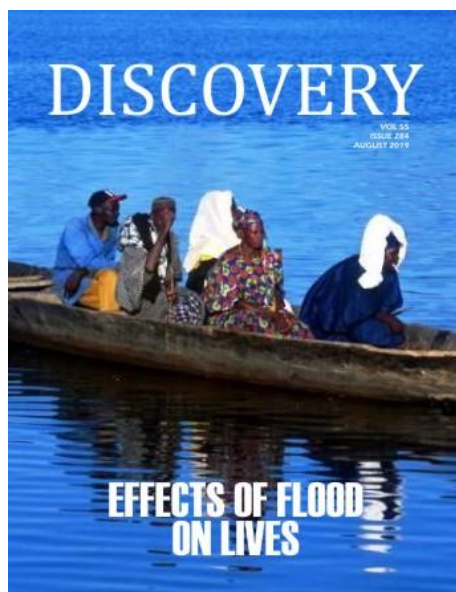


DISCOVERY

About the Cover



This study examines the perceived effects of flooding on lives and properties of the residents of Lokoja, Kogi State, Nigeria. The theory of resilience and concept of vulnerability provided the anchor while cross sectional survey research design was adopted for the study. Both primary and secondary data were sourced and multi-stage sampling technique was adopted where all the six communities (Adankolo, Felele, Ganaja, Lokongoma, and Sarkin Noma) affected were purposively surveyed. All the buildings that fell within 200 metres of the six floods affected communities were identified. The total numbers of buildings (2,018) were enumerated and 10% (202) of the sampled size were taken for the study. Issues that were considered included: Respondents socio-economic characteristics, respondents perceived number of flood occurrences in the study area, perceived impact of flooding on lives and infrastructure, level of household preparedness and diverse methods used in combating flood. Both quantitative (Logistic regression) and qualitative (FGD) techniques were used to analyze the data at $p \geq 0.05$ level of significance. The qualitative data collected were content analyzed. Flooding was discovered to cause damages to household properties (30.8%), household vehicles (3.5%), buildings collapse (0.5%), farmlands (7%) and death (0.4%). Although, more than 77.2% of the respondents were discovered to have been prepared for past flood events, but the nature of their preparedness were poor. The research also revealed significant relationship between level of preparedness and the effect of severe flooding (0.246). Therefore, early warning system should be provided for the residents coupled with flood resilience buildings. (Ref: Jimoh Usman Umaru, Salami Shola Hafiz. Perceived effects of flood on lives and properties of the residents of Lokoja, Kogi State Nigeria. *Discovery*, 2019, 55(284), 441-452).

Metamaterial based split triangular shape microstrip antenna

Smrity Dwivedi

Present paper is based on improvement in gain and the profile of triangular microstrip antenna using metamaterial structure. Widely used metamaterial, engineered for specific purposes, have negative permittivity (ENG) or negative permeability (MNG), or both negative (DNG) with negative refraction coefficient. Author is discussed the antenna with left handed metamaterial (DNG) based structure to enhance the antenna efficiency, reduced the return loss to increase the bandwidth at the same resonant frequency. Simulation is done by using commercial software HFSS, based on finite element method (FEM) and compared with results, obtained from coding. Both obtained results are in close agreement within ~5%. Author is also shown the improvement in gain and bandwidth of simple triangular antenna after using the metamaterial based split ring triangular shape antenna with the help of plots.

Discovery, 2019, 55(284), 367-372**Comparative study of wines produced from Zobo/Pineapple peel using monocultures and mixed cultures of *Saccharomyces cerevisiae* and *Candida ethanolica***

