BOOK OF ABSTRACT

45th

Annual Conference

of

The Nigerian Institute of Physics (NIP)

Theme: **PHYSICS ADVANCEMENTS: Pathways to Economic & Technological Developments**

Date: 6th – 10th May, 2024

Venue: Mahmud Tukur Theater, Old Campus,
Bayero University, Kano

Hosted By: Department of Physics
Bayero University, Kano

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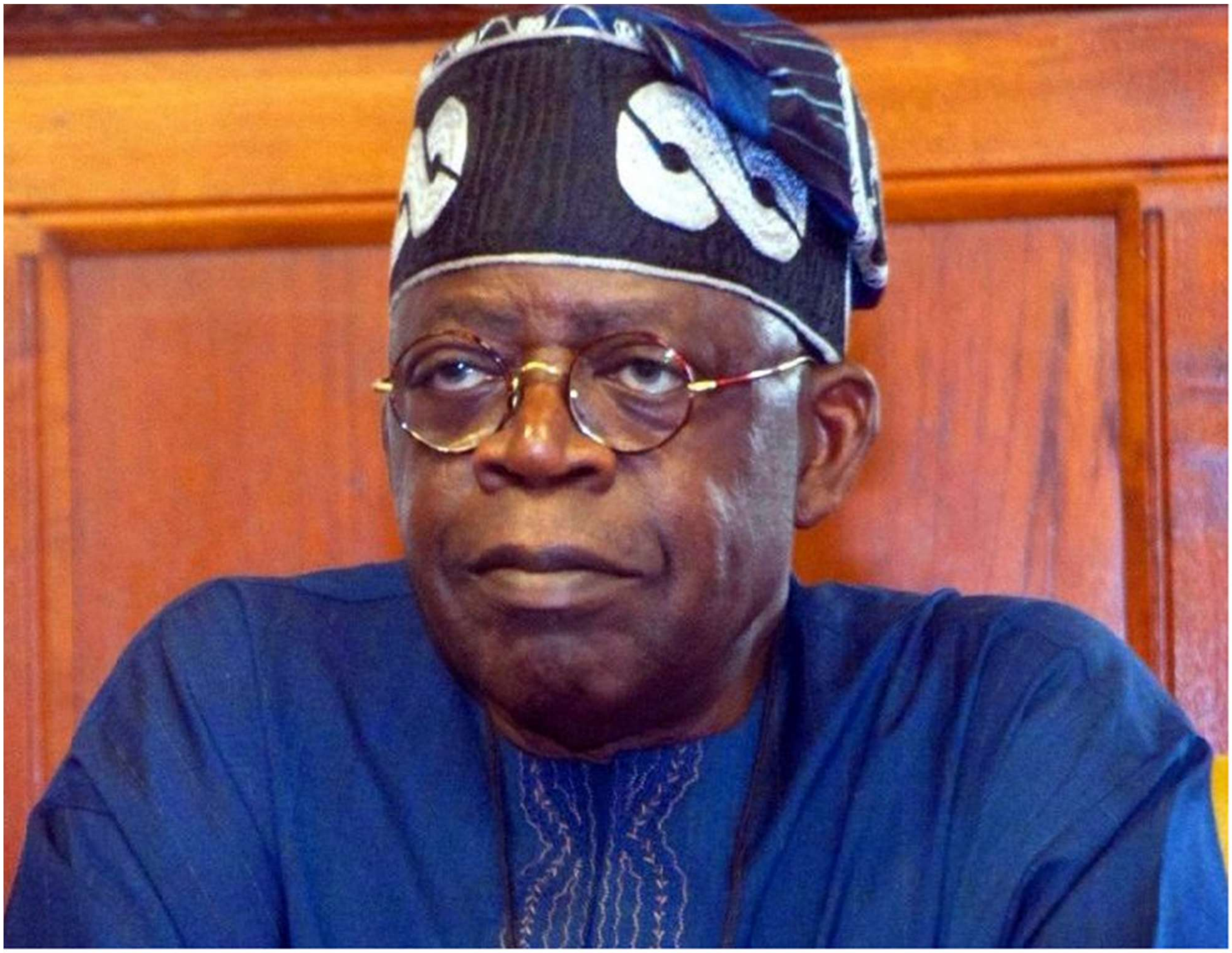

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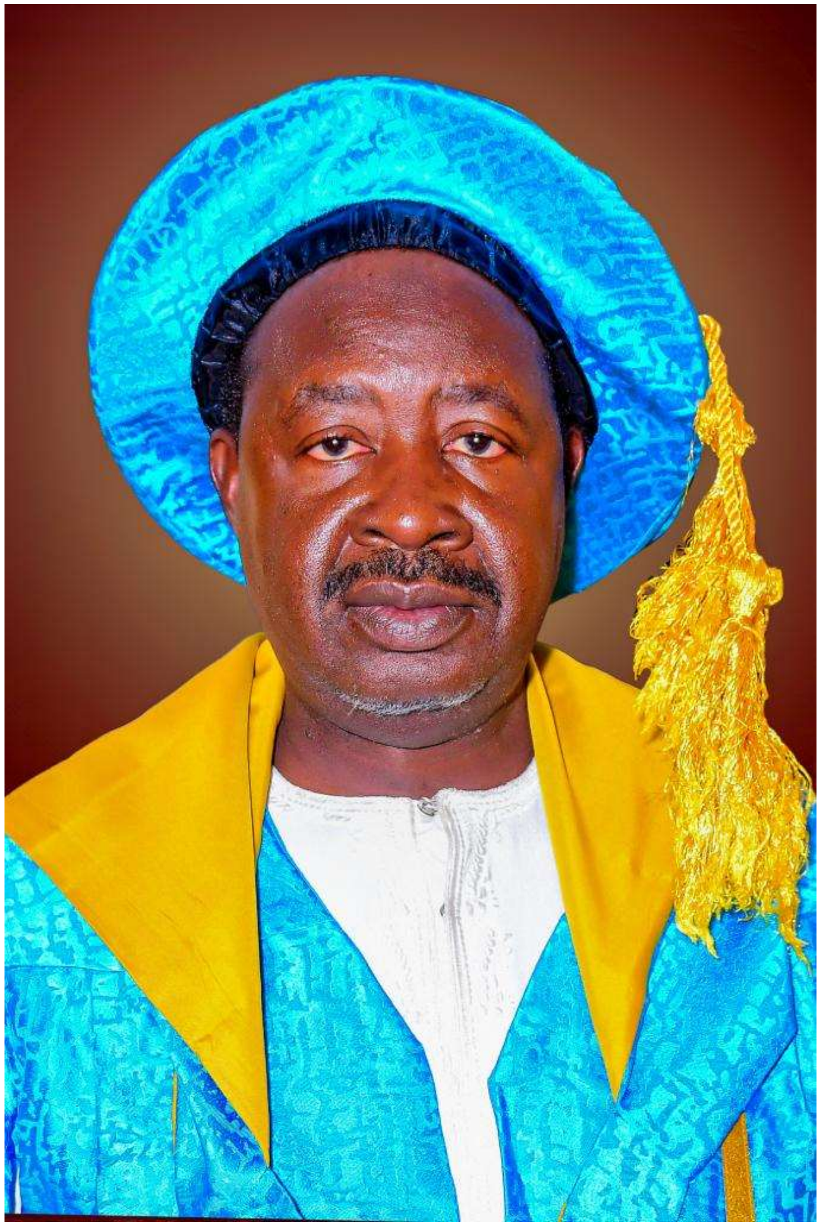

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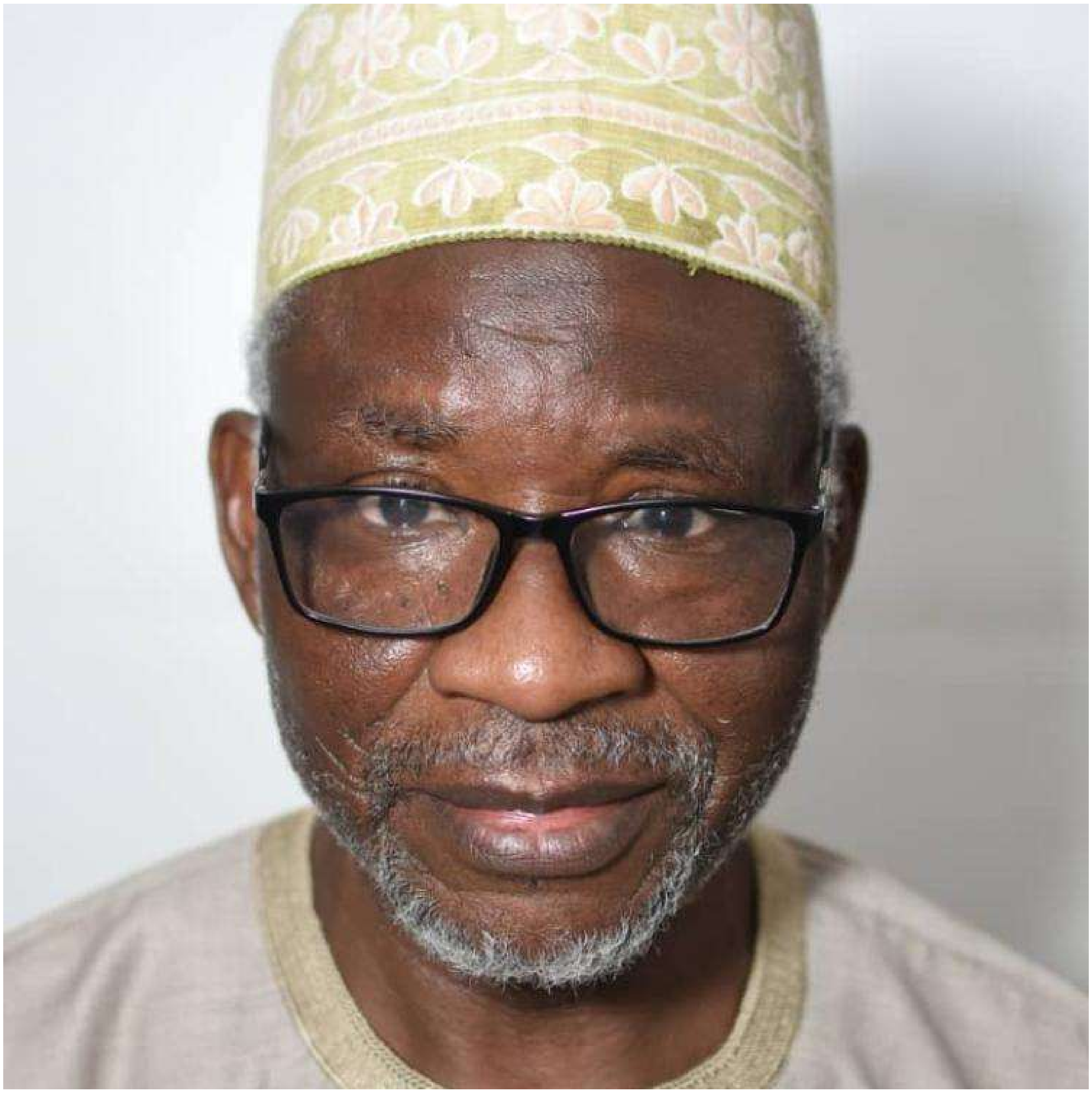

Prof. Idris D. Adamu, Head of Physics Department

Brief History of Bayero University, Kano

The institution known as Bayero University started as Ahmadu Bello College and was named after the then Premier in the Northern Region, Sir Ahmadu Bello Sardauna of Sokoto. It was established in October 1960 as a section of the School of Arabic Studies (SAS) with the primary objective of preparing Secondary School Certificate holders for the General Certificate of Education (GCE) Advance level of Examination in Arabic, Islamic History, Islamic Studies, Hausa, and English Literature. When Ahmadu Bello University (ABU) came into existence in October 1962, the name of the college was changed to Abdullahi Bayero College after the famous Emir of Kano, His Royal Highness, Alhaji Abdullahi Bayero who reigned between 1928 and 1953. The college was affiliated to ABU in 1964 and as a consequence, the College became the Faculty of Arts and Islamic Studies of ABU and enrolled its first set of 10 students for degree programmes. The pioneers graduated in 1966 with the degrees of ABU Zaria.

