimization of Tig Welded Low Carbon Steel

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ABSTRACT
The welding process remains one of the most value-adding techniques in the industry, especially for fabrication and repair purposes. Present scenario report that increasing hardness reduces ductility and percentage elongation properties which are equally essential for structural integrity. Against this backdrop, this study adopts the grey base-Taguchi method to investigate the process parameters combination that results in an optimum balance of tensile strength, hardness, and elongation at break point for the Tungsten Inert Gas welding of low-carbon steel joints. L9 Taguchi matrix is adopted towards maximizing the triple functions. A single grade for the responses was established, followed by ANOVA and signal-to-noise ratio analysis. A confirmatory test followed by a repeat showed a 0.257 improvement in the grey relational grade which validates the effectiveness of the method in achieving the triple-objective functions. The study benefits the scientific and industrial bodies by providing the process window for maximizing the tensile strength and hardness properties of welded joints in a way that the increased hardness properties do not compromise the elongation at break hence making the joint susceptible to brittle failure.

KEYWORDS: Grey-based Taguchi, Triple objective optimization, Tensile strength, Hardness and Percentage elongation

Paper 165 – Sustainable Management of Storm Water Generation in a Fast-Urbanizing Residential Area of Malete, Kwara State, Nigeria

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ABSTRACT
An alteration in the natural land cover characteristics of the environment due to the high rate of urbanization globally has created a large span of impervious surfaces that resist the infiltration rate but encourage runoff from precipitation. This phenomenon affects the natural environment. To mitigate the effect of storm water generation, Low Impact Development (LID) techniques was developed as a means of storm water management. In this study, Storm Water Management Model (SWMM) in conjunction with MAPWindow GIS was used to simulate the effects of selected LIDs embedded in the SWMM to mitigate storm water generated in the study area. The study area was delineated into six sub-basins in the GIS environment and imported into the SWMM to study the effect of some selected LIDs which are green roofs, rain gardens, vegetative swale, and permeable pavement. The results show that the permeable pavement has the highest reduction value of about 50% across all sub-basins while Green Roof has the least reduction value of 0.003%. Outcome of this study can be a decision support tool that can be adopted by different stakeholders and relevant authorities in the selection of appropriate LIDs practices to mitigate the urban impact of storm water generation in the study area.

KEYWORDS: Storm water; Mitigation; SWMM; LIDs; Sub-catchment; MAPWindow

Paper 167 – Assessment of Automobile Users' Perception of Viability of Producing Spare Parts from Biomaterial Composites in Nigeria

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ABSTRACT
The use of composite in automotive parts production engenders lightweight and fossil fuel consumption thereby promoting reduction of volume of gas released into the atmosphere by automobiles. The perception of automobile users on viability of producing spare parts from composite of biomaterials origin in Nigeria was investigated. Google tool was used to share structured questionnaires on 60 WhatsApp groups and responses of 227 respondents were validated with oral interview conducted with 30 car users drawn from Osogbo, Osun State with all respondents randomly but purposively selected. There is general awareness among respondents in respect of promotion of local capacity and content input in commercial production of automobile parts globally. About 89% of the total respondents agreed that development of local capacity and the use of bio-material can reduce the high cost of spare parts. Bumpers, fenders, door handles and doors were indicated by 73.5%, 63.4%, 57.6% and 30.7% respondents, respectively as outer parts made with composite while 82.1%, 46.3%, 44.3%, 36.2% and 34.2% respondents agreed that dashboard, door handle, glove box, clutch pedal and door panel, respectively were interior parts made with composite. This study affirmed the positive disposition of automobile users to buy spare parts made with biomaterials composite.

***KEYWORDS*:** Automotive parts production, Biomaterial composites, Light weight, Green environment, Nigeria

Paper 169 – Development of Ultra-High-Performance Concrete (UHPC) Using Locally Available Materials: A Review

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ABSTRACT
The need for high-strength concrete is on the increase for good workability, high strength, and better durability. Supplementary Cementitious Materials (SCM) are finely ground substances that are used in concrete to replace a part of cement in a Mix. These SCM may be natural, manufactured or natural waste which is abundantly available in a locality. Various types of SCM have been in use. This paper reviews the use of these materials in the UHPC. It was concluded that if locally available materials are capable of producing UHPC that exhibit comparable properties of commercial mixtures, it would significantly lead to reduced costs and acceleration of its field application.

KEYWORDS: Durability, Super-plasticizer, Supplementary Cementitious Materials, Ultra-High-Performance concrete, Workability

Paper 170 – Plant Disease Detection Using CNN With Spatial Attention

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ABSTRACT
Agriculture is one of the most significant contributors to the Nigerian economy. According to statistics by Statista, agriculture contributed about 30% to the country's GDP between July and September 2021, making it the second-largest contributor after oil. However, a significant problem of crop production is pests and disease. Late detection of plant disease causes huge losses to farmers through low returns and depreciated farm produce. The detection of disease is widely done manually by farmers on farms through physical inspection, the result of which may be inaccurate. This paper presents a novel approach to plant disease detection using a Convolutional Neural network (CNN) with spatial attention. The proposed method is applied to a dataset consisting of images of sample leaves of various plants, including apple, blueberry, cherry, corn, grape, orange, peach, potato, raspberry, soybean, squash, strawberry, and tomato. The CNN model was built using transfer learning. The pre-trained EfficientNet80 model was used as the base model, with the final classification layer replaced with a new dense layer and an output layer for binary classification. The model achieved an accuracy of 85%, making the proposed method a better method for detecting plant diseases at an early stage, improving crop yields, and reducing the need for pesticides. It can also be extended to other types of plant diseases and integrated into existing agricultural systems.

KEYWORDS: Plant Disease, Convolutional Neural Network Spatial Attention, Deep Transfer Learning

Paper 172 – Selection and Pore Distribution Analysis of Biocomposite Implants for Load-Bearing Bone Replacement

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ABSTRACT
Fabrication of biocomposites to promote bone growth through pore distribution and gradient formation for load-bearing bone replacement have gained attention due to their excellent mechanical properties and biocompatibility. This research study aims to investigate the selection and pore distribution analysis of homogenous, porous, and gradient biocomposite implants for load-bearing bone replacement. The study utilises powder metallurgy, scanning electron microscopy (SEM) and Image J software to produce and characterise the pore size distribution of the biocomposites, respectively. The software can segment the image to isolate the pores from the rest of the implant, measure the size of individual pores, and generate pore size distribution plots. The radar chart was adopted to compare and evaluate the mechanical strength of various biocomposite implants to identify the most suitable implant for load-bearing bone replacement. The findings of this study revealed the gradient and porous biocomposites exhibited desired mechanical properties with porosity of 20.67 and 27.72 % pore size up to 134 and 256 μm, compressive strength of 162 and 95 MPa and compressive modulus of 30.42 and 28.3 GPa respectively. The SEM analysis, coupled with pore size distribution and porosity percentage measurements, offers valuable information for optimising the design and fabrication of biomaterials with enhanced properties. Radar chart analysis further contributes to a comprehensive evaluation of the implants' mechanical and physical characteristics.

KEYWORDS: Biocomposite, Pore, Mechanical, Properties, Selection, Image

Paper 173 – Building of Machine Learning Predictive Model for Simulating Biodiesel Yield

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ABSTRACT
Continuous exploration, refining, and transportation of fossil fuels resulting in environmental pollution, and harm to man, animals (terrestrial and aquatic) and plants has led to the search for alternative fuel sources. In addition, an increase in the population of men globally has resulted in overdependence and high consumption of fuel. This has led to the release of harmful materials to the ecological system hence the search for more eco-friendly alternatives leading to the production of biodiesel among others. The availability of feedstock required for the production of biodiesel encourages reliance on it as a source of fuel for general usage. The high yield of biodiesel depends on factors such as the type of feedstock, catalyst employed, operating temperature and reaction time. In this paper, a machine learning predictive model was developed which could accurately predict the quality of biodiesel generated from various sources of biomass, including vegetable oils, animal fats, and algae. The model was trained using historical data on biodiesel quality and process conditions and was tested using new data to evaluate its accuracy and performance. The resulting predictive model was used to optimize biodiesel production, reduce cost, and promote the use of renewable energy sources.

KEYWORDS: Machine learning; Predictive model; Pollution; Biomass; Simulation.