Onwumah M, Amakoromo ER, Eruteya OC, Effiong EC, Okoronkwo PC

The high cost of imported wines and the limited supply of grape which is the fruit of choice in wine production have necessitated the search for alternative raw materials. This research evaluates the quality of wines produced from *Hibiscus Sabdariffa* (zobo) and *Ananascomosus* (pineapple) peels, singly and combined, using monocultures and mixed cultures of *Saccharomyces cerevisiae* and *Candida ethanolica*. Musts were prepared with zobo and pineapple peels in the ratio 1:3 by dry weight and inoculated with starter cultures. Uninoculated zobo and a mixture of zobo and pineapple were used as controls. Microbiological and physico-chemical parameters were monitored during fermentation at 4 day interval for 12 days. The sensory attributes of the products were evaluated using 7-point hedonic rating. The ethanol concentration of the two most preferred samples and the controls were determined using gas chromatography - mass spectrometry (GC-MS). The total yeast count of the samples ranged from 7 to 19 log cfu/ml. The pH ranged from 1.7 to 2.5 while temperature ranged from 26.5 to 27.8°C. The titratable acidity ranged from 4.3 to 9.0g tartaric acid/100ml. Specific gravity ranged from 0.91 to 1.03. The sensory evaluation showed that zobo/pineapple mixture fermented with *S. cerevisiae* was scored highest in terms of overall acceptability. The GC-MS analysis revealed that zobo/pineapple mixture fermented with the mixed cultures had the highest alcohol of 11.69% v/v. This study has shown that acceptable wine of good quality can be produced from hot water extracts of zobo and pineapple peels and *Saccharomyces cerevisiae* should be adopted as starter culture for a better product quality. The industrial potential of this product could also be further exploited.

Discovery, 2019, 55(284), 373-384**Behaviour of chemically reacting in compressible fluids in electromagnetic fields provoked by radiation**

Alalibo T Ngiangia, Eghuanoye S Ikata, Peter O Nwabuzor

Application of radiation and first order chemical reaction to the behavior of fluids in electromagnetic fields is investigated analytically. The study reveals that the behavior of fluids in electromagnetic fields is governed by electrical conductivity which gives rise to electromagnetic forces and mechanical forces. The effect of electrical conductivity decreases the magnetic field and increases the electric field while increase in the electrical resistivity, increase magnetic field strength and decrease the electric field strength. Critical observations also reveal that increase in the flow of energy, decreases the heat transfer coefficient and increase in the chemical reaction term results in a decrease in the mass transfer coefficient.

Discovery, 2019, 55(284), 385-396**Comparison between actual and estimated maximum downwind distance using different dispersion parameters**

Khaled SM Essa, Aziz N Mina, Hany S Hamdy, Fawzia Mubarak, Ayman A khalifa

In this paper, the maximum downwind distance x_{max} is calculated which depends on the dispersion parameters σ_y and σ_z by using two methods as follows: the power law function method, and standard method at three effective heights at 5, 100 and 250m respectively. The maximum ground level concentration of air pollution that based on the Gaussian plume model can be calculated by using the values of the estimated and actual x_{max} in the equation of Gaussian air pollution model for different stability classes. The estimated and actual x_{max} are summarized in power law and standard method. Also the percentage of the error between estimated and actual maximum downwind distance are in the range of 0 to 492 and 0.005 to 14.2 respectively. Comparison between the results of estimated and actual x_{max} in case of power law and standard method with the previous work used Brigg's method (Ronbanchob Apiratikul, 2015) are done.

Discovery, 2019, 55(284), 397-403

An investigation on the mechanical properties of heat treated A384 Aluminium alloy

Bawa MA, Umaru OB, Oyewole SO, Onmikpa O

Research has been done to study the effect of heat treatment on the mechanical properties of A384 aluminium alloy. Aluminium scraps were collected, melt and cast to cylindrical rods of 20x300 mm. The first set of the produced alloy was annealed at 470°C for 3 hours, while the second set of samples were hardened by heating it to a solutionizing temperature of 470°C, followed by quenching in warm water and subsequently ageing to 120°C for 5 hours. The as-cast and heat-treated samples were then subjected to mechanical tests. The results revealed that the as-cast, precipitation hardened and annealed sample had a tensile strength of 75Mpa, 128Mpa and 93.4Mpa with hardness values of 37HRF, 91.50HRF, and 12HRF respectively. It was observed that the tensile strength of precipitation hardened sample is 71.8% greater than that of the as-cast, while the tensile strength of the annealed sample is 24.6% greater than the tensile strength of as-cast samples. From the result obtained, Heat treated samples have higher ultimate tensile strength, hardness and elongation values as compared with the as-cast. It can be concluded that the heat treatment operations have improved the mechanical properties of the aluminium alloy under investigation.