The College became a semi-autonomous University College of ABU and was renamed Bayero University College in 1975. At that time, it had four faculties namely Arts and Islamic Studies, Education, Sciences, and Social and Management Sciences. With the establishment of seven additional universities by the Federal Military Government in 1977, the College attained a full-fledged University status on 1st October, 1977, when it was renamed Bayero University, Kano. The Department of Physics was among the pioneer departments in the Faculty of Sciences. The number of the University's Faculties has increased from four to sixteen over the years (as of 2017). The University also has a College of Health Sciences, College of Natural and Pharmaceutical Sciences, a Postgraduate School, eleven research centers/institutes, the Dangote Business School, the School of Continuing Education (in charge of part-time programmes), a Centre of open-and-distance learning (ODL) recently introduced by the University, a Central Laboratory Complex and a number of academic support units. At present, there are seventeen Faculties in the University comprising of 84 Departments running 85 undergraduate programmes and 122 postgraduate programmes (38 PhD, 59 master's and 25 postgraduate diploma).

The University has had 10 Vice Chancellors in its history, the first of whom was Dr. Mahmud Tukur while the current Vice Chancellor (10th) is Professor Sagir Adamu Abbas FMAN. The University consists of several campuses that are geographically separated. The Main Campus of the University (known as the New Campus) is sited on the banks of a major river channel (River Watari), the Old Campus is located just outside the ancient walls of Kano City, Aminu Kano Teaching Hospital-the University's Teaching Hospital, Mambayya House (the former residence of Malam Aminu Kano and now belonging to the University) located at Gwammaja Quarters within Kano City. Located a few meters from Mambayya House is the School of Continuing Education (SCE)

Programme of Events

Day/Date	Time	Event
Tuesday	08:00 – 09:30	Registration
May 7, 2024	09:45 – 09:50	Arrival of NIP council members & special guests
Opening Ceremony	09:50 – 10:00	Arrival of His Excellency, Governor of Kano State, Chancellor, Pro-Chancellor Vice-Chancellor Bayero University, Kano
	10:00 – 10:05	National Anthem
	10:05 – 10:10	Opening Prayer
	10:10 – 10:20	Introduction of Dignitaries & members of the High Table
	10:20 – 10:30	Welcome Address by the LOC Chair Prof. Tijjani H. Darma
	10:30 – 10:40	Address by NIP President Prof. J. O. Coker *FNIP*
		Address by the Vice-Chancellor, B. U. Kano
	10:40 – 11:20	Key note Address by Prof. Yusuf A. Ahmed
	11:20 – 12:00	Awards & Introduction of New Fellows National Physics Competition Awards Excellence Awards Responses from Awardees Introduction of New Fellows
	12:00 – 12:15	Address and declaration of opening the conference by, the Governor, HE Engr. Abba Kabir Yusuf
	12:15 – 12:20	Vote of Thanks by the HOD Physics Prof I. D. Adamu
	12:20 – 13:00	Group photographs
	13:00 – 14:00	Lunch Break & Prayers
		Plenary Session
	14:00 – 15:00	Prof. Abraham A. Ogwu
	15:00 – 16:00	Prof. Umar G. Danbatta

	16:00 – 17:00	Prof. Victor U. Chukuma
	18:40 – 20:00	Vice-Chancellor’s cocktail dinner
Wednesday	09:00 – 13:00	All plenary sessions in parallel
May 8, 2024	13:00 – 14:00	Lunch Break/Prayers
Technical Sessions	14:00 – 17:00	All plenary sessions in parallel
Thursday	09:00 – 13:00	All plenary sessions in parallel
May 9, 2024	13:00 – 14:00	Lunch Break/Prayers
Technical Sessions	14:00 – 17:00	All plenary sessions in parallel
Friday May 10, 2024		Departure

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ABSTRACTS

ASP: Atmospheric, Space & Telecommunication Physics

ASP001

Spatiotemporal Variation of Atmospheric Aerosols Distribution over Nigeria Using MODIS Data (2004 – 2023)

Bello Sa'adu1, Bello I. Tijjani2, and Usman M. Gana2

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[2]Department of Physics, Bayero University, Kano

ABSTRACT

The Sahara desert to the north and the Atlantic Ocean to the south may be considered the two major sources of atmospheric aerosol in Nigeria. In addition, its large population, the resulting human activities, and its developing industries are other contributors to the atmospheric aerosol loading. The temporal characteristics of atmospheric aerosols in this region are explored using satellite Aerosol Optical Depth (AOD) data obtained from MODIS (terra) for years ranging from 2004 to 2023. Aerosol concentration, as measured by AOD, was found to increase with the increase in proximity to the major sources of loading. The concentration shows cyclic behaviour following climatic seasons.

Keywords: AOD, MODIS, AERONET.

ASP002

Determination Of Solar Energy Potentials Within Gombe State University, Gombe, Nigeria.

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Abstract

This research work aimed to determine the solar energy potentials within Gombe State University between the period of 8th April and 8th May, 2010 by using a Campbell stokes sunshine recorder incorporated with cards and thermometers. The average bright sunshine per day was determined as seven hours, twenty four minutes and the average daily temperature as 308.88K. The average amount of power obtained from the Sun within this period was found to be 516.03 W/m2. The highest obtainable average temperature, average mean power and possible maximum power generated using 12% efficient solar panel per unit area is during the 1st week and lower during week 4.

Keywords: Solar energy, conversion, solar radiation, Campbell stoke sunshine recorder.

ASP003

Extragalactic Source Illuminates Intensity Of Black Hole's Magnetic Field

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[2]Department of Physics, Imo State University Owerri, Imo State.
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Abstract

We examined the relationship between the intensity of extragalactic sources and the magnetic field of a black hole. Extragalactic sources such as Active Galactic Nuclei (AGN), gamma-ray bursts, and quasars exhibit a wide range of astrophysical phenomena that captivate astronomers and astrophysicists alike. Among the numerous factors that contribute to their behaviour and emission properties, the magnetic field intensity stands out as a fundamental component. The magnetic fields surrounding and permeating these sources play a crucial role in shaping their structure, dynamics, and energy transfer processes. Therefore, we provide an overview of the effects of magnetic field intensity on extragalactic sources, the clustered plot indicates that the intensity of the extragalactic source increases, while the strength of the black hole's magnetic field decreases. Highlighting its impact on charged particle motions, jet formation, synchrotron radiation, magnetic field reconnection, and cosmic ray interactions.

Keywords: Magnetic field Strength, Intensity, Blackhole

ASP003

The Significance Of Negative Imf B_Z During Super-Storms In The Solar Cycle 23

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Abstract

When the vertical component of the interplanetary magnetic field, B_Z, goes south, then there is a tendency for a magnetic storm to occur. It is assumed that the higher the negativity of B_Z, the more the magnetic storms and their intensity. When the disturbance storm time, Dst < -250 nT, then a super-storm has occurred. We investigated the relevance of B_Z < -10 nT during a super-storm in solar cycle 23 (SC 23) which covered the period between 1996 to 2008. In SC 23, the number of super-storms was 63 using the Hourly Equatorial Dst final values from World Data Center for Geomagnetism, Kyoto and the B_Z values at times of occurrences were obtained from the omniweb website. The number of times when B_Z was < – 10 nT during the 63 super-storm events was 37 which is 59%. This shows that the negative B_Z is averagely relevant during a super-storm event in SC 23.

Keywords: Super-storms, Dst index, B_Z, SC 23

ASP004

Comparison Of Water Intake Of Soil During Peak Wet And Dry Seasons Using Automated Soil Infiltration Measuring Device; A Tool For Irrigation Farming Practice.

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[1,2]Department of Science Laboratory Technology, Auchi Polytechnic, Auchi, Edo State.
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Abstract

The amount of water which the soil can absorb at a particular time varies from season to season and soil type. This season's variation affects plant growth and can cause soil erosion which might lead to flooding that hurt the environment. An automated soil infiltration is an electronics system which can measure the amount of water depth falling into the soil at a particular time and the water intake of the soil during different seasons. This device will improve irrigation farming practice and enable farmers to ascertain the amount of water to be channel/supplied to their farm land during various seasons for irrigation farming practice. The peak wet and dry seasons considered were the months of July and January.

Keywords; Irrigation, Automation, Measurement, Soil infiltration and Peak seasons.

ASP005

Time-Frequency Fourier Transform Spectral Technique for Short Period Climatic Temperature Decomposition in Port-Harcourt, Nigeria

Kudirat O. Adeyemi1, Friday B. Sigalo1, Ganiyu A. Olaniyi2

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Abstract

Climate change is mainly due to anthropogenic factors that affect the level of comfort or health of people. Localized sources of atmospheric disturbances and air pollution (for example black soot) in some cities, like Port-Harcourt, may result in unusual changes in temperature and humidity. In this study we investigate the changes in temperature and humidity around Port-Harcourt in order to understand the sudden weather changes noticeable in the city over very short periods. This study aims at improving and alleviating the long-term time limitations by observing the physical state of the Earth's lower atmosphere at 25m altitudes apart for variations of some weather forcing parameters which include pressure, temperature and relative humidity (with main focus on temperature for the purpose of the study). The daily temperatures data acquired for two years were averaged six (6) hours into four (4) quadrants of daytime and night-time events. The spectral behaviour for regional climatic temperatures for all four (4) quadrants in Port-Harcourt for a short-term time period was also investigated using Short Time Fourier Transformation, decomposition technique and a spectrogram to the discrete meteorological data. Temperature Spectrogram were generated and presented as 'spectral clouds' or yellow band parallel to the time axis. The thermal mass of aerosols increased air temperatures consequently reduced perturbations causing spectral clouds to appear bluish. These findings could help climatologists' gain good understanding of the short-term mechanisms that could cause climate change.

Keywords: Aerosols; Fourier; Localized Sources; Perturbation; Spectral Clouds

ASP006

Variability Of Hmf2 Over Del'ebe: Comparison With International Reference Ionosphere (Iri) Model Predictions.

Olaniyi, G. A.1, Oyeyemi, E. O.2, Adewale, A. O.2, Adeyemi K. O.3

[1]Department of Physics, University of Lagos, Akoka/Crescent University Abeokuta, Ogun State
[2]Deaprtment of Physics, University of Lagos, Akoka, Yaba, Lagos
[3]Department of Physics, Rivers State University, Port-Harcourt, Rivers State

Abstract

Diurnal and seasonal median values of the height of peak electron density of the F2-layer (hmF2) are presented in this study from the values derived from ionosonde measurements at a mid-latitude station in Del'ebe (DEL) (40.8N, 0.3E). These values were analyzed and compared with the International Reference Ionosphere (IRI-2007) model, using Comite' Consultatif International des Radio Communications) (CCIR) and Union Radio-Scientific Internationale (URSI) options. The analysis covered hmF2 values for December Solstices, March Equinox, June Solstices and September Equinox during the high and low solar activity periods of 2001-2002 and 2007-2008 respectively. This study had examined the variations in observed and predicted values of the hmF2. It was achieved by analyzing the diurnal and seasonal averages of HSA (2001-2002) and LSA (2007-2008) hmF2 values for a mid-latitude station: Del'ebe (DEL) (40.8°N. 0.3°E), in comparison with those predicted in the IRI-2007 models. There is a very close similarity in the pattern of the daily maximum and minimum values. However, there are discrepancies between observed values and the IRI-2007 predictions using CCIR and URSI coefficients. IRI model underestimates and overestimates the values of hmF2 at different times of the day for all the seasons, during the different solar activity periods considered.

