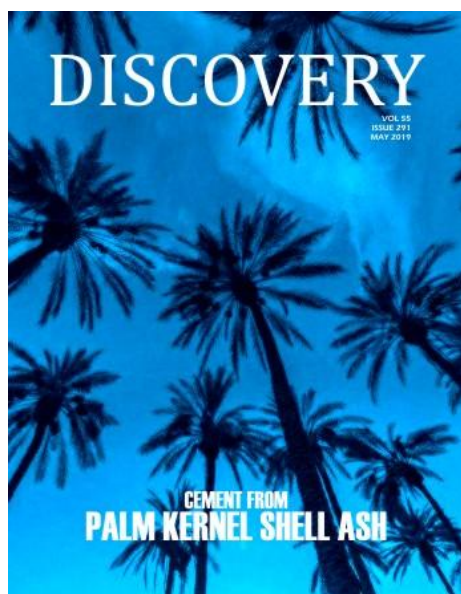


# DISCOVERY

## About the Cover



This research study was primarily conducted to investigate the possibility of using a blend of Palm Kernel Shell Ash (PKSA), Palm Kernel Fiber Ash (PKFA), Chipping Dust (CD) and Clay Soil (kaoline) to produce cement that can possibly reduce the rising cost of building material such as cement as well convert waste to wealth in developing economy like Nigeria. The raw materials were sourced locally and unit operation method was used to achieve formulated cement as an end product. ED x 3600B x-ray fluorescence spectrometer and atomic absorption spectrophotometer model S4=71096 were used to analyze the elemental concentration of the raw materials having done the same on Bua cement, Dangote cement and the formulated cement and it was found to meet the standard requirement. Experimental method, modelling approach and comparison of data were carried out to ascertain the possibility of cement production. The concrete made of the formulated cement was subjected to compressive strength test in the ratio of 1:1.5:3 and 1:2:4 for a maximum curing age period of twenty-eight (28) days. The crushing results are 2.8N/mm<sup>2</sup>, 3.5N/mm<sup>2</sup>, 4.44N/mm<sup>2</sup>, 5.33N/mm<sup>2</sup> and 2.0N/mm<sup>2</sup>, 2.20N/mm<sup>2</sup>, 2.5N/mm<sup>2</sup> and 2.7N/mm<sup>2</sup> respectively. The results show that, strength gained as curing age progresses. However, the result is less when compared to the minimum value of British Standard (BS12) of 16N/mm<sup>2</sup>, 19N/mm<sup>2</sup>, 21N/mm<sup>2</sup> and 24N/mm<sup>2</sup> but upon improvement and technological advancement, it can favourably compete with any brand of cement. (Ref: Ukpaka CP, Amadi SA, Idubamo RC. Production of cement using a blend of palm kernel shell ash, palm fiber ash, chipping dusts and clay soil ash. *Discovery*, 2019, 55(281), 187-197).

## ENGINEERING

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### **Production of briquettes with heating value using different palm kernel shell**

Ukpaka CP, Omeluzor, Christian Ulochukwu, Dagde KK

Investigation was carried to study the variability and performance of briquettes produced from palm kernel shell (PKS), obtained from three locations using cassava starch as binder. Effects of compression pressure and binder content were studied as performance measures to improving the efficiency of briquette. Analysis showed that moisture content decreased with increase in compression pressure, while the reverse was the case for ash content of PKS briquettes. However, the density, moisture content, ash content, volatile matters and fixed carbon of the briquettes obtained at 70kN/m<sup>2</sup> and 8.57% binder content were 1.23g/cm<sup>3</sup>, 3.8%, 3.76%, 73.01% and 23.38% in briquette AB, 1.27g/cm<sup>3</sup>, 3.5%, 3.78%, 74.26% and 21.96% in briquette RB and 1.28g/cm<sup>3</sup>, 3.1%, 3.82%, 76.60% and 19.58% in briquette EB respectively. Also, the ignition time, water boiling time, calorific value and thermal efficiency increased as compression pressure and binder content were increased, while mass of briquettes consumed, burning rate and specific fuel consumption decreased with increase in compression pressure and binder content. The optimum performance was recorded at 8.57% binder content and 70kN/m<sup>2</sup> compression pressure, with burning rate, specific fuel calorific value and thermal efficiency obtained as 0.49g/min, 0.0150 kg fuel/L, 20058.17 kJ/kg and 49.44% in briquette AB, 0.46g/min, 0.0146 kg fuel/L, 20629.46 kJ/kg and 50.14% in briquette RB and 0.43g/min, 0.0142 kg fuel/L, 21246.17 kJ/kg and 50.45% in briquette EB respectively. However, briquette EB performed slightly better than briquettes RB and AB. Also, mathematical relationship established between temperature rise and time as well as the amount of briquette consumed with time during combustion process, can be described by quadratic function. Summarily, the high calorific value, thermal efficiency and the low burning rate of PKS briquettes amongst other excellent properties, are potential indicators that proper utilization of PKS for briquetting in Nigeria would contribute to solving the existing energy crisis, which would reduce the over dependence on refined petroleum products for domestic and commercial heating.