Discovery, 2019, 55(284), 404-409

Chloride solution absorption-moisture content in pre-conditioned FSC cubes

Balakrishna MN, Fouad Mohamad, Robert Evans, Rahman MM

The premature deterioration of RC structures is a major concern for infrastructure owners. The most predominant process associated with reinforced concrete deterioration is the ingress of water contaminated with chloride either from de-icing salt used for snow and ice control on roads for winter maintenance purposes or from the marine environment where, for example, bridges span tidal estuaries. Because the use of de-icing salt is likely to continue for the foreseeable future, and concrete structures will always be placed in, or near, the marine environment, little can be done to prevent structures from being exposed to chloride salts. The premature deterioration of concrete structures due to chloride ingress and subsequent corrosion of the steel reinforcement is a worldwide problem and imparts a significant drain on maintenance resources, not only in terms of the remedial work required, but also in the costs associated with periodic inspections and testing together with indirect costs such as traffic delays and lost productivity. The exposure of concrete infrastructures to chloride ions is the primary cause of premature corrosion of steel reinforcement. The intrusion of chloride ions, present in de-icing salts into reinforced concrete can cause steel corrosion if oxygen and moisture are also available to sustain the reaction. In fact that, the chlorides dissolved in water can also permeate through sound, concrete/reach the steel reinforcement through cracks. The present research work was made an attempt to interpret the concrete chloride absorption in ordered to characterize the different concrete mixtures design for in case of pre-conditioned concrete cubes such as fully saturated condition which is salt ponded with chloride solution for about 160 days at 10% NaCl solution. Thus, the objectives of this present research are such as; first, this research will examine the influence of conditioning such as fully saturated condition on the results of chloride absorption performed on concrete cubes with different mixtures proportion. In which slump, and w/c ratio value was vary with constant compressive strength as in the first case and compressive strength, and w/c ratio value varied with constant slump as in the second case. Twenty four concrete cubes (100 mm³) with grades of concrete ranges from 25-40 N/mm² were prepared and evaluate the chloride absorption under specified exposure condition. It has concluded from the results that, in fully saturated conditioned concrete cubes, the chloride absorption value was increase in all designed mixtures type at longer time duration. Similarly, the average chloride absorption was decrease in solvent/water based impregnation FSC cubes as when compared to control FSC cubes for constant higher compressive strength and varied slump value as well as varied compressive strength and constant slump value. Whereas the average chloride absorption was increase in solvent/water based impregnation FSC cubes for lesser compressive strength and constant slump value as when compare to constant higher compressive strength and varied slump value and the chloride absorption was goes on decreases with increased compressive strength and constant slump value.

Discovery, 2019, 55(284), 410-419

Influence of moisture content on chloride absorption in concrete cubes

Balakrishna MN, Fouad Mohamad, Robert Evans, Rahman MM

Concrete structures deteriorate in their operating environment under the combined action of harsh environmental conditions and external loading. Although the applied load can lead to a certain degradation of the structure, the main long-term deterioration mechanism involves moisture movement and the transport of chlorides within concrete. In order to build durable and reliable structures, it is necessary to be able to accurately predict the movement of moisture and chlorides within concrete. The exposure of concrete infrastructures to chloride ions is the primary cause of premature corrosion of steel reinforcement. The intrusion of chloride ions, present in de-icing salts into reinforced concrete can cause steel corrosion if oxygen and moisture are also available to sustain the reaction. In fact that, the chlorides dissolved in water can also permeate through sound, concrete/reach the steel reinforcement through cracks. Therefore, there is a need to quantify the chloride absorption in concrete cubes, which is of most important factor. The present research work was made an attempt to interpret the concrete chloride absorption in ordered to characterize the different concrete mixtures design for in case of pre-conditioned concrete cubes such as partially saturated condition (Mc = 2%) which is salt ponded with chloride solution for about 160 days at 10% NaCl solution. Thus, the objectives of this present research are