Keywords : IRI-2007 model, CCIR, URSI models, Del'ebe.

ASP007

Optimization Of An Artificial Neural Network (Ann) For The Accurate Prediction Of Daily Rainfall Distribution

Salisu Zubair1*, Aminu Abubakar Umar2, Bashir Abdullahi3
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Abstract

This study delves into the optimization of feedforward Back-propagation artificial neural network (ANN) with multiple perceptron for the accurate prediction of daily rainfall distribution. Recognizing the critical importance of precise rainfall forecasts in various fields, including agriculture and water resource management, the research focuses on refining the ANN's predictive capabilities. Leveraging optimization techniques, the study aims to enhance the network's efficiency and reliability in capturing complex patterns inherent in daily rainfall data. Artificial neural network has out-performed many traditional methods due to its capability to capture non- linearity in the dataset obtained from Nigeria Metrological Agency (NiMet). The dataset is divided into two that's 70% for training the model and 30% for testing the effectiveness of the model. The model will be trained to predict daily distribution of rainfall.

Keywords: Artificial neural network, perceptron, rainfall patterns, Feed Forward Back Propagation, Activation Function.

ASP008

Wavelet Analysis Of Low-Frequency Cycles Of Solar-Geomagnetic Activity And Global Surface Temperature

Efiong A. Ibanga

Abstract

Time-frequency analysis of solar activity characterised by annual mean total sunspot number, geomagnetic activity characterised by aa-index and global surface temperature anomaly characterised by HadCRUT5 series have been performed using continuous wavelet transform methods. The magnitudes of continuous wavelet coefficients and global wavelet power spectrum as a function of the period of the time-series of each phenomenon were studied. Results reveal that, on centennial temporal scales, solar activity manifests three main cycles with peaks at 9, 81 and 705 years/cycle. Geomagnetic activity manifests a main cycle of length ~150 years/cycle localised between 1860 and 1920 and between 1950 and 2000 with a prominent peak at 130 years/cycle. Global surface temperature anomaly also exhibits a main cycle of length between ~228 years/cycle localised between 1850 and 1940 and between 1960 and 2023 with a prominent peak at 184 years/cycle. Between 1920 and

1960, the amplitudes of the prominent cycles of geomagnetic activity and global surface temperature were very low. The near similar variability of geomagnetic activity and global surface temperature suggest a possible causal link between them in the Gleisberg period range. The trend of cyclic variability of solar and geomagnetic phenomena in this study suggests a decline toward a grand episode most likely to be a minimum.

ASP009

An Assessment Of Solar Radiation Patterns For Sustainable Solar Implementation Geidam Area

Halluru Yahaya1 * and Babangida Jauro Mohammed2

1,2Mai Idris Alooma Polytechnic Geidam Yobe State Nigeria

Abstract

In this study, an assessment of solar radiation patterns for sustainable solar implementation will be carried out to investigate the possibility of supplying electricity from a renewable energy-supplemented hybrid system to Geidam. One of the major rural centers in Yobe state. The town despite having a population of more than 157 thousand people (according to 2006 census), is yet to enjoy its own quota of the national electricity grid due to remoteness and distance from the generating stations available in the country and the environmental condition of the area that doesn't allow poles to stay long, this makes transmission to these areas uneconomical. Because of the great need to reduce the cost of erecting poles every year, a feasibility study needs be carried out on how to supply electricity to a sampled residential load. The electric load will consists of only a primary type that is in-line with the present electricity consumption in the area. The data obtain will then be used to design a micro grid system using HOMER Pro version software. The outcome of the research will then be used to advise government on how to install the system.

Keywords: photovoltaic, renewable energy, solar radiation, Microgrid, hybrid system

ASP010

A Research On Global Solar Radiation Estimation In Owerri Nigeria Using Empirical Models.

1Chima Abraham Iheanyichukwu, ,2OGBODO-OSONDU Oluchukwu,1NWODO Emeka ,1Onyia Augustine Ike and 3Ikeri Henry Ifeanyi3

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Abstract

In this research, measured meteorological data, empirical models were used to estimate the global solar radiation in Owerri, Nigeria. The global solar radiation data was correlated with the relative sunlight duration, relative humidity, and maximum temperature for Owerri, Nigeria, using Angstrom and Page's linear regression model. Additional multiple linear regression models were produced to examine the relationship between the amount of solar energy received worldwide and other climatic factors, such as the maximum temperature and relative humidity. The Nigerian climatic Agency (NIMET) in Abuja provided the climatic characteristics for this study for the 11-year period between 2011 and 2021. Four statistical error indicators—Mean Bias Error (MBE), Root Mean Square Error (RMSE), Mean Percentage Error (MPE), and t-stat—were used to verify the data' statistical validity. Although certain models correlate more strongly than others, the results demonstrate a strong relationship between the predicted mean worldwide solar radiation and the measured mean global solar radiation using the established models. Based on the t-statistic results, the optimum empirical equation for city was assessed. The best model for Owerri is $H_2 = H_O\left(-0.496 + 0.599\left(\frac{n}{N}\right) + 0.025(T_{max})\right)$ with $\mathrm{t-stat}$ value of 0.79. The global solar radiation intensity obtained with these models can be used in the design, analysis and performance estimation of solar energy conversion systems which is gradually but steadily gaining ground in Nigeria and the world at large.

Keywords: Solar Radiation, Empirical model, Temperature, relative humidity, sunshine hour, Owerri

ASP011

Spartial Distribution Of Recurrence Quantification Statistics For Wind Speed And Wind Power Over North-Western Nigeria

Jamila Abdullahi Bichi1, Emmanuel V Tikyaa2, Ahmad Ubaidullah3

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Abstract

The problems associated with the use of conventional methods of generating electricity which results to environmental effects, health problems and high cost of fossil fuels relatively catches the attention of recent researches for the need of development of an alternative and sustainable ways of generating electricity and this is mainly due to the worlds growing demand of energy. In this research the recurrence quantification analysis (recurrence rate, determinism, laminarity, trapping time, Shannon entropy) have been used to analyzed the nature of the fluctuations of the recorded wind speed and wind power data and found out to be from highly nonlinear but deterministic chaotic systems and the paper shows the spatial variations of the chaotic behaviour of the data of wind speed and wind power across the seven locations based on recurrence quantification analysis. The research will help weather analyst to adopt the proper strategy to harness maximum wind power efficiency in the locations under study.

Keywords: wind speed, wind power, Shannon entropy and recurrence rate.

ASP012

Multi-Scale Approach To Analysis Of Temperature Changes In Connection To Nigeria's Climate System

[1]Najib Yusuf, [1]Ibrahim Y. Tudunwada, [1]Solomon Jatto J., [2]Rabia Sa'id S. [1]Muawiya Sani, [1]Fatima Akagu and [3]Ibeh, Gabriel Friday

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Abstract

The devastating catastrophes resulted from climate change is causing havocs, with a large population subjected to loss of lives and properties worldwide. Nigeria's recent chaotic and almost unpredictable weather and climate patterns has proven to be increased, therefore needs a different approach. Analysis is carried out using multi-scale approach to better understand the changes in temperature for a period of Four decades, in connection to Nigeria's climate system. Reanalysis datasets from MERRA-2 are employed. Various sub-climate regions within Nigeria are considered and results present an increase in temperatures of up to 2 degrees in arid region and more than half of that in the monsoon climate with 1 degree increment in the central Nigeria. Diurnal analyses over different sub-climate shows peak at noon especially within temperate zones and a shift in the peak is observed that corresponds to the abnormal delays or inconsistent patterns of harmattan, precipitation and dry seasons experience recently in the country. Further, percentage difference on seasonal scale between the decades presented a steady increase with the current decade having the largest increment in temperature. Keyword: Changes, Climate, Multi-scale and temperature,

Keywords

ASP013

A Research on Global Solar Radiation Estimation in Owerri Nigeria Using Empirical Models.

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2.4 Halmshaw terrace, Bentley, Doncaster, England. United Kingdom
3.Department of Physical Sciences Kingsley OzumbaMbadiwe University Ideato Imo State Nigeria
Corresponding email address: Abraham.chima@esut.edu.ng .08066922634

ABSTRACT

In this research, measured meteorological data, empirical models were used to estimate the global solar radiation in Owerri, Nigeria. The global solar radiation data was correlated with the relative sunlight duration, relative humidity, and maximum temperature for Owerri, Nigeria, using Angstrom and Page's linear regression model. Additional multiple linear regression models were produced to examine the relationship between the amount of solar energy received worldwide and other climatic factors, such as the maximum temperature and relative humidity. The Nigerian climatic Agency (NIMET) in Abuja provided the climatic characteristics for this study for the 11-year period between 2011 and 2021. Four statistical error indicators—Mean Bias Error (MBE), Root Mean Square Error (RMSE), Mean Percentage Error (MPE), and t-stat—were used to verify the data' statistical validity. Although certain models correlate more strongly than others, the results demonstrate a strong relationship between the predicted mean worldwide solar radiation and the measured mean global solar radiation using the established models. Based on the t-statistic results, the optimum empirical equation for city was assessed. The best model for Owerri is $H_2 = H_O\left(-0.496 + 0.599\left(\frac{n}{N}\right) + 0.025(T_{max})\right)$ with t – stat value of 0.79.The global solar radiation intensity obtained with these models can be used in the design, analysis and performance estimation of solar energy conversion systems which is gradually but steadily gaining ground in Nigeria and the world at large.

Keywords: Solar Radiation, Empirical model, Temperature, relative humidity, sunshine hour, Owerri

ASP014

Surface Ozone Analysis at both Temporal and Spatial Scale using Different Climate Regions in Nigeria

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ABSTRACT

Tropospheric Ozone (O3) pollution has become one of the most challenging problems in the globe, and its highconcentrations has been a major air quality issue across the universe. The aim of this study was to examine the temporal and spatial regional trend of tropospheric ozone concentration in Nigeria using satellitemonthly and yearly data for ten years between 2013 and 2023. In this study, certain significant observations will be determined: weather activities on tropospheric Ozone concentration, maximum and minimum concentrations over the years, seasonal distribution, regional trends and its implications. Statistical analysis will also be employed to get more insight on the regional variations of tropospheric ozone in Nigeria. The result and recommendation of the study will help to enhance environmental-friendly society.

Keywords:

ASP015

Spartial Distribution Of Recurrence Quantification Statistics For Wind Speed And Wind Power Over North-Western Nigeria

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ABSTRACT

The problems associated with the use of conventional methods of generating electricity which results to environmental effects, health problems and high cost of fossil fuels relatively catches the attention of recent researchers for the need of development of an alternative and sustainable ways of generating electricity and this is mainly due to the worlds growing demand of energy. In this research the recurrence quantification analysis (recurrence rate, determinism, laminarity, trapping time, Shannon entropy) have been used to analyzed the nature of the fluctuations of the recorded wind speed and wind power data and found out to be from highly nonlinear but deterministic chaotic systems and the paper shows the spatial variations of the chaotic behavior of the data of wind speed and wind power across the seven locations based on recurrence quantification analysis. The research will help weather analyst to adopt the proper strategy to harness maximum wind power efficiency in the locations under study.