Paper 174 – Experimental Determination of Comminution Parameters of Zankan Spodumene

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ABSTRACT

Samples of Spodumene obtained from Zankan Village, Nigeria were subjected to grindability test using granite and magnetite as reference ores, from which work index was determined, in line with Bond modified energy equation. Sieve analysis was carried out using laboratory sieve shaker and lastly, homogenized samples obtained using Coning-quartering and riffle splitter methods. The homogenized-samples were processed for Chemical compositional analysis using atomic absorption spectroscopy (AAS). Grindability tests showed that 80% passing size fraction of the "Feed" for Spodumene, Granite and Magnetite was 553.82, 357.68 and 418.85 µm respectively, while, those of the "Product" were 257.02, 177.42 and 242.67 µm respectively. Hence, the work index of the Zankan Spodumene determined from the 80% passing size fraction of the feed and product, was 13.27 kWh/ton. The study showed that spodumene with liberation size of 75 µm has the highest-grade value of 3.02% lithium oxide. The experimental parameters obtained from this study will be relevant to commercial exploitation of the Zankan Spodumene for lithium battery production.

KEYWORDS; Spodumene; Comminution; Grindability; Liberation; Zankan

Paper 175 – Research Findings in Geotechnical Practices for Consideration in Rock Formation

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ABSTRACT

The practice of geotechnical engineering is a field that requires rock and soil mechanics principles. In an environment due to the effects of unconformities and the irreversible result of failures within the rock formation, such as faults, joints, earthquakes, and other environmental problems. The study aided in classifying methods of mineral evaluation and rock formation on the earth's surface. The information was based on reviewed techniques with aided tools using geological surveys, geophysical investigations, and drilling methods as means of exploration operations. The exploration operation on the rock formation investigated surface and subsurface conditions using equipment such as a gravimeter, seismometer, and drilling machine on site. The methods of classifying rocks by mass were determined by the findings from the study, fieldwork, and laboratory experiments. The research findings have been stated for the application of civil and mining engineering, including related geological engineering aspects of the rock formation to be achieved. The study also showed that the engineering qualities of rock and soil materials, such as color, shape, texture, and origin of formation, are connected. Rock mass rating, rock quality designation, and geological strength index were also mentioned as three more ways to classify rock masses

KEYWORDS: Geological, Geophysical, Drilling, Exploration, Investigation

Paper 176 – Development and Characterization of Sawdust/Prosopis Africana Leaf Silver-Zinc Nanoporous Adsorbent

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ABSTRACT
This study focused on the green synthesis and characterization of sawdust/*Prosopis africana* leaf silver-zinc nanoporous (SD/PAL Ag-ZnNPs) adsorbent for air pollution control. Sawdust was carbonized at 450 $°C$ for 1 hour with a conversion yield of 28%. PAL Ag-ZnNPs solution was produced from *Prosopis africana* leaf extract. Bi-metallic PAL nanoparticle extract and the activated carbon from sawdust were hybridized to produce SD/PAL Ag-ZnNPs adsorbent. Characterization results using Ultraviolet-Visible (UV-VIS) spectroscopy indicated the presence of phytoconstituents which acts as capping and stabilizing agents, Fourier Transform Infrared (FT-IR) spectroscopy analysis showed the presence of a carbonyl group in the sample which reduces Ag^{+} in the sample to silver nanoparticles, Scanning Electron Microscopy (SEM) confirmed the porosity of the sample, Energy Dispersive Spectroscopy (EDS) showed carbon and oxygen as the major components with atomic weight percentages of 83.54% and 15.51% respectively. Transmission Electron Microscopy (TEM) analysis confirmed the presence of nanoparticles, and X-Ray Diffraction (XRD) analysis indicated the presence of face-centered cubic crystal. Overall analyses showed that SD/PAL Ag-ZnNPs adsorbent exhibited high adsorption capacity which may be useful for air pollution control. This study showed the potential of producing low-cost adsorbents from agricultural and wood processing wastes.

KEYWORDS: Nanoparticles; Green synthesis; Bimetallic; *Prosopis africana*

Paper 177 – Development and Characterization of Nanoporous Adsorbent from Agricultural Waste

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ABSTRACT
This study focused on the production and characterization of flamboyant pod/banana peel silver-zinc nanoporous (FP/BPE Ag-ZnNPs) adsorbent for air pollution control. The flamboyant pod was carbonized at 450$°C$ for 1 hour with a conversion yield of 27.48%. Extract from banana peel was used to synthesise Ag-ZnNPs solution. The nanoparticle extract and the carbonized flamboyant pod were hybridized to produce FP/BPE Ag-ZnNPs adsorbent. Characterization results using Ultraviolet-Visible (UV-VIS) spectroscopy indicated the presence of unsaturated hydrocarbon absorbing compounds which acts as stabilizing agent, Fourier Transform Infrared (FT-IR) spectroscopy analysis showed the presence of carbonyl group which acts as a reducing agent for reducing silver ions present in the sample to silver nanoparticles. Scanning Electron Microscopy (SEM) confirmed the porosity of the sample, Energy Dispersive Spectroscopy (EDS) showed carbon and oxygen as the major components with atomic weight percentages of 82.52% and 11.88% respectively. Transmission Electron Microscopy (TEM) analysis confirmed the presence of nanoparticles, and X-Ray Diffraction (XRD) analysis indicated the presence of face-centred cubic crystal. Overall analyses showed that FP/BPE Ag-ZnNPs adsorbent exhibited high adsorption capacity which may be useful for air pollution control. This study showed the potential of producing low-cost, non-toxic, and environmentally friendly adsorbents from agricultural wastes.

KEYWORDS: Volatile Organic Compounds, Green Synthesis of Nanoparticles, Indoor Air Pollution

Paper 178 – Development of a Smart Traffic Control Model using Deep Learning Technique

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ABSTRACT
In recent times, ineffective traffic light control has been the cause of numerous problems such as delay on the highway as well as waste of energy and resources. To improve the effectiveness, taking the traffic data as input and intelligently adjusting the traffic light duration accordingly has become pertinent. Therefore, an improved traffic light control system is required so as to address the traffic delay-based problems. The application of artificial intelligence has recently gained widespread attention due to its capability to be able to solve complex problems such as in signal and traffic light control. Hence, this study developed an improved traffic signal model exploiting Deep Neural Network tool. The performance evaluation of the developed model shows that isolated intersection and coordinated intersections (Deep Learning) approach is superior to that of the fixed-time signal control method.

***KEYWORDS*:** Control system, data, deep neural network, light, optimization, signal, traffic.

Paper 179 – Analysis of Locally Produced Aluminium Oxide for The Production of Wastewater Treatment Filter Using XRF, SEM/EDX

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ABSTRACT
Aluminium oxide (Al_2O_3) an inorganic chemical reagent with chemical name Aluminium oxide. It is also called as Alpha-Alumina, Alumina, Alundum or Aloxide. It is mostly used in wastewater treatment. Water pollution due to industrial, agricultural and domestic activities has caused a significant threat to human as well as surrounding environment. The quest towards mitigating the environmental hazard and making use of waste (waste to wealth), finding alternative, locally available and more economical way of treating wastewater has motivated this research. The Aluminium oxide was extracted from waste Maltina Can using alkali method and the Laboratory Developed Aluminium oxides (LDA) was characterized by XRF. EDX analysis of the LDA was done and Image J software was used to analyze SEM images. The LDA contained 69.70% of Al_2O_3, an indication of higher percentage of aluminium oxide (78.4% threshold) present in the Malt Can. The LDA SEM analysis indicated 1.435µm, 33.421µm, 24.757µm, and 11.237 µm for an average Area, Mean, Standard deviation, and Length respectively. The Aluminium oxide developed in the laboratory is pure enough to be used for the development of composite filter for effective treatment of wastewater.

KEYWORDS: Aluminium Oxide, EDX, SEM, Waste Can, Wastewater Treatment, XRF

Paper 180 – Impact assessment of a solid waste dump site on its host environment: Particulate Matter

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ABSTRACT

Burning of solid waste openly has contributed greatly to the degradation of ambient air quality, thus having a harmful effect on environment, animals, materials and humans. This study employs a mass-based solid waste characterization method and also looks at the parameter such as ash content of the solid waste. Met One GT 331 mass monitor was employed to assess the levels of particulate matter and Total suspended particles (TSP) at ten sampling points on a dumpsite when the solid wastes were combusted. The study characterized 35.151 kg of solid waste with food waste, nylon, plastic, metals, paper and textile contributing to the major components in the study area with 23.46%, 27.64%, 7.30%, 3.29%, 24.32%, and 13.98% respectively. The percentage ash content was 7.12%, 7.09%, 21.41%, 29.16%, 8.88% and 7.58% respectively for food waste, nylon, plastic, paper, textile and composite waste. The 24 hr extrapolated concentrations for $PM_{2.5}$, PM_{10} and TSP ranged from 1.97 – 23.48 µg/m^3, 12.70 – 796.62 µg/m^3 and 17.38 - 882.27 µg/m^3 respectively. The extrapolated concentration for TSP breach the standard limit by FEPA for two days of the study.