such as; first, this research will examine the influence of conditioning such as partially condition on the results of chloride absorption performed on concrete cubes with different mixtures proportion. In which slump, and w/c ratio value was vary with constant compressive strength as in the first case and compressive strength, and w/c ratio value varied with constant slump as in the second case. Twenty four concrete cubes (100 mm^3) with grades of concrete ranges from 25-40 N/mm^2 were prepared and evaluate the chloride absorption under specified exposure condition. It has concluded from the results that, in partially saturated conditioned concrete cubes, the chloride absorption value was increase in all designed mixtures type at longer time duration. Similarly, the average chloride absorption was decrease in solvent/water based impregnation PSC cubes as when compared to control PSC cubes for constant higher compressive strength and varied slump value as well as varied compressive strength and constant slump value. Whereas the average chloride absorption was increase in solvent/water based impregnation PSC cubes for lesser compressive strength and constant slump value as when compare to constant higher compressive strength and varied slump value and the chloride absorption was goes on decreases with increased compressive strength and constant slump value.

Discovery, 2019, 55(284), 420-429

Parametric study for Solar Dryer Design

Benjamin Ternenge Abur, Habou Dandakouta, Adisa AB, Ejilah RI

Solar collector is a core sub-system in solar thermal energy systems with various applications including solar drying of agricultural products. This research paper studied the effect of input parameters that affect the collector size and efficiency of a solar cabinet dryer. For solar drying of tomatoes slices, design equations of collector top heat loss, bottom and edges heat losses, mass of moisture removed from crop, quantity of heat required for evaporating moisture from crop, drying chamber heat lost, estimation of average solar radiation for location using Angstrom-Prescott equation, collector area and collector efficiency were coded in MATLAB programming language. The month of August was used as the design month bearing in mind that the month has the least solar radiation in Bauchi. Variables studied included single and double glazing, wind speed in the range of 1 to 5m/s, thermal conductivity of insulating materials between 0.01 to 0.1W/mK, collector tilt angle 0 to 60° and initial moisture content of crops in the range of 20 to 96%. The solar collector area and efficiency were calculated from the MATLAB programme codes. Result shows that wind speed of 1 and 2m/s have smaller collector areas and relatively higher collector efficiencies compared to wind speeds of 3, 4 and 5m/s for both single and double glazing. Crops with low initial moisture content required small collector areas compared to those with high initial moisture content and optimum collector tilt angle of 13.01° for Bauchi. The use of insulating materials of low thermal conductivity minimizes heat lost and hence lower collector areas and higher collector efficiency. Collector air gap height of 50mm and optimize collector tilt angle of 13.01° in addition to materials of low thermal conductivity for thermal lagging maximizes solar energy input utilization, high thermal efficiency and small solar collector area. This design approach minimizes the use of materials, will maximized energy usage and give optimum returns on investment.

Discovery, 2019, 55(284), 430-440

ENVIRONMENTAL SCIENCE

Perceived effects of flood on lives and properties of the residents of Lokoja, Kogi State Nigeria

Jimoh Usman Umaru, Salami Shola Hafiz

This study examines the perceived effects of flooding on lives and properties of the residents of Lokoja, Kogi State, Nigeria. The theory of resilience and concept of vulnerability provided the anchor while cross sectional survey research design was adopted for the study. Both primary and secondary data were sourced and multi-stage sampling technique was adopted where all the six communities (Adankolo, Felele, Ganaja, Lokongoma, and Sarkin Noma) affected were purposively surveyed. All the buildings that fell within 200 metres of the six floods affected communities were identified. The total numbers of buildings (2,018) were enumerated and 10% (202) of the sampled size were taken for the study. Issues that were considered included: Respondents socio-economic characteristics, respondents perceived number of flood occurrences in the study area, perceived impact of flooding on lives and infrastructure, level of household preparedness and diverse methods used in combating flood. Both quantitative (Logistic regression) and qualitative (FGD) techniques were used to analyze the data at $p \geq 0.05$ level of significance. The qualitative data collected were content analyzed. Flooding was discovered to cause damages to household properties (30.8%), household vehicles (3.5%), buildings collapse (0.5%), farmlands (7%) and death (0.4%). Although, more than 77.2% of the respondents were discovered to have been prepared for past flood events, but the nature of their preparedness were poor. The research also revealed significant relationship between level of preparedness and the effect of severe flooding (0.246). Therefore, early warning system should be provided for the residents coupled with flood resilience buildings.

Discovery, 2019, 55(284), 441-452