Keywords: wind speed, wind power, Shannon entropy and recurrence rate.

ASP016

Multi-Scale Approach to Analysis of Temperature Changes in Connection to Nigeria's Climate System

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ABSTRACT

The devastating catastrophes resulted from climate change is causing havocs, with a large population subjected to loss of lives and properties worldwide. Nigeria's recent chaotic and almost unpredictable weather and climate patterns has proven to be increased, therefore needs a different approach. Analysis is carried out using multi-scale approach to better understand the changes in temperature for a period of Four decades, in connection to Nigeria's climate system. Reanalysis datasets from MERRA-2 are employed. Various sub-climate regions within Nigeria are considered and results present an increase in temperatures of up to 2 degrees in arid region and more than half of that in the monsoon climate with 1 degree increment in the central Nigeria. Diurnal analyses over different sub-climate shows peak at noon especially within temperate zones and a shift in the peak is observed that corresponds to the abnormal delays or inconsistent patterns of harmattan, precipitation and dry seasons experience recently in the country. Further, percentage difference on seasonal scale between the decades presented a steady increase with the current decade having the largest increment in temperature.

Keyword: Changes, Climate, Multi-scale and temperature,

ASP017

Trend Significance in the Chaotic Dynamics of Drought Caused by Precipitation in Makurdi, Nigeria

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ABSTRACT

Global warming and its effects are no doubt, attributed to the human activities that are influencing the increase in the emission of greenhouse gases in the atmosphere. Because the atmosphere is now battling with the excesses of carbon dioxide and other gases that may be present in it, and these are influencing the extreme weather that we are experiencing nowadays. The level of positive trend significance of drought in Makurdi and like other region in the north central parts of Nigeria, is something to worry about. To acknowledge drought cycle, a nonlinear dynamical approach was applied, this led to the evaluation of the Lyapunov exponent, λ. The average Lyapunov exponent is 0.0139 per day (positive value of λ) was discovered to present that drought is a chaotic system. From 1977 to 2013, hydrological drought has been threatening. This may endure for an approximation of 72 days if human activities continue. The largest Lyapunov exponent within the years under study is 0.0213. Making it that hydrological drought has worst hit Makurdi in the year 2000. Drought may persist by approximately 47 days if the reciprocal of λ is taken. Hence, statistical tool was further implored to access the level of drought in the precipitation data, it portrays that drought thus exist in Makurdi within this period of analysis.

Key Words: Trend, chaotic, Drought, Precipitation, Lyapunov Exponent, Correlation Coefficient, climate change, global warming, hydrology

ASP018

Atmospheric Particulate Matter 2.5(Pm2.5) Air Pollution Levelassesement At Abakaliki Rice Processing Sites

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ABSTRACT

On a regular interval, atmospheric air that supports life on the Earth is often polluted through several sources. In our contemporary society, there are great concerns about the high levels of atmospheric air pollution due to PM2.5 generated particularly at various rice processing sites and circulated in the lower atmosphere (troposphere), where life is supported. After harvesting, Abakaliki rice normally undergoes through numerous processing cycles to make it viable for human consumption. The aim of this study is to access the levels of PM2.5 generated at Abakaliki rice processing sites. Dataset used in this study was obtained by direct monitoring and measurement of PM2.5 levels at various rice processing sites in the area of study. The results obtained showed that high levels of PM2.5were recorded at the sites of husk removing/milling, parboiling and final heating with their mean values, 55.93μg/m3, 52.05μg/m3 and 47.46μg/m3 respectively. Similarly, high levels of Air Quality Indices (AQIs) of 365, 280 and 268 were equally obtained for the three sites which are far above the World Health Organization 2021 updated guideline recommended for safe and healthy air quality. Thus, suggesting a potential trait to health of the people at those processing sites.

KEYWORDS: AtmosphericPM2.5, air pollution, Abakaliki rice, processing sites.

ASP019

Climate Change, Trend Analysis of Temperature in Yola, North East Nigeria.

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ABSTRACT

Climate Change is causing temperature and rainfall to change pattern in most parts of the world. Therefore a trend analysis of temperature in Yola, North East Nigeria between 1975 and 2018 was carried out using Mann Kendall trend test to find out whether there has been any change in its pattern in the past years. The data on temperature was obtained from the archive of Nigerian Meteorological Agency (NiMet). The results revealed that maximum temperature is decreasing while minimum temperature is increasing in the area. This imply that the area is becoming warmer and likely to experience increase in rainfall. It is therefore recommended that residences should build houses that allow for good ventilation to minimize heat stress on them and residences should not build or farm on water ways to avoid flooding and destruction of farm produce during raining season.

Keywords: Climate Change, temperature, Yola, flooding, rainfall.

ASP020

An Evaluation of Radio Refractivity Variation across Yearly, Seasonal and Monthly Timescale

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ABSTRACT

Understanding radio refractivity is essential for designing and operating communication systems because it directly affects how radio-waves propagate. Engineers use this understanding to predict changes in signal strength and anomalies, improving network planning and optimization. Radio refractivity bends radio-waves, especially at higher frequencies like VHF and UHF, crucial for communication systems like broadcasting, television, radar, and satellite communications. In this research radio refractivity variations across different timescales (yearly, seasonal, and monthly) have been evaluated using the International Telecommunication Union (ITU) recommendation. Meteorological data spanning forty-one years (1980 to 2020) from seven locations (Birnin Kebbi, Kano, Katsina, Kaduna, Dutse, Sokoto, and Gusau) in north-western Nigeria were utilized to calculate radio refractivity. The results indicate that Kaduna had the highest yearly radio refractivity of 353.4296 in 2013, while Sokoto had the lowest yearly radio refractivity of 319.4540 in 1983. The difference between the yearly values across the seven locations ranged from 13.37 to 10.35. In terms of monthly radio refractivity, Kaduna also recorded the highest value of 391.5037 in October 1997, whereas Sokoto had the lowest value of 270.7715 in March. Seasonal variations reveal that the highest values across all locations occur during wet seasons, while the lowest values occur during dry seasons.

Keywords: Radio Refractivity, Dry Season, Wet Season, and Radio Signal

ASP021

Evaluation Of Aerosol Concentrations And Humidity Impact On Polarization Polarizability And Phase Function Of Urban Atmosphere Validatedwith Satellite Aerosol Data

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ABSTRACT

Aerosol particles are one of the main gaps in the present knowledge of radiative forcing (Myhre et al., 2013), and mineral particles are especially essential due to their large amount and temporal and spatial variability. Since mineral particles in general are no spheres, Mie-theory as scattering theory may lead to wrong values of their optical properties, if they are modelled based on size distribution and refractive index, and vice versa, if remote sensing data are used to get aerosol properties. Thus, as a major improvement, the optical properties of mineral particles in the new version ofOptical Properties of Aerosols and Clouds(OPAC) are derived using the T-Matrix method for spheroids. However, in the solar spectral range the shape effects can be strong. Since this is the wavelength range that is generally used for remote sensing of aerosol particles, on the one hand, and relevant for aerosol radiative forcing, on the other hand, the use of the phase functions and polarization polarizability of non-spherical particles will be a real improvement. To allowan easy use of the optical properties of urban aerosol with non-spherical particles, the data are made available in OPAC. In this research simulation using OPAC average concentration setup for relative humidity (RH) (0,50,70,80,90,95,98, and 99%) at visible wavelength 0.4 – 0.8 µm to vary the concentrations of three aerosol components: WASO (Water-soluble), INSO (Insoluble) and SOOT. The Stokes parameters will be used to obtain the polarization polarizability and phase function of non-spherical Urban aerosol. ClaussiMassoti together with Maxwell relations and Lorentz – Lorentz relation will be used to compute the effective polarizabilities for non-spherical urban atmospheric aerosol components. Hence, the effective polarizabilities, polarization and phase function data for urban aerosol will be extracted from OPAC. The mean exponent of aerosol size growth curve determine from the effective hygroscopic growth. The satellite data will be extracted at an average Angstrom exponents and relative humidity to be use for validation against the simulated OPAC urban components. The obtained results from OPAC simulations analyzed and compared to Moderate Resolution Imaging Spectroradiometer (MODIS) aboard the Aqua and Terra satellites data. This comparison allows for the evaluation of the model's accuracy and reliability in predicting the polarization polarizability and phase function of urban non-spherical aerosols.

Keywords: aerosols, polarization, polarizability, and phase function.

ASP022

Analysis Of The Effects Of Variation Of Aerosols Concentration And Relative Humidity On Effective Polarization Polarizability, Effective Refractive Index and Phase Functions Of Desert Aerosols

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ABSTRACT

Atmospheric aerosols are of high importance for understanding the evolution of the radiation balance and play a significant role in climate change at the regional and global scales. Atmospheric mineral dust scatters and absorbs solar radiation and emits thermal radiation, contributing to the radiation balance of the Earth–atmosphere system and influencing atmospheric remote-sensing observations. Mineral particles in general are not spheres and so the assumption of spherical particles, instead of more realistic shapes, has significant effects on modeled optical properties and therefore on the remote sensing procedures for desert aerosol. The new version of the data base OPAC 4.0 (optical properties of aerosols and clouds) Hess et al., (1998), the optical properties are modeled describing the particles as spheroid with size distributions and the spectral refractive index. Stokes parameter will be use to obtain the phase function and Lorentz-Lorentz relation will be analyze to determine the effective polarization polarizability, effective refractive index present in the desert atmosphere using OPAC 4.0. The parameters will be extracted within the visible spectral range (0.4μm to 0.8μm) at eight different types of relative Humidity's (00%, 50%, 70%, 80%, 90%, 95%, 98%, and 99%). The microphysical properties to be extracted are common mode radii and will be used to determine the effective hygroscopic growth. It will be analyzed by varying the WASO (water-soluble aerosol concentrations), MIAN (mineral accumulation non-spherical), MICN (mineral coarse non spherical) and MINN (mineral nucleation non spherical). SPSS and EXCEL will be used for the data analysis. The obtain results from OPAC 4.0 simulations analyzed will be compared with the MODIS (Moderate Resolution Imaging Spectroradiometer) aboard the Aqua and Terra satellite data.

KEYWORDS: OPAC 4.0 model, WASO, MIAN, MICN, MINN, polarization polarizability, phase function, effective polarization polarizability, effective refractive index

ASP023

Estimating Solar Energy Radiation Potential in Bauchi State and North Eastern Nigeria using Angstrom-Prescott Model

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ABSTRACT

In this study, the solar energy radiation potential in Bauchi State and north eastern Nigeria (NEN) was estimated using Angstrom-Prescott model. The obtained results were compared with experimental values obtained from other similar studies. The linear and quadratic models equations provided the best estimate for the monthly values of the data processed in preparation for the correlation of mean average temperature, cloud cover (clearness index), sunshine duration for Bauchi and NEN. Comparing the results, it has revealed that the mean bias error (MBE), mean percentage error (MPE), and the root means square error (RMSE) gave a very good results 0.02294, 5.66%, and 0.1515 respectively. The quantity of solar

radiation in the study area is useful to the solar energy engineers, architects, agriculturists, hydrologists in planning and executing their projects.