*Discovery*, 2019, 55(281), 147-157

## SOCIAL SCIENCE

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### **Use of social media for job search and application: a perspective from the job seekers in Bangladesh**

Md. Al-Amin, Shohel Md. Nafi, Md Al Amin

This paper explores the impacts of social networking sites on job aspirants in Bangladesh in terms of job search and application as well as the different perspectives from the job seekers' point of views. Using a mixed method approach, this cross-sectional study collected basically primary data through questionnaire survey and In-depth Interview with the stakeholders. Data obtained from the sources showed that the prevalence of using social media for job search is high among Bangladeshi job seekers and they are mostly using Facebook (84.2%) and LinkedIn (9.8%) for it. Many applied (77.0%) for jobs getting the advertisement from social media and only 70.8 % of them get contacted by the employers. Of the interacted candidates, 46.8% were offered the job and only 21.6% of them joined at their desired job. The study identified that there were many reasons why candidates were leaning away from joining at the jobs and not much get interested in social media use for the purpose of job search. Though there were found a bunch of constructive advantages of using social media for job searching like; cost reduction (94.6%), fair playground for all (49.5%), easy way (70.7%), user-friendly (55.2%), fewer formalities (35.9%), and direct response and flexibility (39.8%) etc., there were also found some challenges for it; insecurity (22.8%), fake recruitment (38.6%), deception (21.7%), unsecured or betrayed (29.7%) and hiring for a short time (11.4%) are mentionable. However, if the trust, credibility, and authenticity in whole recruitment processes and eradication of fake advertisements, security threats and betraying behaviors –could be identified and addressed, social media will be a powerful catalyst for job search and application –which will definitely lead to a proper, effective and efficient recruitment gateway in Bangladesh.

*Discovery*, 2019, 55(281), 158-166

## VETERINARY SCIENCE

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### **Haematological and biochemical indices of albino rats fed processed sickle pod (*Senna obtusifolia*) seed meal based-diets**

Ardo MU, Augustine C, Khobe D, Johnson A, Katsala JA, Umar M, Faci AD, Garba YM, Shall MP, Maspalma AJ

A feeding trial was conducted to evaluate the effects of feeding raw or processed *Senna obtusifolia* seed meal based-diets on the haematological and biochemical indices of albino rats. Five experimental diets were compounded to contain 0 and 20% each of the raw, toasted, boiled and fermented *Senna obtusifolia* seed meal represented as T1, T2, T3, T4 and T5, respectively. A total of 60 young albino rats with average body weight of 72.67 g were randomly allotted to the 5 dietary treatments in complete randomized designed with 3 replicates of 4 rats each. Data were collected on chemical composition of raw and processed *Senna obtusifolia* seed meals packed cell volume (PCV), haemoglobin (Hb), Red blood cells (RBC), white blood cells (WBC), total protein, albumin, globulin, creatinine, aspartate aminotransferase, alanine aminotransferase and total bilirubin. The chemical composition of *Senna obtusifolia* seed meal revealed that the raw seed meal had crude protein of 22.68%. The different processing methods were observed to reduce the protein content of the seed meal except for the fermented seed meal which indicated an increase in protein content (23% CP). The PCV (29.67%), Hb (9.67g/dl) and RBC ( $2.90 \times 10^3/\text{mm}^3$ ) were significantly ( $P < 0.05$ ) depressed in the albino rats fed the raw *Senna obtusifolia* seed meal based-diet. However, WBC was observed to be high ( $6.77 \times 10^6/\text{mm}^3$ ) in the group of albino rats fed the raw *Senna obtusifolia* seed meal based-diets. Low total protein (3.54 g/dl), albumin (0.91 g/dl) and globulin (2.83 g/dl) were observed in threats fed raw *Senna obtusifolia* seed meal based-diets. Higher values for aspartate aminotransferase (47.33  $\mu\text{L}$ ) alanine aminotransferase (37.33  $\mu\text{L}$ ) and total bilirubin (16.67 mmol/L) were recorded in albino rats fed the raw *Senna obtusifolia* seed meal based-diets. Among the albino rats fed the processed *Senna obtusifolia* seed meal based-diets, those fed the fermented seed meal based-diets recorded better haematological and biochemical values. It was concluded that albino rats fed the fermented *Senna obtusifolia* seed meal indicated better haematological and biochemical constituents and is therefore recommended for feeding albino rats.