KEYWORDS: Solid waste, Air emission, Climate action, Particulate matter

Paper 183 – Effect of Carburization Time and Temperature on Hardness Properties of Mild Steel

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ABSTRACT

The service conditions of automobile steel components such as crankshaft, gears and cams to mention but a few require high hardness to enable them satisfy their design requirements when in operation. In this study, hardness properties of carburized mild steel rods were investigated to determine the impact of carburization parameters on the steel. Mild steel rods were carburized using coconut charcoal powder and periwinkle shell powder. The samples were carburized at temperatures of 850°C, 900°C and 950°C respectively; and were soaked for 1 hour, followed by water quenching. Leeb hardness tester was used to determine the hardness values of the carburized mild steel rods. The highest hardness value of 774 HL was obtained with carburization parameters of 436.80g of coconut shell charcoal, 150.23g of periwinkle shell powder, carburization temperature of 900^{0}C and at a soaking time of 109 minutes. It was established that locally sourced materials (Carburized coconut shell and periwinkle shell) could serve as effective carburization ingredients for mild steel due to the improvement in hardness of the mild steel.

KEYWORDS: Mild steel, Carburized coconut shell, Periwinkle shell, Carburization

Paper 185 – Green Hydrogen Production from Photovoltaic Power Station as A Road Map to Climate Change Mitigation

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ABSTRACT
Hydrogen is increasingly recognized as a critical element in the global net-zero transition. Addressing climate change is increasingly urgent, and hydrogen's role as a decarbonisation vector in hard-to-abate sectors is clear. Africa enjoys high renewable energy capacity factors ranging from 28% to 36% for solar according to global solar irradiance index report. According to IRENA, 96% of all hydrogen produced today comes from fossil fuels. Only 4% is produced by water electrolysis. Realizing green hydrogen fuel ambition would have significant positive socio-economic effects across the continent. This study discusses the Africa green hydrogen production industry using Nigeria as a case study to enunciate the possibility of generating clean hydrogen vectors from a percentage of the Photovoltaic power output of a standalone solar grid electrification project in different regions in the country. The usage analysis and effectiveness of the produced hydrogen fuel in each region is carried out with the highest region having an annual output of 12,247,278 kg of green hydrogen and 8,573,094 kg of ammonia, expected production from the proposed usage of 50 % of the power generation output of the installed 1.6 MWp solar power mini-grid in the region. The analysis was repeated for the other considered regions in the country. The results showcased the enormous advantages of electrolytic production of hydrogen and how the greener economy project can play a major role in mitigating climate change effects and overreliance on fossil fuels as the driver of the economy in many Africa countries.

KEYWORDS: Renewable energy, Photovoltaic, Climate change, green hydrogen vector, fossil fuels, electrolysis

Paper 187 – Corrosion Susceptibility of Food Grinding Discs in Gastro-Intestinal Environment

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ABSTRACT
The need for food size reduction before consumption has led to the use of motorized grinding machine which operates on energized rubbing of two grooved cast-iron discs, and this unintentionally results in tribological degradation and corrosion of grinding discs into the ground food. Six grinding discs from three states in Nigeria were selected for this study, based on manufacturing methods namely: rotary, cupola and pit furnaces, for assessment of their corrosion susceptibility in a simulated gastro-intestinal environment. The electrolyte used contained 2 g/L NaCl acidified to pH of 1.7 with HCl and regulated at 37°C. Experimental techniques used for the study included: XRF for chemical composition and XRD for phase identification. Corrosion susceptibility of discs in pseudo-body fluid was studied using potentiodynamic polarisation scan and gasometric methods in simulated gastro-intestinal environment, as electrolyte. Key finding from the study was that all grinding discs contain iron and silicon as dominant alloys, which existed as iron carbide and ferrosilicon phases. Corrosion of discs in simulated gastric solution was well profound irrespective of the manufacturing method, though, with varying degrees among the discs. The outcome of this study is applicable to food industries to minimise the risk of food contamination from corrosion.

KEYWORDS: *grinding disc, corrosion, potentiodynamic, gasometry, gastric, food contamination*

Paper 190 – Correlation Between Production Methods and Tribological Degradation of Food Grinding Discs

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ABSTRACT
Staple foods consumed in Africa and Asia often require size reduction with the aid of grinding machine which operates on energized rubbing of two grooved cast-iron discs. This eventually results in tribological degradation of grinding discs into the ground food. In this study, six grinding discs from two geopolitical zones in Nigeria were considered based on four melting furnaces namely: rotary, cupola, pit and induction furnaces, to assess the correlation between their production methods and tribological degradation. Techniques used for the study included: X-Ray Fluorescence spectroscopy for determination of elemental composition; X-Ray Diffractometry was used for identification of phases; Vickers hardness test was carried out to determine hardness values of the discs and lastly, pin on disc wear tribometer was used to measure wear mass loss from discs. The study revealed that all grinding discs contain iron, carbon and silicon as dominant alloy elements, which existed predominantly as iron carbide and ferrosilicon phases. The hardness values measured ranged between 239-455 Hv20 with highest and lowest hardness values recorded in rotary and induction samples, respectively. Least and highest wear was observed in rotary and induction samples, respectively. Hence, strong correlation exits between hardness values and mass losses observed in tribological test. Findings from this study is relevant to food industries where control measures on materials selection and production routes may be adopted to minimise the risk of food contamination from tribological degradation.

KEYWORDS: grinding disc, hardness, wear, tribological degradation, friction, food contamination

Paper 191 – Effects of Processing Routes on The Physicochemical Properties of Recycled Carbonated Can

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ABSTRACT
Recycling of aluminium cans and other scraps are secondary sources of aluminium alloys and composites to ensure healthier environment and low cost of production. Aluminium cans were processed into different casts; whole can, can bodies, and can lids with or without paints. The casts include whole cans, cans without paint, cans without paint and lid, and the lid. Microstructural examination and chemical analysis of the casts were studied using Scanning Electron Microscope (SEM) and Energy Dispersive Spectrometry (EDS), respectively. Tensile and hardness properties of the casts were also examined. The chemical analysis revealed that the can body and lid contain Al, C, Mg and O but the lid contains more trace elements. Mn, Fe and Si were observed to be pronounced when paint is removed prior to casting, thus reducing some elements migration to the slag phase. The hardness test showed the lids alone had the highest hardness value but casts without paint has least hardness. The tensile result showed that the lid had the highest tensile strength value of about 240 MPa with least observed in can without paint. Removal of paints prior to casting aluminium cans has no significant effects on the physicomechanical properties of aluminium casts.

KEYWORDS: Recycling, aluminium can, paint, processing routes, casting

Paper 192 – Development of An Artificial Intelligence Based System for Nutrient Delivery to Greenhouse Grown Crops

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ABSTRACT
Applying nutrients to crops either on the field or in a greenhouse has been a manual process, especially in developing countries where farmers or greenhouse attendants introduce nutrients based on intuition, or at specific intervals, not knowing exactly when a crop requires the said nutrients. This is one of many reasons why artificial intelligence has been introduced into the agricultural sector. This project was designed to develop an artificial intelligence-based system for the automatic delivery of nutrients to greenhouse-grown crops. The system was built with an Arduino microcontroller serving as the brain box of the system, a soil Nitrogen, Phosphorus and Potassium (NPK) sensor for reading nutrients level, an organic light-emitting diode which displays the specific nutrient level in mg/kg, while a solenoid valve was incorporated into the delivery mechanism. The data was logged onto a secure digital (SD) card via SD module installed on the Arduino board. The microcontroller was configured to interpret the varied states of the soil as relayed by the soil sensor; and this involved data capture from NPK sensor, data processing to determine when to release nutrients, and delivery of nutrients if the solenoid valve is activated. The system was evaluated on soil whose nutrients were leached out, placed in a greenhouse, and the performance was satisfactory.

KEYWORDS: Nutrients, Arduino microcontroller, NPK sensor, Organic Light-Emitting Diode, Secure digital module.

Paper 193 – Learning from Examples Paradigm for The Design of Fuzzy Control for A Reactive Distillation Process

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A***BSTRACT***
The successful implementation of process intensification techniques, such as reactive distillation (RD), often requires tight control of the process. Tight control refers to the need to closely monitor and regulate process parameters such as temperature, pressure, flow rate, and reactant concentrations, among others, to maintain optimal performance. However, RD is highly nonlinear due to complex interactions between vapor-liquid equilibrium, vapor-liquid mass transfer, and chemical kinetics arising from the concurrent separation and reaction and hence making its control challenging. In this work, a generic nonlinear two-reactant-two product reactive distillation process model was used to design a fuzzy controller based on the 'learning from examples' paradigm for RD closed loop system. The performance of the fuzzy controller was compared with Proportional Integral (PI) controller. The results showed that the fuzzy controller outperformed the PI controller in terms of setpoint tracking with no overshoot.