Keywords: Solar Energy Radiation, North Eastern Nigeria, Angstrom-Prescott model, MBE, MPE, RMSE

ASP024

Estimation of Global Solar Radiation Using Three Sunshine and Temperature Based Models in Minna, North - Central, Nigeria

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ABSTRACT

In this study, the monthly mean daily meteorological data measured in Minna (09.65oN, 06.47oE) from 1990-2010 were obtained. These data, are Measured global solar radiation, sunshine hour and minimum and maximum temperature, which were analyzed based on Sunshine and temperature based models to generate several models (equations) for predicting global solar radiation. These models were subjected to statistical error test methods of the Mean Bias error (MBE), Root Mean Square Error (RMSE), Mean Percentage error (MPE), Coefficient of determination (R), Coefficient of correlation R2 and t test to ascertain the best performing Models. The results of R and R2 are within the range of 0.792 – 0.927 and 0.628 – 0.861 which shows statistical significant between the measured and predicted global solar radiation. The Mean percentage error is within the range -0.3724 - (-0.80714). The calculated global solar radiation is in good agreement with the three sunshine and temperature based models. This study shows that more than one sunshine and temperature -based models can be used to predict solar radiation in Niger state, Nigeria. In order to test for the performance of statistical significance of the models, mean bias error (MBE), root mean square error (RMSE), mean percentage error (MPE) and t-test values were adopted, the results show that despite overestimation and underestimation of the models, there are fairly good level of significance at both confidence level of 95% and 99%. The results of the coefficient of determination indicate that the calculated clearness index and relative sunshine duration shows excellent data.

Keywords: Solar Radiation, Clearness index, Regression Constants

ASP025

Estimation Of Global Solar Radiation Using Hargreaves-Sammani And Bristow-Cambell Model In Dutsinma, Katsina State

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ABSTRACT

Two temperature based models the Hargreaves-sammani and bristow-cambell model have been used to estimate the global solar radiation of Dutsinma by adopting monthly average maximum and minimum air temperature obtained from the meteorological stations as input parameters, the simulation were performed using C++ programming software application, The Models Are Evaluated Based On Statistical Performance Metrics Such As Root Mean Square Error (RMSE), Mean Bias Error (MBE) And Mean Percentage Error (MPE). The statistical analysis of the models shows that The Hargreaves-Samani model with root mean square error (RMSE) value of 6.441126, mean bias error (MBE) of value 6.441126 and mean percentage error (MPE) value 34.88667 is adequate ans most accurate for estimating global solar radiation in Dutsinma between the two models. From the simulation and analyzed results, it implies that simple empirical models can be utilized to predict solar radiation with easily obtainable air temperature where sophisticated solar radiation instrument are not readily available and the values of the estimated global solar radiation obtained from these models can be used for designing solar systems and for research purposes in Dutsinma.

Keywords: Air temperature amplitude, global solar radiation, meteorological data, Dutsinma

ASP026

Empirical Models for Estimation of Global Solar Radiation in Awka Nigeria Using Measured Meteorological Data

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ABSTRACT

The Knowledge of global solar radiation dynamics especially the intensity of solar radiation at a given location is of fundamental importance for all solar energy conversion system and for the estimation of their performance. In this paper, empirical models were developed for estimating global solar radiation in Awka. The meteorological parameters such as measured daily global radiation, daily extra-terrestrial solar radiation on a horizontal surface, daily maximum temperature, daily maximum number of hours of possible sunshine , the daily number of hours of bright sunshine and daily relative humidity used for this work were obtained from the Nigeria meteorological agency (NIMET) Abuja for the period of 11 years from 2011 to 2021. Linear regression model of Angstrom and Page was employed to correlate the global solar radiation data with relative sunshine duration, relative humidity

and maximum temperature for Awka, Nigeria. Other multiple linear regression models were obtained to check the correlation of global solar radiation with sunshine duration combined with other meteorological parameters, which include maximum temperature and relative humidity. The results obtained were statistically tested using four statistical error indicators: Mean Bias Error (MBE), Root Mean Square Error, (RMSE), Mean Percentage Error (MPE) and t-stat to establish the validity of the results. The analyses show that there is close correlation between the calculated mean global solar radiation and the measured global solar radiation using the established models, though some models correlate better than others. The best empirical equation for each of the cities was evaluated based on the values of the t – stat. The best model for Awka is $H_1 = H_O\left(0.2 + 0.64\left(\frac{n}{N}\right)\right)$ with t – stat value of 0.25. The global solar radiation intensity obtained with these models can be used in the design, analysis and performance estimation of solar energy conversion systems which is gradually but steadily gaining ground in Nigeria and the world at large.

Keywords: Solar Radiation, Empirical model, Temperature, relative humidity, sunshine hour, Awka

ASP027

Climate Change, Rainfall Trends And Variation In Yola, Adamawa State

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ABSTRACT

This study evaluated the effect of climate change on rainfall trends and variation in Yola, Adamawa state for the period of 30 years (1992-2021) which represents a climatic period. Rainfall data were collected from the archive of the Nigerian Meteorological Agency (NiMet), Yola station, from 1992-2021. Rainfall variations and trends over the study period were analyzed using Mann Kendal trend test and the Theil Sen slope estimator. The analysis of the inter annual trend of the rainfall shows an overall decreasing trend in Yola within the study period (1992-2021), which implies that rainfall in Yola has decreased during the study period with a magnitude of 7.23 mm year-1. The decadal analysis revealed a positive trend for the three decades. It further show that the first decade has the highest rainfall trend while the second decade is the lowest rainfall decade with values that range from 10.7 to 45.1 mm decade-1. It was also observed that there was a considerable increase in rainfall amount in the third decade compared to the second decade. Finally, the projection of rainfall shows a decreasing trend for the next decade with a decadal trend of -0.057 mm decade -1. It was therefore recommended that farmers should plant species of early maturing crops, drought resistance seeds should be made available to the farmers for planting and government should build earth dams to harvest rain waters for irrigation farming activities in the state.

Keywords: Climate change, Trends, Variation, Rainfall variability, planting

ASP028

Integration of Weather Forecasting Data in Network Planning and Optimization to Enhance Predictive Analytics for Wireless Networks in Nigeria

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Abstract

The integration of weather forecasting data in network planning and optimization to enhance predictive analytics for wireless networks in Nigeria is a critical area of research with significant implications in the telecommunications sector. This research investigated the potential benefits of incorporating weather forecasting data into network planning and optimization processes to proactively address challenges posed by adverse weather conditions. The study involves a comprehensive analysis of weather forecasting data relevant to Nigeria, including variables such as temperature, humidity, precipitation, wind speed, and atmospheric pressure. Additionally, network performance data, encompassing key metrics such as signal strength, coverage areas, throughput, latency, and reliability, are collected from wireless network operators. Through advanced data analysis techniques, including statistical modeling, machine learning algorithms, and predictive analytics, the research aims to develop predictive models that leverage weather forecasting data to anticipate changes in network performance under different weather conditions. This predictive model was integrated into network planning and optimization frameworks used by wireless network operators in Nigeria. The findings of this research are expected to contribute to the improvement of network resilience, optimization of resource allocation, enhancement of quality of service, cost savings, and enhancement of user experience for subscribers of wireless networks in Nigeria.

Keywords: Weather forecasting, Network planning, Wireless networks and Quality of service

ASP029

Assessment Of Particulate Matter In Nigeria Using Satellite Data

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Abstract

Air pollution, particularly particulate matter (PM) pollution poses a significant threat to public health and the environment globally, with Nigeria being no exception.In Nigeria, rapid urbanization and industrialization have contributed to escalating levels of PM pollution, raising concerns about its adverse impacts. Traditional ground-based monitoring systems offer limited spatial coverage and are often inadequate to capture the full extent of PM distribution. This study aims to assess the distribution and concentration of particulate matter (PM2.5) in Nigeria utilizing satellite data. The research utilizes the year 2004–2023 data from the Modern-Era Retrospective Analysis for Research and Applications, Version 2 (MERRA-2), the latest atmospheric reanalysis of the modern satellite era produced by NASA's Global Modeling and Assimilation Office (GMAO). The analysis showed that the monthly mean PM2.5 concentrations decreased by 1.7−9.4μg/m3/year. The year 2020 saw a sharp decline of 24.13% in PM2.5 concentrations due to the COVID-19 lockdown. The World Health Organization Global Ambient Air Quality Database, available from OpenAQ, was also used to access the distribution of PM2.5 in Nigeria. Data for Abuja, Lagos, Calabar, and Ilorin were available. Lagos had the highest mean monthly value of 334.06 μg/m3 in January 2023. Seasonal variation of PM2.5 was observed, with concentrations higher in the dry season than in the wet season. The study's findings provide useful insights into the magnitude, distribution, and patterns of PM2.5 pollution in Nigeria, facilitating informed decision-making for policymakers and environmental agencies.

Keywords: Air Pollution; Air Quality; Particulate matter; MERRA-2

ASP030

Application of Empirical Orthogonal Transformation Analysis of Aerosol Data to Differentiate Seasons in West Africa

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Abstract

Aerosol properties in Cinzana and Ilorin in West Africa were studied using aerosol properties data for the duration of 16 years(2000–2015) from Moderate resolution Imaging Spectroradiometer (MODIS). There has been limited report on the comparison of aerosol properties between this two West African Stations.The Empirical Orthogonal Transformation (EOT)from the Statistical Package for the Social Sciences (SPSS) software was used in the analysis. Data of monthly averaged measurements of aerosol optical depth at 550 nm (τ550), Angstrom exponent at 470 – 660 nm (α470-660), cloud fraction (Ncloud), fine mode fraction (FMF) and single scattering albedo at 470 nm (ωo) over the two stations were analysed. The EOT analysis shows that the two stations were characterised by four (4) seasons. The rainy and dry seasons were both characterized by two phases each.

Keywords :EOT, Aerosols, Cinzana, Ilorin, MODIS, Seasons,

ASP031

Computational analysis of meterological data of Ikeja Lagos State using the EOF analysis

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ABSTRACT

In this work, empirical orthogonal transformation (EOF) is used to analyse the meteorological data of Ikeja Lagos State. The meteorological parameters utilized were monthly Solar radiation, sunshine hours, wind speed, maximum and minimum temperatures, rainfall, cloud cover, and relative humidity, with a data spanning thirty-one (43) years (1980 to 2023). The data was analysed using unrotated data, and three orthogonal transformations and seven components were extracted. From component matrices, it was discovered that there are two distinct seasons: A rainy or wet and Dry. The period of wet is around 7.2 months. For the dry season, is 4.9 months. The values of the eigen- values are consistent with what is observed in real-time of 7.0 months of rainy season and 5.0 months of dry season. It can be said that the EOF now describes the two seasons quantitatively

Keywords: Empirical orthogonal transformations, Meteorological data, Regression analysis, Ikeja, Nigeria

ASP032

A Comparison of Selected Artificial Neural Network Model, in Predicting Global Solar Radiation in Lagos and Abuja, Nigeria

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Abstract

The enormous challenges that have affected not only the entire value chain but also the billing system which consumers have repeatedly rejected, resulting in violence against staffs of the distribution companies. Accurate estimation of global solar radiation is essential for the design and assessment of solar energy utilization system. The aim of this research work is to investigate the feasibility of using artificial neural network to predict, the global solar radiation of the selected site and to compare the effectiveness of the model. The stations under study are Lagos with latitude 6.39ON, longitude 3.23OE and Abuja at latitude 9.08ON, longitude 7.40OE. The six years data which was obtained from Nigerian Meteorological Agency (NIMET), Oshodi, Lagos, was split into three parts which are: the training, validation and testing datasets. The forecasting performance parameter such as root mean square error (RMSE), mean bias error (MBE) and absolute fraction of radiance (R2) for the tested location are found respectively. Among the model tested, the light GBM with R2= 0.8883, MSE=0.0619 and RMSE = 0.2488 emerged as the most appropriate model for Abuja and the light GBM with R2= 0.7340, MSE=0.2944 and RMSE = 0.5426 also emerged as the most appropriate for Lagos. The results of validation and testing indicates that the light GBM will be suitable for predicting GSR for both location and other locations having

Keywords: Air quality, Low-cost sensors, Meteorological parameters, Bivariate polar plot

ENT001

Modeling Usability and Acceptance For Learning Innovations: A Generic Framework

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Abstract

Understanding users' acceptance is a key factor for the development and success of learning innovations (LIs). Several models have been developed and validated in different domains to help explicate the technology adoption. However, these models did not address technology adoption in learning institutions as no educational-related constructs were tested. More so, no model was found in the extant literature that captures the dynamic nature of the technology adoption process within schools. The norm was to modify/extend the choice models to predict the adoption and use of a single technology, indicating a possible gap for researchers to fill. Against this background, this study tends to develop a generic model with a view to measuring behavioural intention to accept and use learning innovations. By doing so, future researchers would need not to search, collate and integrate constructs from different models but instead could just apply the generic model to gain an understanding of a variety of problems relating to LI adoption. The proposed generic framework has not been tested in an empirical setting; therefore, an empirical study needs to be performed to identify the goodness-of-fit of the proposed model. Managers, and practitioners can use this framework to study the behavioural intention of staff and students to adopt and use learning innovations.