*Discovery*, 2019, 55(281), 167-172

## POLLUTION SCIENCE

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### **Impact of vehicular emission on air pollution in Ojo local government area of Lagos State, Nigeria**

Ogunbe AS, Iginla SA, Alabi AA, Onori EO

This study was carried out to assess the impact of vehicular emission on air pollution at some locations in Ojo Local Government Area of Lagos State, Nigeria, with a view to determining the contribution of motor vehicle emissions to air pollution. The sites were: Iyana Iba Bus-stop, LASU Main Gate, Okokomaiko Bus stop, LASU Second Gate and LASU Main Campus. Some of the air pollutants measured include carbon monoxide (CO), sulphur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), hydrogen sulphide (H<sub>2</sub>S) and suspended particulate matter (SPM). MSA 5x Multi Gas Detector was used to measure the concentration of air pollutants of CO and H<sub>2</sub>S while Kanomax Single Gas Detector was used to measure NO<sub>2</sub> and SO<sub>2</sub> and TSI Aero Trak Handheld Particle Counter Model 9303 was used to determine SPM. Vehicular traffic was observed during the peak traffic periods; 8:00 a.m. – 10:00 a.m. and 4:00 p.m. – 6:00 p.m. each day for eight days. The number of traffic at each site per hour was counted using an electronic counting machine. The results indicated that the concentration of CO at Okokomaiko Bus-stop was the highest with an average of 54.88±7.94 ppm (n=8). At this site, the concentration fell between 41.00 and 65.00 ppm between the hours of 8:00 a.m. and 10:00 a.m. while the average concentration between 4:00 p.m. and 6:00 p.m. was 49.63±10.50. The reason for high concentration of CO at Okokomaiko was due to high vehicular traffic. CO concentration is influenced greatly by traffic flow, in which case the concentration for free-flowing traffic was less compared to an impeded flow due to traffic jam as experienced in most of the locations. The result of the study also showed that hydrogen sulphide profile within the metropolis and control stations was not detected within the equipment's detection limit. The assessment of the impact of vehicular emissions on the air quality at the study locations showed that traffic density can increase the concentration of air pollutants (NO<sub>2</sub>, SO<sub>2</sub>, CO and SPM) emanating from vehicular emissions because pollutants concentrations showed high correlation with traffic density except for H<sub>2</sub>S. All the pollutants were either within or above the WHO standards for ambient air quality. The study also revealed that measured gaseous pollutants in the air directly or indirectly threaten the environment and life of inhabitants of the locations and that motor vehicles emission and other related activities carried out along these roads remain the main sources of these pollutants.

*Discovery*, 2019, 55(281), 173-186

## MATERIALS SCIENCE

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### **Production of cement using a blend of palm kernel shell ash, palm fiber ash, chipping dusts and clay soil ash**

Ukpaka CP, Amadi SA, Idubamo RC

This research study was primarily conducted to investigate the possibility of using a blend of Palm Kernel Shell Ash (PKSA), Palm Kernel Fiber Ash (PKFA), Chipping Dust (CD) and Clay Soil (kaoline) to produce cement that can possibly reduce the rising cost of building material such as cement as well convert waste to wealth in developing economy like Nigeria. The raw materials were sourced locally and unit operation method was used to achieve formulated cement as an end product. ED x 3600B x-ray fluorescence spectrometer and atomic absorption spectrophotometer model S4=71096 were used to analyze the elemental concentration of the raw materials having done the same on Bua cement, Dangote cement and the formulated cement and it was found to meet the standard requirement. Experimental method, modelling approach and comparison of data were carried out to ascertain the possibility of cement production. The concrete made of the formulated cement was subjected to compressive strength test in the ratio of 1:1.5:3 and 1:2:4 for a maximum curing age period of twenty-eight (28) days. The crushing results are 2.8N/mm<sup>2</sup>, 3.5N/mm<sup>2</sup>, 4.44N/mm<sup>2</sup>, 5.33N/mm<sup>2</sup> and 2.0N/mm<sup>2</sup>, 2.20N/mm<sup>2</sup>, 2.5N/mm<sup>2</sup> and 2.7N/mm<sup>2</sup> respectively. The results show that, strength gained as curing age progresses. However, the result is less when compared to the minimum value of British Standard (BS12) of 16N/mm<sup>2</sup>, 19N/mm<sup>2</sup>, 21N/mm<sup>2</sup> and 24N/mm<sup>2</sup> but upon improvement and technological advancement, it can favourably compete with any brand of cement.