KEYWORDS: process intensification, Reactive Distillation, Nonlinear, Fuzzy controller, Proportional integral control

Paper 194 – Remediation of Spent Engine Oil-Contaminated Soil by The Use of Biomaterials

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ABSTRACT
This experiment was carried out in metropolitan Minna, the capital of Niger State. The study aimed to assess the effects of soil contamination with spent engine oil on some selected soil physiochemical properties. The experiment was set up in a completely randomized design in 3 replicates. The treatments consisted of 3 kg soil samples contaminated with 50, 100, 200 and 300 milliliters of spent engine oil, while the control sample was soil without added engine oil. The physicochemical properties of the soil samples before and after remediation were analyzed using standard methods. The contaminated soils showed a significant ($P<0.05$) increase in soil pH, bulk density and organic carbon (OC) contents compared to the control sample, while nitrogen, phosphorus and potassium decreased significantly ($P<0.05$). However, the pH, organic carbon, phosphorus and potassium values of each contaminated soil samples decreased significantly ($P< 0.05$) while the nitrogen content increased significantly after remediation of the contaminated soil samples using the biomaterials. The bulk density of the of the contaminated soil samples also decreased when treated with rice husk but increased when treated with sawdust.

***KEYWORDS*:** spent engine oil, physicochemical properties, remediation, rice husk, sawdust.

Paper 195 – Effects of Iron Ore Tailings (IOT) On the Mechanical Properties of Concrete

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ABSTRACT
A lot of research has shown that iron ore tailings (IOT) is not only a source of pollutant but also has good pozzolanic properties. However, the behaviour of IOT concrete in service is yet to be fully reported. This research investigates the effect of IOT on the mechanical properties of concrete whose fine aggregates is partially replaced with IOT. Fine aggregates content in concrete of mix ratio 1:2:4 of 10 to 40% was replaced with IOT. Young's modulus and Poisson ratio of the resulting concrete beams were determined by compression test. The results showed that 20% replacement of fine aggregates by IOT in the concrete mix gave the best mechanical properties of the resulting concrete. The Young's modulus of the concrete was seen to increase by 26.53% when with 20% IOT content when compared to that without IOT. The Poisson ratio at 20% IOT content was seen to also decrease by 61.54% when compared to that without IOT. As such, 20% IOT for fine aggregate content replacement in concrete mix 1:2:4 is recommended for structural uses.

***KEYWORDS*:** Concrete, Fine aggregates, Iron ore tailings, Poisson ratio, Young's modulus

Paper 196 – Overview Storage Techniques and Quality Evaluation of Fruits and Vegetables for Minima Postharvest Losses

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ABSTRACT
Appropriate Storage techniques and quality evaluation constituted two major phases in any postharvest, as it determines the degree of probable loss likely to experience in any postharvest. Harvesting is considered as the first step in the vegetable and grain supply chain and it is a criticaloperation in deciding the overall crop quality, due to inadequacy in post- harvest practices 30 to 43 percent of agricultural product are often lost. The motivation for this research was strengthenby the fact that postharvest storage techniques and concomitant quality evaluation are seldom treated and less than 5% research funding has been allocated for this issue in previous years. Related few literatures on spotlight were relative old and lack technical innovations. Thus, attemptwas made in this paper to write a overview on various storage techniques and it corresponding quality impactas it concern fruits and vegetables for minima postharvest losses. Finding here indicates that eachmeasure taken to reduce postharvest losses has a direct impact on the nutritional and sensory quality of produce. All pre and postharvest practices directly affect produce quality and therefore should be evaluated from a plant physiology and pathology point of view in addition to food chemistry and food nutrient aspects.

***KEYWORDS*:** Storage, Techniques, Quality Evaluation, Minimal, Fruits and Vegetables, PostharvestLosses

Paper 197 – Techno-Economic Analysis of Wind Electric Energy Generation in Benin City

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ABSTRACT
All over the world, attention is now being focused on producing electricity from renewable energy sources rather than the conventional use of fossil fuel. Nigeria is not an exception in this regard, especially when supply is grossly inadequate to meet the demands of her growing population. This study presents a techno-economic analysis for generating electricity from wind in Benin City, Edo State. Wind speed data was obtained from Nigerian Meteorological Agency, Edo State. Analysis of the wind data obtained shows that due to the low wind speed, the size of a unit wind turbine appropriate for installation in Benin City is 1kW. The economic analysis of installing wind turbine of 1kW considering a lot of variables such as cost of turbine, exchange rate, current cost of energy per kWh and depreciation indicates that the total expenditure made cannot be recovered within 20 years of the expected life span of a wind turbine. Hence, making wind turbine installation in Benin City technically feasible but not economically and commercially viable.

KEYWORDS: electricity, wind turbine, economically viable, wind speed.

Paper 198 – Development and Performance Evaluation of a Facultative Stabilisation Pond for Fish Wastewater Treatment

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ABSTRACT

Wastewater is characterized by high concentration of nutrients and solid materials which are usually discharged into water Streams, Environment and Rivers without any form of treatment. This practice causes pollution and changes in river hydrology and other environmental issues such as eutrophication of receiving water and environment. Thus the search for effective method for the control or removing pollutant from wastewater. To this end waste treatment using stabilisation pond has become a preferred alternative waste stabilisation pond is a relatively shallow body of wastewater contained in an earthen man-made basin into which wastewater flows and from which after a certain retention time, a well-treated effluent is discharged. The study aimed at developing and evaluating the performance of a facultative wastewater stabilisation pond for the fish wastewater treatment. The objectives of the study are to: Design a facultative wastewater pond, construct the designed facultative stabilisation pond, and carry out performance evaluation on some physicochemical parameters using the efficiency removal formula % removal = $\frac{c1-cf}{cf}$ x 100. The aerial loading rate formula was used for the design of facultative pond. The result of experimental analysis reveals BOD_5 in all instances in terms of whether the pond was screened or covered that there was significant reduction in concentration. The entire configuration allowed for average reduction in concentration by 53%, PH in the other hand in all instances had slight increases, for TDS, TSS, EC with exemption of TSS there was reduction in concentration of 50% irrespective of whether the pond is covered, screened or covered plus screened.

KEYWORDS: Wastewater, BOD_5, retention time,

Paper 199 – Analysis of Five-Phase Synchronous Reluctance Motor Under Multi-Phase Faults

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ABSTRACT

A model of a five-phase synchronous reluctance motor is presented. The machine is modelled for a five-phase supplied, with ACEBD winding configuration. The model considers the utilization of the third harmonics of the air-gap MMF as well the fundamental component, and a neglect of the third harmonics. These two models speed performance characteristics are monitored for multi-phase faults and their subsequence restorations. The fault pattern of losing $\frac{2\pi}{5}$phases from the first faulty before the $\frac{4\pi}{5}$ radian phase and the losing of $\frac{4\pi}{5}$ phase radian first before the $\frac{2\pi}{5}$ Radian phase. These phases were subsequently restored according to the considered fault patterns. The machine was then monitored on load and on no load using MATLAB/SIMULINK software for the analysis. The effect of the utilization of the third harmonic of the air-gap MMF is pronounced especially at fault and restorations.

KEYWORDS: Finite Element Analysis, Five-Phase, Harmonics, Multi-phase fault, Synchronous Reluctance Machine.

Paper 201 – Reaction Kinetics of Corncob Hydrolysis of a Magnetic Sulfonated Solid Acid Catalyst

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ABSTRACT
The study investigated the kinetics of corncob hydrolysis into glucose using a synthesized magnetic sulfonated solid acid catalyst. A core nanomagnetic particle was modified using SiO_2 from calcined rice husk ash to generate grafting nanoparticles that accommodate sulfonic groups from concentrated sulfuric acid. The magnetic sulfonated solid acid catalyst was applied in the hydrolysis of corncobs at 100, 110, and 120 °C. Glucose recovery from batch hydrolysis was fitted into Saeman's, first-order and second-order reaction models. Results showed that the magnetic sulfonated solid acid catalyst possessed excellent catalytic properties and was effective in corncob hydrolysis. Among the equations used for the kinetic modeling, Saeman's model perfectly fitted the experimental data at all temperatures investigated. Reaction kinetic was consistent for the hydrolysis yield at 110 °C in all the models. Activation energy of corncob hydrolysis was 10.45 kJ/mol and 69% of sugar was recovered from the hydrolysate. Hence, this study could help to achieve optimal operation in a biorefinery to sustain sugar availability for chemical and fuel production.