Keywords: Acceptance Model; Conceptual Framework; GUAM; Learning Innovations

ENT002

A Comparative Study Of Denoising Techniques For Improving 5g Communication At 3.5ghz. Simulation Approach

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Abstract

This paper presents a comparative study of denoising techniques for improving 5G communication at 3.5GHz. A 5G communication system comprising a transmitter, a channel, and a receiver is simulated with MatLab and three types of noise (thermal noise, intermodulation noise, and external interference) are introduced to the generated signal.

The wavelet, PCA, weiner, median filter, and the karmer filter are used to denoised the signal with only thermal noise and also denoise the signal with all the noise present. Their performances are measured using signal-to-noise ratio (SNR), mean square error (MSE), and peak signal-to-noise ratio (PSNR). The results show that karmer filter outperforms the other techniques in terms of MSE, SNR and PSNR. These findings can be valuable for researchers and practitioners in the field of 5G communication system design and implementation, as they provide insights into the most effective denoising techniques for improving 5G communication performance.

Keywords: 5G, communication, Denoising, Wavelet, Wiener Filtering, PCA, Median Filtering, Kalman Filtering.

ENT003

Overcoming Nonsinusoidal Signal Output In Design And Construction Of Local Inverter For Sensitive Equipment

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Abstract

Epileptic power supply is a major problem in developing countries, therefore this problem calls for solution with locally available materials and one viable means is inverter. The output signal when inverter is constructed locally beyond certain critical power rating comes with transient signal (impure sine wave) which is dangerous for sensitive equipment. This study designed and constructed pure sine wave inverter from conventional materials for sensitive equipment application. Proteus 8.9 was used for virtual design and simulation of the inverter system with PIC30f2010 microcontroller in conjunction with LM324 integrated circuit (IC) that accepts low frequency square and high frequency saw tooth signals from IRF3205 Metal Oxide Semiconductor Field Effect Transistors (MOSFET) after receiving weak direct current (d.c) signal of 24V from cell for switching and creation of alternating current (a.c) signal. The microcontroller produces a pure sine wave signal from the inputs based on the set of mathematically formulated computer algorithm, this is ready for final amplification and filtering as output power supply. The hardware of the inverter was realized through placing and soldering of electronics components method on printed circuit board (PCB). The input and output signals were observed and measured for comparison analysis for 3.5KVA inverter. The output signal was found to be a pure and steady sine wave signal of frequency 50Hz and voltage range of 220V - 240V, this is suitable for sensitive equipment such as medical equipment that prevent loss of lives, data and properties during operation.

KEYWORDS: Microcontroller, Integrated circuit, MOSFET, PCB, Pure sine wave, signal switching.

ENT004

Impact Of Nanowire Length On The Recital Of Black Silicon Nanowires Based Solar Cell Applications.

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Abstract
Currently, black silicon nanowires (b-Si NWs) are attracting attention as promising candidate materials for developing the next-generation solar cells to realize both low cost and high efficiency owed to their unique morphological structure, electrical, and optical properties. In this paper, a vertical-aligned b-Si NWs array has been prepared by one-step electroless metal-assistant chemical etching (MACE) process. The shape and size of b-Si NWs were controlled by etching time of 25 min, 30 min, 35 min and 40 min with the length of b-Si NWs of 3 μm, 5 μm, 6 μm and 7 μm, respectively. The optical properties of a b-Si NWs array with different lengths were investigated in terms of optical reflection property. Less than 5% weighted average reflection (WAR) from 300 nm to 600 nm wavelength was achieved. Additionally, J-V characteristic was applied to compute the dependency of the b-Si NWs length on the recital of b-Si NWs based solar cell. Power conservation efficiencies (PCE) were attained for the planar c-Si of 6.8% and 7.2 %, 7.4%, 7.9% and 9.1% corresponding to 3 μm, 5 μm, 6 μm and 7 μm b-Si NWs in length, respectively.

Keywords: black silicon nanowires, b-Si NW array, MACE, solar cells, b-Si NWs based solar cell.

ENT005

Analytical Simulation Study of Transit Antenna Diversity Technique on OFDM System

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Abstract
Orthogonal frequency-division multiplexing (OFDM) is a distinctive digital multiplexing technique that is used in fourth generation (4G) and fifth generation (5G) mobile communication systems. It is a multi-access scheme that provides means of splitting a stream of information among several narrowly spaced sub-channel frequencies during data transmission. The OFDM system is also designed and empowered with the capacity to convert a single wideband signal channels into multiple narrowband channels and then transmits them to the receiver while ensuring no intersymbol interference (ISI). However, the OFDM systems is sensitive to multipath fading and lost of signal strength due shadowing in different radio frequency propagation terrains during practical applications. One key approach to combat its multipath fading problem is via the utilization of antenna diversity combining techniques. In this thesis, with the aid of MATLAB Simulink software, an

analytical-simulation design approach has been explored to engage three antenna diversity combining techniques, which includes the selection combining (SC), Equal Gain Combining (EGC) and Maximum Ratio Combining (MRC) to combat the aforementioned problem with focus on Rayleigh fading channels and quadrature phase shift keying (QPSK). By means of Bit Error Rate (BER) and Symbol Error Rate (SER) performance indicators, the result obtained shows that the MRC achieved the best performances irrespective of the antenna number compared to the EGC and SC techniques. As a case in point, while the MRC technique achieved BER and SER performance values of 0.000002 and 0.00000013 with three antenna number, the EGC and SC techniques achieved 0.0000023, 0.0000004 and 0.00000054, 0.0000068 BER and SER performance values, respectively with the same antenna number. The results also show that the performance of the three diversity techniques improves as the antenna number grows in quantity.

Keywords: OFDM system, Diversity techniques, Rayleigh model, QPSK modulation, Selection combining, Equal gain combining, Maximum ratio combining, SNR, BER and SER.

ENT006

Exploration and Analysis of Anatase Titanium Dioxide Nanoparticle And Environmental Applications.

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Abstract

Nanoparticles are materials that have structural components smaller than 100nm and can be either in 1-D,2-D or 3-D nanoscales. Titanium dioxide nanoparticles are particles with diameters less than 100nm. This research study delves into the synthesis and comprehensive characterization of TiO2 nanoparticles using the sol-gel method. Thorough material property determination is essential before integrating substances into diverse fields such as science, Engineering, and Technology. This study focuses on the synthesis of titanium dioxide nanoparticles via the sol-gel technique employing Titanium Tetrachloride (Ticl4) and Ethanol (CH3CH2OH) as precursor materials at ambient temperature. The resultant gel was subjected to calcination at 6000c for one hour, and subsequent characterization was performed using Elemental Dispersive Spectroscopy (EDS) with a JEOL JSM-760F model and ultraviolet-visible spectroscope. The findings reveal the prevalence of the anatase phase within the TiO2 nanoparticles, a highly valuable state for various applications. Electron micrographs of TiO2 nanoparticles portray delicate, aggregate, and fibre-like structures. EDS analysis attests to the composition with Titanium and Oxygen elements constituting 70.24% and 20.30% of the total weight respectively, indicating a compositionally pure sample comprising 90.54% of the analysed components. Detected as impurities, carbon and silicon are present in trace amounts. The significance of the anatase variant of TiO2 extends to diverse applications including but not limited to lithium-ion batteries, filtration systems, anti-reflective coatings and environmental and health benefits.

Keywords: Titanium dioxide, Exploration, EDS, Ultraviolet-visible spectroscope, Environmental applications.

ENT007

Ain/B-Ga2o3 Based High Electron Mobility Transistor A Future Corridor To Ultimate Power Electronics

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Abstract

Beta gallium oxide β-Ga2O3 also known as (BGO) provides a huge possibility for the fabrication of high voltage devices due to its extraordinary physical properties of high breakdown electric field (EBR) of about 8 MV/cm. It also has the largest polarization constant needed for excellent electron transport (saturation velocity 2 × 107 cm/s16, mobility > 2000cm2 /Vs) which is an important metrics for both an E-mode vertical and lateral HEMT. β-Ga2O3 as the thermodynamics stable phase has been demonstrated to form high electron mobility transistor (HEMT) through ion-implantation technology and large area native substrates result in exceptionally low conduction power losses, faster power switching frequency and even radio frequency power Although β-Ga2O3 channel HEMT have demonstrated superior performance , but issues with regards to reliability are contentious mainly because of the perceptible drawback of low thermal conductivity due to the accumulation of substantial amount of holes caused by self-trapping and self-heating effects. This under high power operational condition, the channel operating temperature rises to several degrees above ambient and resulted in the monumental self-heating effects. This self-heating is responsible for the deleterious trapping effect also known as "current collapse" - a phenomenon responsible for the temporal and recoverable reduction of the device drain current due to channel temperature rise. This occur during the on-state operations, were the hot mobile electrons injected by the channel acquires enough energy to penetrate the barrier energy of the interfacial layer of AIN/β-Ga2O3 and gets trapped inside the barrier. Consequently, the trapped electrons neutralize the electrostatics properties of the channel by depleting the carrier concentration of the extrinsic drain region of the channel resulting in the decrease of the drain current. While on the other hand, the offstate operation is affected by high drain voltage (VDG) which resulted in the trapping of electrons at surface of gate-drain region and accumulate a negative potential at the edge of the gate metal. This study provides a new research approach to heat spreading mechanism in order to control the trap related degradation in drain current of AIN/β-Ga2O3 HEMTs. The dielectric passivation and barrier optimization strategy is proposed to spread the device self-heating effects in order to effectively eradicate trap-related current collapse. The propose use of Al2O3 as the gate dielectric material for spreading of the self-heating effect not only decrease the leakage current, but also enhances high breakdown voltage, and provides an effective accumulation of 2DEG under both low and high voltage operation. Al2O3 material has been

successfully studied as a gate passivation dielectric and has become one of the leading candidates to replace both SiO2 and SiN in the near future.