*Discovery*, 2019, 55(281), 187-197

## ENVIRONMENTAL SCIENCE

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### **Removal of fluoride by using *Musa paradisiaca* fruit peel as natural coagulant**

Gandhi N, Sirisha D

In this work, treatment of synthetic fluoride containing solutions by using *Musa paradisiaca* fruit peel powder as natural coagulant by coagulation-flocculation process. This method has been studied in order to treat wastewater from various industries (Electroplating, Photovoltaic wafers, Mineral processing units and Electronic goods production industries) and ground water (where high amount of fluoride observed in ground & drinking water). Several working parameters, such as concentration of fluoride, dosage of coagulant, initial pH of the solution and contact time of the reaction were studied to achieve a higher removal capacity. Variable concentrations (1-4 mg/L) of fluoride solutions were prepared by mixing proper amount of sodium fluoride with demonized water. The varying initial pH of the solution (pH 3 to pH 11) was also studied to measure the removal efficiency of *Musa paradisiaca* fruit peel powder. Results obtained with synthetic solutions revealed that the most effective removal capacities of fluoride could be achieved at 1 gm of coagulant dosage at 4 mg/L initial fluoride concentration. The removal efficiency is decreased as increases the initial fluoride concentration of the solution at constant coagulant dosage. The obtained results were substituted with coagulation flocculation kinetic parameters, which available in literature to find out the order of the process. The results indicated that the removal of fluoride by *Musa paradisiaca* fruit peel powder follows zero order of reaction. In addition, the process was successfully applied to the treatment of electroplating industry wastewater, where an effective reduction of fluoride concentration under legal limits was obtained just after 50-60 minutes. The results of this study showed that the removal efficiency of fluoride with *Musa paradisiaca* fruit peel powder given an economical solution to remove fluoride from aqueous solution.

*Discovery*, 2019, 55(281), 198-209

## PHYSICS

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### **Improved design and optimization of Excess-3 Adder for quantum computation**

Jeong Ryeol Choi, Ji Nny Song

When we design an arithmetic logic circuit for quantum computers, a required condition is that data processes in the circuit should be reversible. Such reversibility ensures that there is no information loss during the execution of a computation. For a reversible computing process, the circuits do not emit heat relevant to information losses during the operation. In this work, we have designed an improved circuit of the reversible Excess-3 Adder which is used to execute decimal arithmetic operation. The number of operation lines in the circuit proposed here is 14; Among them, four lines are garbage lines. Through this design, the operation process in the circuit has been simplified from the existing ones. By testing the adding processes of the new Excess-3 Adder with example operations, we have confirmed that our circuit works well.

FISHERIES SCIENCE

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**Use of mobile phone in receiving information on fish culture: A case study of farmers in Bangladesh**

Mohammed Nasir Uddin, Md. Shajahan, Md Abdul Momen Miah, Farhana Yeasmin

Use of the Mobile phone in agricultural arena specifically fisheries sectors is one of the issue in the concurrent world both in fish culture and its marketing. Thus, the study was under taken mainly to determine the extent of use of mobile phone by the farmers in receiving information on fish culture and to explore the relationship between the selected characteristics of the farmers and their use of mobile phone in receiving information on fish culture. The study was conducted in three villages of Kaladho union at Fulbaria Upazila in Mymensingh district. The Fish farmers of the three villagers at Kalabho Union of Fulbaria Upazila who have been using mobile phone as a communication media were the population (502) of the study while twenty percent of the fish farmers were selected as sample (100) following simple random method. Data were collected from 100 randomly selected farmers during the period from 15 September to 15 October, 2017 using a pre-tested interview schedule. Appropriate scales were developed and use in order to measure the concerned variables. Collected data were analyzed using descriptive statistics while Pearson's Product Moment Correlation were also used for the same. The findings indicated that 59 percent of them had low use of mobile phone while the rest 39 percent of them had medium use of mobile phone and 2 percent of them had high use of mobile phone. Among eleven characteristics of the farmer's education, annual family income, knowledge on fish culture and information seeking tendency of the fish farmers showed significant and positive relationship while age, family size, farm size, credit farming experience received, training received and organizational participation did not show any significant relationship with their use of mobile phone. Besides, the highest proportion (71 percent) of the respondents in the study area faced medium problem, while the rest 29 percent of the respondents faced low problem but none of them belong to high problems category. However, the findings of the study did not show satisfactory results may be because of several problems faced by the farmers in using mobile phone while low literacy, low annual income etc. were also responsible.

*Discovery*, 2019, 55(281), 214-219