KEYWORDS: Hydrolysis, Corncobs, Kinetics, Solid acid catalyst

Paper 204 – Effect of Salinity on The Growth Parameters of Okra Plant in Tungan Kawo Irrigation Scheme

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ABSTRACT
Wushishi (Tungan Kawo) irrigation scheme is located in Niger State, Nigeria and it serves as the study area for this experiment. Beds were prepared and plots were marked out according to the design before planting, so as to ensure a proper and conducive environment for easy germination of the okra plant. Varying amounts of salt water concentration of 5 g/L, 10 g/L, 15 g/L and also fresh water (non-salt concentrated water) were used to irrigate the okra plant. The effect of the planting period and the various salt concentration on height, leaf dry matter, leaf area and leaf number of the okra plant was determined. The varying levels of salt concentration had no negative impact on the growth of the crops at a point, while after while crop growth was negatively impacted indicating crop stress. These were evident after the twelfth week of growth as there was decrease in the growth parameter of most crops irrigated with the 5 g/L and 10 g/L salt concentrated water application compared to the crops that were irrigated with fresh water.

KEYWORDS: Tungan Kawo, Salinity, okra, growth parameters

Paper 206 – Development of Bio-nanocomposite Films from Sweet Potato for Active Food Packaging

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ABSTRACT

Continuous use of synthetic polymers in food industries constitutes threat in terms of pollution of our environment and micro-plastic pollution of living cells. This has driven diverse innovations in bio-plastics productions; however, most bio-plastics typically have poor barrier, mechanical and thermal properties making it difficult to replace synthetic plastics. This work proposed development of reinforced nanocomposite films as alternatives for petroleum-based polymers in food packaging. Potato starch nanocomposite films were prepared by solution casting method with cellulose nanofibers (CNF) isolated from Oil Palm Empty Fruit Bunches mechanically as reinforcement agent. 20 wt% of silver nanoparticles (AgNPs) were incorporated as an antimicrobial agent while 20 wt% glycerol was added as plasticizer. The effects of the plasticizer, AgNPs and CNF contents on the mechanical, thermal and antimicrobial properties of the films were investigated. Increase in CNF increased the film′s tensile strength and the rate of water vapor transmission was reduced. Incorporation of 20 wt% glycerol, however, decreased the tensile strength of the composite films by 14%. Bio-assay tests revealed the antimicrobial activity of the films. However, increase in CNF did not translate to higher thermal stability as previously reported in some findings. This could be attributed to the ultrasonication method used.

KEYWORDS: Bio-nanocomposite, Cellulose nanofiber, silver nanoparticles, Films, bio-plastics, reinforcement

Paper 207 – Influence of Land Levelling and Tillage Operations on Some Soil Physical Property of Sandy Loam Soil

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ABSTRACT

The undulating nature of land in the guinea savannah of Nigerian poses a set back to agricultural production. The use of conventional tillage method by the farmers in the region led to lower crop yield. In order to eliminate the irregularities of the soil surface thereby creating a favourable soil condition, brings the ideal of soil levelling before imposing tillage methods. This paper presents experiment conducted to determine the influence of land levelling and tillage operations on some physical properties of sandy loamy soil of the department of agricultural and Biosystem experimental field, faculty of engineering University of Ilorin in 2018 cropping season. The experimental plot was marked out into leveled plot and unleveled plot of dimension (25 x 120m). The leveled plot and unleveled plot were further divided into six sub plots, each of 25 x 20m. The tillage methods imposed on leveled plot (L1) are T1L1 (ploughing, harrowing, ridging)T2L1 (only harrowing) and T3L1 (only ridging), and tillage treatment replicated twice. The tillage methods imposed on unleveled plot (L2) are T1L2 (ploughing, harrowing, ridging), T2L2 (only Harrowing) and T3L2 (only ridging). The experimental design was completely randomized design (CRD). The leveling and Tillage treatment and unleveled plot and Tillage treatment were achieved by the use of Tractor, land leveller, disc plough, disc hatrrow and disc ridger. Soil samples were taken from the plots at depth 0 – 20cm to determine the soil moisture content, bulk density and porosity. The moisture content and bulk density were determined using standard procedure. The porosity was derived from the relationship between the bulk density and solid density. Statistical analysis was carried out on the field results using analysis of variance (ANOVA). The moisture content (mc) was significant at $P<0.05$ on tillage for only harrowing operation, and not significant on leveling operations and on their interaction, Bulk density (Bd) was significant at $P<0.05$ on leveled plots and not significant at $P<0.05$ on Tillage and on their interaction. Porosity was significant at $P>0.05$ on levelled plots, not significant on Tillage and on their interactions.

Keywords, Land Levelling, Tillage operation, physical properties, Sandy Loamy Soil

Paper 208 – Influence of Carbonized Plantain Peel Addition on The Properties of Aluminium Matrix Composite

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ABSTRACT
Current applications in engineering require high-strength, lighter and inexpensive materials. Aluminium alloys and composites have been extensively used for engineering applications because of their good specific strength. Unfortunately, synthetic materials like silicon carbide that are used to reinforce aluminium are expensive. In this work, aluminium matrix was reinforced with a cheap carbonized plantain peel (CPP) selected among three agricultural wastes based on their thermal stability. Less than 100 µm CPP powder (0 – 4.8wt %) was incorporated in molten aluminium using the stir-casting method. TGA analysis was carried out on plantain peel. Tensile, hardness, XRD, and SEM/EDS of the specimens were carried out. From the results obtained, there was an increase in strength from 1280.1113 N/mm^2 to 4373.25 N/mm^2. Hardness number of the pure aluminium casting at 9.4 increased to 26.76 of the reinforced casting (4.8 wt.%). This new class of material can be used in automobile industry.

KEYWORDS: plantain peel, carbonization, reinforcement, aluminium, composite

Paper 209 – Application of Support Vector Regression Modelling for The Prediction of Impact Attenuation of 3d Printed Hip Protectors

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ABSTRACT
3D printed thermoplastic polyurethanes of different shore hardness were used to make hip protectors for the prevention of osteoporotic hip fracture, which was then tested. The result was used to develop a support vector regression model to estimate the effect of the protector shore hardness, shell thickness, and infill density on the impact attenuation capacity at different energy levels. The results from the model show that the impact attenuation ability of a hip protector is significantly dependent on the infill density of the hip protector and its shore hardness. Excellent agreement was found between the model results and test results.

KEYWORDS: 3D print, thermoplastic polyurethane; hip protector; impact attenuation; support vector regression; performance prediction.

Paper 210 – Influence of Carbonized Coconut Husk Addition on The Properties of Aluminium Matrix Composite

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ABSTRACT
The use of different kinds of metal-matrix composite (MMC) materials is growing rapidly over the last decades because they offer a better combination of properties. Research attempts have been previously made to reduce the cost of composite processing, weight reduction, and improved desired performance. The properties of aluminium matrix composites reinforced with carbonized coconut husk (CCH) were investigated. The composite samples were produced by stir-casting methods using varying percentages of carbonized coconut husk. Tensile, hardness, EDX, XRD, and XRF were carried out on the composites. The results showed that the tensile strength of the composite increased with the addition of carbonized coconut husk. The composite sample with 3.6 wt.% CCH showed the highest tensile strength of 85 MPa and hardness also increases with reinforcement. The composite can be utilized in automobiles where high strength is required.

KEYWORDS: coconut husk, carbonization, reinforcement, aluminium, composite

Paper 211 – CFD Analysis of A 3-Bladed NACA 0018 Vertical Axis Wind Turbine for Deployment in Ilorin, Kwara State, Nigeria

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ABSTRACT
During the last few years, vertical axis wind tubines have evolved as a suitable supplement to energy production worldwide. There has been a lot of interest in vertical axis wind turbines as a small-scale renewable power converter because they can be used in places where the wind speeds are turbulent or unsteady. When investigating the aerodynamic characteristics of vertical axis wind turbines, computational fluid dynamics has been shown to be one of the most effective methods. There is a need for better knowledge of the factors that influence the accuracy of computational fluid dynamics. The aim of this paper is to demonstrate the influence of these factors on the simulation of a low-speed turbine to guide the execution of accurate computational fluid dynamics simulations of vertical axis wind turbines at varying tip speed ratios and solidities. To simulate the turbulent, unstable fluid flow around the turbine, we used a 2D SIMPLE approach with the help of ANSYS FLUENT. In the study, it was found that when the tip speed ratio is low, the result is largely dependent on the azimuthal increment, and a fine azimuthal increment of 0.1 is usually better for low tip speed ratios.

***KEYWORDS*:** Aerodynamic performance, CFD, vertical axis wind turbine, wind energy

Paper 212 – Development of An Application Software for Design of Off-Grid Photovoltaic Energy Systems

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ABSTRACT
The task of sizing solar PV system using manual method is time consuming and susceptible to error. This may lead to poor design that cumulate to in-efficient solar PV installation and waste of scarce resources. The solar PV system is the cleanest and cheapest source being the energy from the sun. A system of this type has a high initial setup cost, but has little or no ongoing operating costs over an extended period of time. In this research, a software was developed to give the specification of the components that constitute solar PV system, thus avoiding oversized or undersized solar PV system installation.
The work was carried out using a residential building as a case study. The peak sun hour considered is 7 hours, which is subject to change as it depends on the location. The developed software is a GUI tool, easy to use, and vary fast to give accurate results unlike the manual sizing calculation method. Three different input data and sized output interface are developed for the software tool; load demand module, battery size module, and PV array module. The software operation was validated with manual other existing application to establish it accuracy and correctness.