Keywords: β-Ga2O3, Stacked AIN, Frenkel–Poole emission, Trapping effects, leakage current

ENT008

Design and Construction of an Automatic Recycling Irrigation Sprinkling System

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Abstract

An adequate water supply and nutrient are important for plant growth in a soilless garden. When there is insufficient rainfall it is necessary to provide additional means of supplying water to the plant. To this effect, an automate new matrix system can be introduce which will effectively supply water to all the plants with the help of automated switch, relay and an assorted scrap phone that form an integral part of an irrigation system. It is an essential tool to supply water in the required quantity and at the right time to sustain plant production and to achieve high levels of efficiency of plant growth. In this system, two water tanks were placed at a strategic position in which one of the tank is kept at a height to subject the follow of water to the plants under influence of gravity. While the other tank at zero potential collect the excess water from the seed pot and then automatically recycle it to the overhead tank through a forceful means without interruption, depending on your scheduled time that are being remote by a sensors. It can either be twice or three times daily depending on the holding capacity of the medium on which the plants were planted or when the medium gets dry. The medium may be gravels, soil, or floating materials which can anchored the plant on the surface of water. There are more than one signal that auto control the system, based on a first come first served basis and irrigate the crop accordingly. Therefore, this automated irrigation system will reduce human labour and water consumption thereby increasing productivity. This type of automated irrigation system is very significant for indoor agriculture or vertical agricultural farming. It could also be used for home gardening needs or could be used in multiple potted plants. So it is suitable for both commercial as well as growing plants for domestic household.

Key word: Automate irrigation system, soilless garden, plant's growth, gravity and medium

ENT009

Investigating the Optical Properties and Band-Gaps of Justicia Carnea and Canarium Schweinfurthii As PhotosensitizerS

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Abstract

Natural pigments as photosensitizers proffer advantages of natural abundance, environmental friendliness, simplicity of preparation and low cost. The research work focused on investigating the optical properties and band-gaps of justicia carnea and canarium schweinfurthii leaf extracts using CH3OH as extraction solvent. Using SprectrumLab 752S UV-VIS Spectrophotometer for the characterizations, the results of the absorbance spectra for all the extracted samples showed that the adsorption edge shifted to the visible region, having high absorbance range of (0.671 a.u. – 0.981a.u) though the leaf extract of justicia carnea showed the highest absorbance peaks range of (1.671a.u.- 1.771a.u). The results also showed decrease in the Transmittance within 300nm to 600nm. The samples had transmittance of above 0.5a.u and NIR of the spectrum such that we can use them as optical windows in solar cells. The reflectance results of the samples showed that there was decrease in the reflectance values in the range of (0.018a.u- 0.8a.u) within 400nm – 700nm. For refractive index, the results showed high refractive index range of (1.450a.u – 2.581 a.u)and justicia carnea having the highest refractive index range of (7.389a.u – 9.126a.u). Extinction Coefficient increases within the visible region for all the samples while justicia carnea showed higher Extinction Coefficient values than the other. Also the results showed high absorption Coefficient for all the samples, although leaf extracts of justicia carnea brought about higher absorption coefficient within 400nm – 700nm. For optical conductivity, the result of justicia carnea showed that its film had higher optical conductivity value than that of canarium schweinfurthii though all showed high values within 400nm-700nm. The Direct band-gap for the films ranged films ranged from (2.10eV – 1.80eV) while the InDirect band-gap results ranged from (1.80eV – 1.60eV) for canarium schweinfurthii and justicia carnea extracts respectively. Hence the leaf extracts are good photosensitizers for DSSC.

Keywords: Photocatalysis, Organic Dyes, Optical Properties, Dye-sensitized solar cell (DSSC).

ENT010

Determination and Measurement of Optimum Tilt Angle of a Dc-Dc Converter

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Abstract

Photovoltaic (PV) system is a promising and reliable source of renewable energy sequel to its ability to generate clean electricity. The PV systems have high significance due to their attractive specifications and simplicity in operation, installation and low cost of maintenance, and it produces no noise because it has no moving parts. Among the factors that affect the amount of solar energy received by a photovoltaic cell is the tilt angle. Therefore, the need arises to measure and determine the optimum tilt angle and location less affected by buildings. Measurements were conducted along four profiles (North, South, West

and East) of the Faculty of Science, Federal University Birnin Kebbi (FUBK). The values of voltage and current obtained in these profiles were recorded and the results were suitably represented in graphs. It was observed that, Southern route has the highest solar radiation reception when compared with the other three routes. With the analysis of the readings, it was found that the best value of the optimum tilt angle for the location is 20°. After the realization of the tilt angle, a simple DC-DC converter circuit was built and incorporated with a PV panel placed at 20o. The results obtained show the best performance of the converter can be harnessed when the PV panel is best placed at 20o tilt angle.

Keywords: DC-DC, Converter, Photovoltaic (PV), Tilt angle, Voltage gain, Renewable energy.

ENT011

Synthesis, Characterization, And Electromagnetic Wave Absorbing Properties Of Spinal-Ferrite (Sf) With Calcium Titanium Oxide Cto And Mwcnt Nanocomposite For Microwave Absorption Performance In 8–18 Ghz Frequency Range.

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Abstract

Broad bandwidth electromagnetic (EM) wave absorbers are persistently desired due to their massive applications in many fields. This paper highlights the strategic approach to obtain the ultrawide, thin, and high impedance matching of the absorber. The Spinel-ferrite Cu0.5Ni0.5Fe1.9Mn0.1O4 (SF), doped calcium titanium oxide, (SF@CTO), and Spinel ferrite doped calcium-copper titanate and multiwalled carbon nanotubes (SF@CTO@MWCNT) nanocomposites absorbers were reported. The spinel ferrite and calcium copper titanite were synthesized via a co-precipitation method, and hydrothermally with the MWCNT by acid functionalization process. Evidence of the presence of single-phase ferrite was observed by the XRD with crystallite-sized ranges from 55.6 to 75.3 nm. Raman spectra show peaks that are consistent with the single crystalline phase of prepared ferrites, CTO and MWCNT. The highest reflection loss (RL) of -39.12 dB (99.98% absorption) at 13.3 GHz with a thickness of 2 mm was anticipated using the complex permittivity and permeability characteristics. Interfacial electric polarization, electromagnetic impedance matching, as well as the numerous scattering network structure of SF@CTO@MWCNT nanocomposites, are all credited with effective ultra-wide bandwidth microwave absorption. This report is important for paving future work in obtaining a desired thin and ultra-wide bandwidth absorber.

Keywords: Nanoparticles; permittivity; permeability; microwave-absorption and impedance matching.

ENT012

Comparism of Electromagnetic Radiation Of Radio Waves Propagation Pattern In Kogi Central With Lokoja, The State Capital, Kogi State, Nigeria

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Abstract

Signal attenuation and distortions have characterized the radio frequency signals experienced in Kogi State. Several complaints were observed from the residents of the state on this issue. As a resident of the state and a user of radio frequency, I also observed the difficulties in assessing signals. Since radio frequency is an electromagnetic wave frequency, it is imperative to measure the EM waves. This study therefore compares the patterns of radio wave propagation from two radio stations in Kogi central with three in Lokoja, Kogi State, Nigeria. A town, Okene was preferred in the central because of its population, centrally located and boarders other towns. Equipment, a field strength metre was used to measure signal strengths and quality of radio signals. Six locations in Lokoja, Okene and the environs were selected for each radio station. The approximate distances between the transmitting and receiving antennas were determined. Thirty five locations were measured inclusive of the five radio stations and the six selected positions. Thereafter, calculations of the signal wavelengths of each radio station and the free space path-loss of signals were calculated at the positions. Factors such as reflections by buildings, mountains and vegetation cover, refractions by the rivers, streams, rainfall and absorption of the human abdomen were looked into as likely causes of signal attenuation. The strength of the signals being propagated at the central was compared with that at the state capital. The approximate distances from the stations to establish booster stations in order to receive news adequately were also determined.

Keywords: Attenuation, Impedance Mismatch, Pathloss, EM fields, EM Spectrum

ENT013

Construction of a Mini Submersible Pump

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Abstract

Water pump is a device used in moving water from one place to another, the research work focus on how to minimize excess cost in energy. While the effect of rising price of petrol in Nigeria becomes a critical issue, especially in the provision of basic energy need in our rural community. “water is life” as it is usually said, but the cost of obtaining a sufficient water for

our domestic use and irrigation farming has pose a serious concern, especially where machineries are to be employed for continue supply of water. The overall power consumption of any equipment plays a vital role in cost of ruining it. In this project work a mini motorize pump was design using a locally sourced stepper motor and a recycled plastic materials was used to fabricate the suction blades and casing. The motor and blade was coupled by shaft which can be able to lift water to a height of about 10m with less power consumption. The pump can operate at a minimum power of 6volt 15amps of battery or 12volt 20amps panel. The flow rate depends on the power rating.

Keywords: volt/amp, suction, stepper.

ENT014

Electronic and Phononic Band Structures of Chlorine and Bromine Doped MoTe2 and WSe2 Two-Dimensional Transition Metal Dichalcogenide

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Abstract

Due to their exotic and outstanding physical properties for nanoelectronics applications transition metal dichalcogenides (TMDCs) monolayer have shown a potential candidacy to replace the traditional silicon in silicon-based technology. Hence the exploration of the most important features of these crystal compounds is indispensable. In this paper, we provide a theoretical elucidation of the electronic and Phononic characteristics of Chlorine doped and Bromine doped of two materials namely MoTe2 and WSe2 monolayers. This investigation was carried out within the frame work of the density functional theory (DFT) technique using first principle calculations. The generalized gradient approximation (GGA) as proposed by Perdew Burke Enrnzerhof (PBE) scheme as performed in the Quantum ESPRESSO package is used. Electronic band structures of the considered materials show that all the materials are direct band gap semiconductors. The obtained result of phonon calculation reveals an excellent dynamical stability of the pristine compounds, while the doped materials are metastable. These results obtained hold promise for structural and electronic properties and therefore could be considered for potential uses in electronic and optoelectronic devices

Keyword: Electronic band structure, phonon dispersion, bromine/chlorine doped MoTe2 and WSe2 monolaye.

ENT015

Analysis and Comparison of Photovoltaic Array Configurations Under Partial Shading Conditions

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Abstract

Rising global energy demand, linked with population growth, relies heavily on depleting fossil fuels, contributing to environmental harm. In response, renewable energy, particularly solar photovoltaics (PV), is gaining traction. This study explores the impact of partial shading on 5x5 PV arrays with Series-Parallel (SP) and Total Crossed Tied (TCT) configurations. Six shading patterns, including single module, consecutive row/column, and diagonal shading, were examined. Analysis of voltage, current, and power at the Maximum Power Point (MPP) quantified shading effects on power loss and overall array performance. Results showed significant power reduction across all configurations and patterns, with column and diagonal shading causing the highest losses, while row shading incurred comparatively lower losses. TCT consistently outperformed SP, especially under row shading, exhibiting superior efficiency, power output, and minimal losses. The study recommends PV installers enhance knowledge of TCT configurations to mitigate partial shading effects, improving the overall user experience. This underscores the importance of efficient array designs to optimize PV system performance in the face of increasing partial shading scenarios.

Keywords: partial shading conditions; photovoltaic; PV array; series-parallel configuration; total-cross-tied configuration.

ENT016

Correlation between Radio Signal Strength and Attenuation as a Function Of Linear Distance And Time.