KEYWORDS: Solar PV System, Peak Sun Hour, Load Demand, Battery Size, PV Array Size,

Paper 213 – Development and Performance Evaluation of a Screw Press Briquetting Machine

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ABSTRACT
Nigeria produces a massive amount of crop residue with high bulk volume and low density, most especially, rice husk. This low-density, high-volume agro residue is difficult to handle, transport, and store. A briquetting machine was developed and it was used to produce briquettes from rice husk. The feedstock was formulated for briquetting using rice husk of varying particle sizes (2mm, 3mm, 4mm), conditioned to varying moisture (10%, 12%, 14%), starch was obtained from the by-product of the rice colour cortex (rejections) and was processed into gel and added in proportion of 40, 50 and 60% by weight to 1 kg each of samples of rice husk as binder and was fed into screw press machine, which was operated at varying die diameter (30mm, 40mm, 50mm) and barrel temperature (100 ^{o}C, 120 ^{o}C, 150 ^{o}C). The analysis of variance indicate that the machine produced rice husk briquette of 3.4087×10^{-4}kg/m^3 density, calorific value of 14.235 MJ/kg having a durability of 77.27% and hardness of 31.49HVN respectively, while the efficiency and capacity of the machine were 87 % and 192.74 kg/h, respectively. The machine would be useful for compacting quality solid fuel of crop residue that would aid handling, transportation and storage challenges.

KEYWORDS: Briquette; renewable resources; development and rejected rice powder.

Paper 214 – Consolidation Characteristics of Road Soils at Different Compaction Energies and Moisture

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ABSTRACT

Road construction material samples were sourced from two borrows pits at Ogbondoroko and Ogele in Kwara State, Nigeria. The samples were subjected to conventional roadwork tests according to British International testing procedure BS1377:2000 and Nigerian General Specification for Road and Bridges (1997). The tests include index properties, compaction, and consolidation (when saturated). The moisture contents for the Ogbondoroko soil ranged from 3.47 to 21.10% and Ogele from 6.79% to 20.65%. Ogbondoroko road Soil Gs = 2.47, PL = 23%, LL = 37%, Ip = 14% GI = 1; and the soil was grouped as A-2-6(1) according to AASHTO (M145-91) and was classified as a good subgrade material. Ogele Soil has Gs = 2.53, PL = 18%, LL = 36%, Ip = 18% with GI = 0 and was grouped as A-2-6(0), the soil was classified as a good subgrade material. The compaction characteristics are 15% and 6% Optimum Moisture Content (OMC) while the Maximum Dry Density (MDD) are 1.58g/cm^3 and 1.62g/cm^3 for the Ogbondoroko and Ogele soil samples respectively. The consolidation characteristics of the selected soil samples for Ogbondoroko: Cc = 0.055, Cv = 2.08mm^2/minutes, av = 0.0023, Mv = 0.0014, t90 = 163.3 minutes, e_o= 0.674, e_f = 0.573 while for Ogele: Cc = 0.20 , Cv = 1.77mm^2/minutes, av = 0.062, Mv = 0.039, t90 = 191.9 minutes, e_f = 0.573, e_o = 0.674. It is concluded that the soils of the two borrow pits are not suitable as road construction material and should be delisted for road works development in the State, except as subgrade.

KEYWORDS**:** consolidation characteristics, road soils, moisture contents, quality control, pavement failure, stability

Paper 215 – Development of A Fuzzy Logic Based Offline Handwritten Character Recognition System

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ABSTRACT

Offline character recognition is a technique that allows computers to read letters, numbers, and other symbols and convert them into digital form that can be used by computers. Existing fuzzy logic based recognition systems have employed transition data and other features to recognize alphabets. In this study, geometrical features of the alphabet character contour, based on the basic line types that form the character skeletons are used. The selected features are the number of vertical lines (VL), the number of left diagonal lines (LD), number of intersection points (IP) and the sum of pixel (SOP) values. The fuzzy logic model takes these inputs and outputs numbers corresponding to the recognized alphabets. The fuzzy system actual outputs have been compared with the reference outputs; the maximum error observed was 0.45 which is considerably minimal. The mean absolute percentage error (MAPE) value obtained for the model was 1.72%. The MSE and RMSE are 0.03 and 0.16 respectively.

KEYWORDS: Fuzzy logic, Handwritten, Recognition, Geometric

Paper 216 – Development of Harmonic Period-Based Task Set Scaling Mechanism For Real Time Task Scheduling Algorithm Based On The Rbound Utilization Bound Approach

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ABSTRACT
In this paper, development of harmonic period-based task set scaling mechanism for real time job scheduling based on the Rbound utilization bound approach applicable to single core and multicore systems is presented. The solution includes selection and broadcasting of harmonic task period by the computing platforms, harmonic period-based traffic shaping at the clients and harmonic period-based Task Set Scaling (hpenTSS) at the computing platforms. Relevant analytical expressions and corresponding algorithms are developed in respect of the solution. A case study harmonic period shaped task set, Γ with six tasks was used for numerical examples and the results of the hpenTSS mechanism was compared with two other RBound task set scaling methods identified as TSSmax and TSSrand. The results show that the task set with system utilization of 0.91 and Rbound(Γ') of 1.30 is not schedulable with the TSSmax approach because the r-value is greater than 2. Similarly, the task set is not schedulable with the TSSrand approach because the utilization of 0.91 is greater than the Rbound(Γ') of 0.74 obtained from the TSSrand mechanism. However, the task set is schedulable with the hpenTSS approach since the r-value is 1 which satisfies the condition $1 \leq r < 2$ and also the utilization of 0.91 is less than Rbound($\vec{\Gamma}$) of 1 obtained from the hpenTSS mechanism. In all, the combination of traffic shaping and hpenTSS mechanisms guarantees improved system utilization performance when compared with the existing RBound based TSSmax and TSSrand mechanisms for real time task scheduling on single core and multicore systems.

KEYWORDS: Harmonic Period, Real Time Task, Task Set Scaling Mechanism, Fog Computing, Task Scheduling Algorithm, Rbound Utilization Bound Approach, Single Core System.

Paper 217 – Occupational Safety Practices and Attainment of Sustainable Development Goals Among Tricycle Riders in Minna

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ABSTRACT
This conceptual review article explores the relationship between occupational safety practices and the attainment of sustainable development goals among tricycle riders in Minna. Tricycle riders are a significant mean s of transportation in Minna, providing affordable transportation to many people. However, the nature of their work exposes them to various hazards, including road accidents, environmental pollution, and poor working conditions. The article reviews the literature on the importance of occupational safety practices in the transportation sector, with a particular focus on tricycle riders. It discusses the potential impact of unsafe working conditions on the attainment of sustainable development goals, such as poverty reduction, environmental protection, and economic growth. The article also discusses various strategies that can be used to promote occupational safety practices among tricycle riders. Overall, the article concludes that promoting occupational safety practices among tricycle riders is crucial for the attainment of sustainable development goals in Minna.

KEYWORDS: Occupational safety practices; Sustainable Development Goals; Tricycle riders; Minna

Paper 218 – Enhancing Food Safety and Quality with Edible Coatings: A Review

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ABSTRACT
The edible coating is utilized to prolong the post-harvest lifespan of fresh food while simultaneously enhancing the visual appeal property and ensuring food safety. These coatings can be derived from both animal and plant sources. Edible coatings come in various forms such as proteins, lipids, polysaccharides, resins, or combinations thereof. Edible coatings act as a protective barrier which effectively prevents moisture and gas exchange whenever food is processed, handled or stored. They effectively mitigate food spoilage and promote protection by either their inherent properties or the inclusion of antimicrobial compounds. In addition to their protective qualities, edible coatings offer several other advantages such as minimizing packaging material wastage, prolonging the lifespan of fresh and slightly treated products, and shielding fresh foods against detrimental atmospheric factors. By facilitating the controlled spread of gas, water, aroma, and taste components within the food structure, these coatings play a vital role in preserving product quality.

KEYWORDS: Edible coating, Fruits, Vegetables, shelf life

Paper 219 – Effect of Process Variables on The Synthesis of Zeolite A from Aloji Kaolin

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ABSTRACT
This study investigates the effects of alkalinity (5,6.5,8 M), metakaolinization temperature (600, 725, 850 ˚C), crystallization temperature (80, 115,150 ˚C), and stirring time during aging (1,2,3 h) on zeolite A synthesis from kaolin. The hydrothermal method of synthesizing zeolite A was used in the study, and the synthesized zeolite was characterized for XRD and SEM. The findings showed that, alkalinity of 5M yielded only pure zeolite A crystals. The metakaolinization temperature of 850 ˚C, crystallization temperature 115 ˚C and stirring time of 2h gave the best crystallinity and cubic morphology, a feature that is widely associated with zeolite A. Further, findings reveal that increasing metakaolinization temperature and crystallization temperature increases crystallinity and crystal size while stirring time did not have significant effect on zeolite A synthesis.

KEYWORDS: Zeolite, Metakaolinization, Crystallization, Temperature, Alkalinity, kaolin

Paper 220 – Optimization of Some Selected Properties for Bioplastic Production from Waste Cassava and Potato Peels

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ABSTRACT
Starch-based bioplastics produced using waste cassava peel and potato peel. Glycerol and white vinegar used as plasticizers, while Kenaf nanofiber used as reinforcement. 3:1 ratio of cassava to potato starch was mixed with different proportions of additives (glycerol, kenaf and white vinegar) at a temperature of 50℃ for 20 minutes. The percentage proportion of the two alpha glucan types (amylose and amylopectin) showed that Potato Peels starch has 27.22% amylose and 72.78 % amylopectin while Cassava Peels starch has 13.13% amylose and 86.87% amylopectin. Optimization was carried out on the waste starch (CP and PP) and was found that the optimal values were gotten at 8. wt% K, 2 ml G, and 2.5 ml WV with a predicted TS and WA values of 2.465 MPa and 7.56 % respectively. Aspergillus Niger was used as a microorganism to monitor weight loss after 10 days for biodegradation. It was found that, run 1 (8% kenaf, 5ml glycerol and 2.5ml white vinegar) has the highest weight loss of 69.66% while the optimized value for the weight loss was 42.05%. Therefore, the optimal sample in terms of tensile strength and water intake can be degraded in 43.90 days.

KEYWORDS: Bioplastic, Cassava-peel, Potato-peel, Optimization, Mechanical Properties

Paper 221 – Biodiesel Production from Waste Cooking Oil: The Influence of Hierarchical and Conventional Beta Zeolite on Yield and Qualities

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ABSTRACT

This study reports biodiesel production from waste cooking oil: the influence of hierarchical and conventional beta zeolite catalyst on yield and qualities. Both commercial zeolite beta (CZB) and hierarchical zeolite beta (HZB) synthesize form Ahoko kaolin were characterized using X-Ray diffraction (XRD), Scanning electron microscopy (SEM) and Energy dispersive X-ray micro spectroscopy (EDX) analysis. The XRD of CZB, shows a series of characteristic diffraction peak assigned to the zeolite beta type as its finger print. It can be seen that zeolites beta had strong characteristic peak at position 2θ of 7.8°, 21.6°, 22.6°, 25.3°, 27.0° and 29.6° while the SEM/EDX determined the crystal size and the morphology, the sample maintains the same surface structure of beta zeolite even after it was protonated. From the EDX, the CZB Si/Al ratio was calculated to be 1.59. HZB gave biodiesel yield of 91.67 % at methanol to oil ratio of 9:1, while CZB gave yield of 84.0 % at the same condition. Reusability test carried out showed that at repeated 6th runs, biodiesel yield using the same HZB catalyst dropped to 75 % which was still much active compare to commercial zeolite Y (CZY) catalyst.

KEYWORDS: Biodiesel, Hierarchical zeolite beta, Commercial zeolite beta, Transesterification.

Paper 222 – Synthesis and Characterization of Hierarchical Beta Zeolite Catalyst from Ahoko Kaolin

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ABSTRACT
Ahoko kaolin clay has been employed as the unique source of silica and alumina in the synthesis of hierarchical beta zeolite using a simple hydrothermal method, first by transforming the kaolin into metakaolin. Zeolization of the beta crystals was performed at optimized conditions using the top-down and bottom-up approach. In the top-down approach, dealumination was carried using 8 M HCl at 90 ^{o}C for 3 h under reflux. The hierarchical form of the beta zeolite was obtained by desilicating (bottom-up) the synthesized beta with 10 wt% urea solution. Different analytical analysis such as XRD, XRF, SEM, BET and EDX were used to determine the structure and crystallinity of the synthesized beta, elemental composition, morphology, pore volume and surface area. The characterization results shows that hierarchical beta zeolite synthesized from Ahoko kaolin is a high silica zeolite (about 77 % silica content) that possess good crystallinity and bimodal pore structure. The morphology of the synthesized hierarchical beta zeolite also gives the spheroid shape of beta crystal with a hexagonal structure. Urea also proves to be a mild desilicating agent in the generation of mesopores.

KEYWORDS: Zeolite, Beta zeolite, Hierarchical Beta zeolite, Kaolin, Metakaolin.

Paper 224 – High-Capacity Data-Hiding Using RLE Compression and LSB Steganography Algorithm

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ABSTRACT
The exponential growth of computer networks and people sharing highly confidential information has driven data security into high alert around the globe, several algorithms and models have been developed to conceal secret information during communication over unsecured channels without suspicion. Different techniques such as steganography and cryptography (i.e. encryption and hiding of secret messages in a cover file) have been adopted to secure classified messages. However, the more the secret message the larger the file size of the message making it suspicious and can be subjected to brutal attacks to access the information. The work proposed an improved run-length encoding (RLE) compression algorithm to compress the cover image before applying the Least Significant Bit (LSB) steganography technique to hide the secret message in the cover image to obtain the stego-image. The lena.jpg with the file size of 36.9KB was used as a sample cover file to hide the secret messages of 5.08KB, 113KB and 655KB stego-image was obtained when the compressed cover file was used and uncompressed cover file was used respectively. Hence the file size of the stego-image when the uncompressed cover file was used is larger compared to the stego-file when the compressed cover file was used which gives room for more messages. The Mean Squared Error (MSE) and Peak signal-to-noise ratio (PSNR) result was 0.03% and 63.64dB respectively when comparing the cover file and the stego-file when the compressed cover file was used. This signifies the proposed algorithm result is less distorted, effective, efficient, and less suspicious when applied to secure secret messages during communication over unsecured channels.

KEYWORDS: Steganography, Secret Message, Cover Image, Visual C#, Image Compression Algorithm, MATLAB

Paper 225 – Chemical Modification of Locust Bean Pod Husk Fibre as A Reinforcing Component for Polymer Composite Application

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ABSTRACT
This paper focuses on the chemical modification of raw locust bean pod husk (LBPH) fibre using sodium hydroxide. The LBPH fibres were cleaned and reduced to a particle size range of (250-150µm). Sequential extraction method of biomass analysis was used to determine the chemical composition of the LBPH fibre. Analysis shows that the chemical composition consists of cellulose (59.3%), hemicellulose (20.2%), lignin (10.2%), extractive (9.1%) and ash (1.2%). 100 g of raw LBPH was mercerized at varying treatment concentration and contact time using NaOH to optimally improve the cellulose content, reduce the hydrophilic property of the LBPH fibre and improve the interfacial adhesion capacity of the LBPH fibre for polymer composite. Upon mercerization, a high optimum cellulose content of 80% was achieved using 1.5% NaOH at a contact time of 3 h. This indicates that the alkaline treatment process has a positive effect on the raw LBPH fibre. This is further confirmed by the FTIR spectrum of the treated LBPH fibre, recording minimal OH groups and aromatic lignin peaks. High NaOH treatment concentration weakens and denature the LBPH fibre. The LBPH treated fibre with the optimum cellulose content was preserved as a reinforcing material for polymer composite production.

***KEYWORDS*:** Chemical Treatment, Locust Bean Pod Husk, Cellulose Content, Mercerization, Contact time and Polymer Composite.

Paper 226 – Study of the pyrolytic conversion of palm kernel shells biomass to fuel

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ABSTRACT
The overdependence on the use of fossil fuels, environmental problems caused by conventional energy sources and deforestation caused by the excessive use of wood for energy has brought the need for alternative energy sources. Agricultural residue such as palm kernel shells have shown great promise in solving this energy problem. The biomass material used (palm kernel shell) was obtained from Suleja, Niger state. The palm kernel shell was washed and sun dried to reduce the level of moisture present in the feedstock. A pyrolyzer was designed, fabricated and was used for the pyrolysis of palm kernel shell. The process of pyrolysis was carried out at pyrolyzing temperature range of 300°C – 700°C and at a pyrolysis duration of 20 minutes. The result showed that palm kernel shell at 300°C yielded 71.34% char, 20.69% tar and 7.92% gas; 400°C yielded 44.04% char, 26.12% tar and 18.1% gas; 500°C yielded 42.10% char, 37.29% tar and 20.61% gas; 600°C yield 33.71% char, 40.14% tar and 26.14% gas; 700°C yielded 29.88% char, 33.04% tar and 37.08% gas.
From the above result, it can be concluded that as the pyrolyzing temperature increases, both tar and gas increases rapidly while the char production reduces and vice-versa.

KEYWORDS: Biomass, energy, pyrolysis, tar, char, fabricated, design

Paper 227 – Performance Evaluation of Furfural Production from Rice Straw Using Different Solvents as Promoters

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ABSTRACT
This paper reports a study on the production of furfural from rice straw biomass using different and specifically investigate the effects of solvents as promoters on furfural Yield from rice straw by carrying performance evaluation on various KCr_2O_7, H_2O/THF and H_2O/Toluene at constant reaction temperature (180 ^{0}C), reaction time of 30 min and acid concentration of 0.5M H_2SO_4. Furfural production was carried out by hydrolysis of Pentosans to Pentoses where Pentosans in hemicelluloses is hydrolyzed with dilute mineral acids and various solvents as a promoters at relatively temperature to pentoses and subsequent dehydration of pentoses to furfural in a single stage process. The results showed that potasium dichromate salt gave a better yeild of 84.7% using 0.5M H_2SO_4 of the three salt employed in the experiment followed by H_2O/THF with yield of 78.3% at 0.5M H_2SO_4 and H_2O/toulene with a yield of 68.9% at 0.5M H_2SO_4 respectively. Furfural produced was successfully characterized and compared to that of commercial grade. Its molecular weight is 96.03 g/mol, boiling point of 160.48 °C, and its chemical formula is $C_5H_4O_2$ with a bitter almond odor. FTIR Resultconfirms the presence of carbonyl and aldehyde functional groups at wave length of 1666.27cm^{-1} and 2844.18cm^{-1} . The FTIR of furfural produced was compared with that of commercial furfural both followed a similar pattern.

KEYWORDS: Rice straw, Furfural, Solvent, Performance and Yield.

Paper 228 – Spatial and Temporal Analysis of Rainfall and Mean Temperature Pattern Under Climate Change in Nigeria

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ABSTRACT
Climate change is expected to cause significant changes in weather patterns, with overreaching effects on agriculture, water supply, amongst other key sectors. Understanding the spatial and temporal characteristics of climate change is important for developing effective adaptation and mitigation strategies against the threat of climate change This study investigates the spatiotemporal characterization of climate change effect in Nigeria under two different Representative Concentration Pathways (RCPs), namely RCP4.5 and RCP8.5. Using the Mann-Kendall test, dynamically downscaled Global Circulation Models (GCMs) obtained from the Coupled Model Intercomparison Project phase 5 (CMIP5) for the period 1950-2100 were evaluated for three temporal scales, the "historical", "near future" and "far future". The results show that Nigeria is experiencing significant spatiotemporal variations in temperature and precipitation trends under the two concentration pathways. The Mann-Kendall test revealed a warming trend across the country, with some regions in the north experiencing up to 667% increase in temperature. Comparing the two RCPs, our results indicate that RCP8.5 has more severe impacts on temperature and precipitation than RCP4.5. The study provides valuable insights into the spatial and temporal patterns of climate change in Nigeria and highlights the potential impacts of different greenhouse gas concentration trajectories.

KEYWORDS: Climate variability, Nigeria, Non-parametric trend test, Climate change, RCP4.5, RCP8.5

Paper 229 – Modification of Urea Formaldehyde with Nanocellulose Derived from Baobab Pod Fibre and Waste Nose Mask

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ABSTRACT
This study focuses on utilizing nanocellulose from baobab pod fibers and waste nose masks to modify urea formaldehyde. The fibers underwent characterization and chemical treatment to enhance adhesive properties. Acid hydrolysis produced nanocellulose, analyzed using FTIR, SEM/EDS, and X-ray Diffraction. Compression molding modified urea formaldehyde with ratios of 10-90 wt%, 20-80 wt%, 30-70 wt%, and 40-60 wt%. Mechanical property investigation revealed excellent properties of nanocellulose from baobab pod fibers and waste nose masks. These fibers exhibited high cellulose content and low lignin and hemicellulose content, suitable for nanocellulose production. Acid hydrolysis yielded nanocellulose with high crystallinity and surface area. SEM/EDS analysis revealed a porous structure, enhancing adhesion with urea formaldehyde. The addition of nanocellulose improved mechanical properties, including tensile strength, modulus of elasticity, and elongation at break. The Highest properties were observed with the highest nanocellulose content, indicating a positive impact on urea formaldehyde. In conclusion, this study highlights the potential of nanocellulose from baobab pod fibers and waste nose masks to modify urea formaldehyde, enhancing its mechanical properties. Findings hold implications for sustainable and eco-friendly materials' development.

KEYWORDS: Nanocellulose, Urea, formaldehyde, Baobab, Nose masks.

Paper 230 – Effect of Different Mulching Materials on Growth Parameters and Yield of Okra (Abelmoschus Esculentus) Production in Minna, Nigeria

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ABSTRACT
An experiment was conducted to investigate the impact of mulching on the growth, yield, and moisture content of Okra at four growth stages (initial, development, mid, and late stage) and at different soil depths (0-30 cm and 30-60 cm). The experiment was carried out in a randomized complete block design with four replications, and the treatments were control (T0), groundnut shells mulch (T1), black polythene mulch (T2), and white polythene mulch (T3). The maximum average Okra fresh pod yield of 23.4t/ha was obtained from the white plastic mulch treatment, while the lowest yield of 22t/ha was obtained from the control treatment. Yield reductions of up to 32% were observed in the control plots compared to the white plastic mulched plots. The quality yield was significantly affected by the application of mulch, with the highest quality observed in the white plastic mulch treatment (26t/ha) and the lowest in the control treatment (24.3t/ha). Groundnut shells mulch also had an effect on moisture conservation, but they did not show any significant difference from the control plots. Therefore, the study suggests that polythene mulch may be the most suitable type to enhance quality on okra production by conserving soil moisture.

Paper 231 – Exploring the Effects of Heat Treatments on Ti6Al4V: A Review

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ABSTRACT
Ti–6Al–4V is a widely used titanium alloy in various industries due to its strength, toughness, and corrosion resistance. Heat treatment is one of the most critical aspects of its processing, which can significantly affect its microstructure and mechanical properties. This review provides an overview of the heat treatment of Ti–6Al–4V, including its annealing, solution treatment, aging, and stress relief processes while it also provides the effect of these heat treatment methods on the microstructural properties of Ti6Al4V. Results reviewed show that the solution heat treatment technique improves the material's ductility, making it easy to machine, form, and more wear-resistant, allowing for wide application of the alloy, Ti–6Al–4V.

KEYWORDS: Heat treatment, Annealing, Solution heat treatment, Mechanical properties, Stress relief

Paper 232 – Performance Evaluation of Developed Engine Powered Tigernut Harvesting Machine

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ABSTRACT
Tigernut (*Cyperus esculentus*) is a valuable crop known for its nutritional and economic significance. Harvesting tigernuts manually is labour intensive and time-consuming, leading to a growing interest in mechanized solutions to improve efficiency and productivity. This study is about the performance evaluation of developed engine powered tigernut harvesting machine. The Harvesting efficiency, Actual Capacity of the Machine and Cleaning efficiency of the machine were determined with respect to speed rate (15, 20 and 25 rpm) at three levels of digging depth (50mm, 80mm, and 100mm). At digging depth of 50mm the harvesting efficiency, actual capacity and cleaning efficiency increase with increase in speed. At 80mm and 100mm digging depth, the harvesting efficiency decrease with speed while both the actual capacity and cleaning efficiency increased with speed at 80mm and 100mm, respectively.

KEYWORDS: tigernut, performance evaluation, harvesting efficiency, actual capacity and cleaning efficiency

Paper 233 – Quality Enhancement of Stiff Dough (Tuwo): A Review

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ABSTRACT
In West Africa, specifically in Nigeria, cereals such as corn and sorghum flour are widely consumed. These grains are transformed into a stiff dough called "tuwo" in the local language, Hausa. Tuwo is a semi-solid dough made by cooking cereals flour in a slurry form. To shape and solidify the dough, it is moulded and wrapped in polythene materials or food-grade plastic containers. Tuwo is traditionally enjoyed with various soups, garden egg, and locus beans. Cereals have relatively low protein content but high caloric value. Therefore, it is important to supplement the production and consumption of tuwo with additional nutrients to create a well-balanced meal. To improve the quality of tuwo, it is possible to enhance the chemical properties of the grains by utilizing selected pre-treatment methods. These methods, including blanching, soaking, and malting, can improve the nutritional and functional quality of the cereals while reducing anti-nutritional components. By implementing pre-treatment techniques on cereal grains, the resultant stiff dough, tuwo, can be enhanced to provide a balanced meal, improve overall acceptability, and optimize production.

KEYWORDS: Cereal, quality, nutritional, functional, anti-nutritional, tuwo