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Abstract

In this study, the Radio Signal Strength of Vision FM Gombe that transmit at 92.5 MHz was measured as a function of linear distance and time of the day using a locally constructed Radio Signal Strength Meter and a Quantum Geographic Information System, (QGIS) version 3.2. Values of the Radio Signal Strength against linear distance were also simulated using an empirical formula. Both the measured and the Calculated Statistical correlation results show a negative correlation of -0.92 and -0.52 respectively. This shows an inverse relationship between radio signal strength and linear distance. The respective radio signal attenuations were also calculated. The statistical correlation results show a positive correlation of 0.25

for the measured and 0.59 for the calculated between radio signal attenuation and the linear distance. This gives a linearly proportional relationship between radio signal attenuation and linear distance. Variations between radio signal strength and time of the day did not follow any pattern. The results conform to many researchers studies on the effects of time of the day and linear distance on radio signal strength attenuation. This study will have applications in telecommunications, for the procurements of transmitters for radio stations and in the installation of booster stations.

Keywords: Signal Strength, Attenuation, Linear Distance, Time, Correlation.

ENT0017

Design Of Ka-Band VSAT Network Service Provision For Nigeria Using Nigcomsat-1r

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Abstract

The Very Small Aperture Terminals (VSAT) network has been one of the ways of providing broadband internet services via satellites where the conventional terrestrial infrastructures are not available. Nigerian banking sectors improved their services to customers by adopting the Communication Technology (ICT) in their operations, which facilitates their e-operations considerably, but at an unimaginable cost. On the other hand, the Nigerian government have owned satellites one of which is the Nigerian Communication Satellite, NigCommSat-1R, which in addition to the legacy C-band and Ku-band; it also has Ka-band transponders, with narrow spot-beams transmission capability. In order to enhance the banking sector operating capabilities, and to put into proper economic utilization of the NigComSat-1R spare capacity, this research implemented a VSAT network for the thirty six (36) state capitals in Nigeria plus the Federal capital Territory, A star VSAT network with parabolic reflector antenna of size 1m diameter, with 3W transmit power and a hub of 4m diameters is considered. The ITU-R rain attenuation model and its associated input parameter model has been implemented in MATLAB for all the cities, attenuation values at various percentages of times, are obtained and used in the link budget calculations. System Tool Kit (STK) is used in determining the each city's locations and the range between the cities and NigCommSat-1R. The results indicated that in the southern regions of Nigeria the rain attenuation level is relatively higher than what is obtainable in the northern regions. This is not unconnected with the prevalent high rainfall rate in the southern regions. The rain attenuation value at p=0.01% is very high leading to a great link degradation, which is gauged by the reduction in carrier-to-noise ratio (C/N), that is not reasonably possible to operate the system at this availability objectives. However, it is realistic to operate the system reliably at 99.9% target availability. This is evidenced by the C/N being above the stated threshold. It is concluded that adopting a VSAT broadband service provided by NigComSat-1R network by the Nigerian banking sectors, by providing reliable, efficient and high speed internet for broadband communication service for the banking sector.

Keywords: Broadband wide band of electromagnetic frequency, VSAT; the Very Small Aperture Terminals, Attenuation: reduction in amplitude of a wave or the strength of a signal.

ENT0018

Optimization Techniques In Lte Wireless Communication Systems: A Focus On Genetic Algorithm-Based Path Loss Models

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Abstract

This study focused on developing signal propagation path loss models using wavelet transform and genetic algorithm approach. The research involved measuring signal data at four base stations commercially deployed within Port Harcourt, using long term evolution (LTE) network service at 2600MHz. A field-drive test method was used to measure the signal data with part of Port Harcourt. Path loss models were developed based on the denoised signal data and unprocessed signal data and compared accordingly with that of COST231-Hata, and Okumura-Hata models using RMSE, MAE, and correlation coefficient. It showed that Okumura-Hata model performed better than COST231-Hata model. The developed path loss model based on denoised signal data model was predictively superior than the developed path loss model based on unprocessed signal data, COST231-Hata, and Okumura-Hata models, as such showed with lowest RMSE and MAE values, and highest correlation coefficients in all the base stations. The developed path loss model based on denoised signal data estimated RMSEs of 2.27 dB, 4.61 dB, 3.77 dB, 3.93 dB and also derived the least MAE values of 1.68 dB, 3.30 dB, 3.02 dB, 3.34 dB. The correlation coefficient analysis revealed close alignment between the measured path loss and the developed path loss model based on denoised signal data, indicating its high level of performance. It showed that COST231-Hata model estimated the highest RMSE and MAE, as well as the lowest correlation coefficient. The correlation coefficients were also compared with measured path loss data, and it showed that the developed model estimated 94.49%, 84.85%, 92.17% and 93.25% for the base stations respectively. Validation with data from a different base-station confirmed the efficacy of the developed path loss model based on denoised signal data, providing valuable insights for network planning. It was noticed that the developed path loss model is 92.41% valid to be applied within part of Port Harcourt. Conclusively, it showed that the developed path loss models outperformed existing path loss models as such recommended for cellular network planning within Port Harcourt as to remedy the poor quality of service experienced within the areas.

Keywords: Optimisation; Communication; genetic-algorithm; path-loss; models.

ENT019

Review on Calcium-Based Nanoparticles Entrapped in Up conversion Nanoparticles for Theranostic Applications

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Abstract

Research on novel nanomaterials for improved performance on theranostic applications is still on the increase. Inorganic materials, such as calcium-based nanoparticles [calcium carbonate (CaCO3), calcium phosphate (Ca(H2PO4)2)] for targeted drug delivery and lanthanide-based upconversion nanoparticles (UCNPs) for bioimaging respectively fall into these class of materials. The aim of this paper is to review the recent advances of cancer targeted delivery using calcium-based nanoparticles entrapped in UCNPs and to suggest possible ways of developing novel targeted nanocarriers using natural sourced calcium materials (egg, sea and periwinkle shell) entrapped in UCNPs for theranostic applications.

Keywords: Calcium-based materials, UCNPs, Theranostics, Cancer.

ENT020

Optical And Photovoltaic Characterization Of An Inverse Hybrid Solar Cell With Pcmb:P3ht Blend And Laminated Silver Electrodes

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Abstract

The study investigated the performance of hybrid photovoltaic using an inverse structure and laminated silver electrodes. The purpose was to look at the characteristics of the zinc oxide (ZnO) used in solar cells and how they affect device performance. UV-Visible absorption spectroscopy revealed strong absorption between 584.55 and 623.33 nm in the PCMB: P3HT mix, with modest absorption in red and near-infrared. Poor transmittance was observed between 400 and 635 nm. The optical energy bandgap was 1.94 eV. ZnO films have high UV absorbance, selective transmittance, strong light-matter interaction, and outstanding absorption properties, making them ideal electron transport layers in solar cells. The photovoltaic properties of the solar cell were evaluated utilising I-V measurements. The essential parameters measured were open-circuit voltage, short-circuit current, maximum power point voltage, and maximum power point current. The fill factor and efficiency of the solar cell were estimated to be 0.51 and 1.236%, respectively. The research contributes to a better understanding of the performance characteristics of an inverse structure. Organic-inorganic hybrid photovoltaic with laminated silver electrodes.

Further research and optimisation of the device structure and materials may enhance the fill factor and efficiency, increasing the performance and use of organic photovoltaics in renewable energy applications.

Keywords: Inverse structure, Organic/inorganic hybrid photovoltaic, Laminated silver electrodes, PCMB: P3HT blend.

ENT021

Optical And Electrical Properties Of As-Synthesized Graphene-Copper Nanocomposite

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Abstract

Graphene is a sensitive allotrope of carbon with nearly zero band gap and high electrical conductivity while graphene based nanocomposites with metals are known to defective with widened band gap and highly reduced electrical conductivity. Graphene-copper (G-Cu) nanocomposite was synthesized from graphene oxide and copper nitrate using glucose as catalyst and varying the composition of copper from 5 wt% to 25 wt% in steps of 5 wt%. The XRD peaks for 5 wt% of copper were observed at 2θ = 26.63°, 44° and 54.4° for G-Cu5 and that of G-Cu25 peaks were at 2θ = 26.63°, 44° and 54.6°. The absorbance and transmittance peaks were determined by the crystallinity and weight percentage ratio of the nanocomposite, with the optical band gap varying between 4.16 eV and 4.13 eV from 5 wt% to 25 wt% respectively. The nanocomposite showed peak in the infrared (IR) region while electrical conductivity increases with copper weight percentage in the G-Cu nanocomposite.

KEYWORDS: Graphene, Nanocomposite, Band gap, Conductivity.

ENT022

EFFECT OF Zno NANOPARTICLES ON THE OPTICAL BAND GAP OF ANNEALED Ceo2 THIN FIJM DEPOSITED BY CHEMICAL BATH METHOD

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Abstract

The optical properties of CeO2 /ZnO Core-Shell thin grown using the solution growth technique. The films were grow at temperature of 70oC and annealed at annealing temperature ≤ 200oC. The film were then characterized using UV – VIS optical spectroscopy to determine the transmittance versus wavelength measurement from which other optical

parameters were evaluated. The result show that the transmittances of the films were significantly modified by the heat treatments. In particular the transmittance were higher for films annealed at annealing temperature. The energy bang gap for as – deposited varied from 3.80ev to 3.95ev, 3.95ev to 3.95ev for annealed at 100oC, 3.50ev to 3.95ev for annealed at 150oC and 3.50ev to 3.75ev for 3.75ev for annealed at 200oC. The band gasp of the binary core component was greatly improved after coating with ZnO nanoparticles thus providing tuning effect to the band gap for several new applications, such as in solar cell technology, selective surfaces and optoelectronic devices.

Keywords: band gap, temperature, thin film, annealing, transmittance.

ENT023

Measurement Of Braking Indices Of Frequently Glitching Pulsars Using Integration Method

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Abstract

Using the Australian Telescope National Facility (ATNF) pulsar catalogue, we selected 208 pulsars with 670 glitches and used the distributions of the spin properties to statistically investigate their effects on the braking indices. We then classified the braking indices of these pulsars into two subsets: ($n > 0$ and $n < 0$) based on whether the value of the braking index is greater or less than 0. We obtained 112 pulsars with positive braking indices and 96 pulsars have negative braking indices. The relationship between the braking indices of our sample and the spin down properties of the glitching pulsars were investigated using the Pearson correlation theory. These correlations suggest that spin down properties is a function of the braking indices. We computed the braking indices of these pulsars using the theoretical method and observed that the braking index is much smaller for very young pulsars (104-107) which have been observed to show more glitch activity than their old, stable counterparts. The study of the measurement of these braking indices have been very much significant in that it has provided insights into the evolution of pulsars. We computed the braking indices of these pulsars using the theoretical method and observed that the braking index is much smaller for very young pulsars (104-107) which have been observed to show more glitch activity than their old, stable counterparts. We computed the braking indices of these pulsars. From the results, we obtained the values of the braking indices of the 208 pulsars with the period range ($0.0016 \text{ s} \leq P \leq 4.30819 \text{ s}$) and period derivative (7.02

$\times 10^{-21} \leq \dot{P} \leq 1.53 \times 10^{-12}$). The values of their characteristic ages were found within the range of (10^3 yr$\leq \tau \leq 10^9$ yr). We also obtained significant values of the braking indices of the 16 sub-sample with frequency (2.4532 Hz $\leq \nu \leq$ 15.8248 Hz) and frequency derivative ($-6.03 \times 10^{-14} \leq \dot{\nu} \leq -2.42 \times 10^{-11}$). The values of their characteristic ages were found within the range of (10^3 yr$\leq \tau \leq 10^6$ yr) with 12 young pulsars and 5 middle-aged pulsars. Our results showed that the braking indices were observed to be a function of magnetic field of the pulsars, spin down rate and rotational periods. The implications of the spin properties on braking indices on long time scales are discussed.

Keywords: Pulsars, Glitches, Breaking Indices.

ENT024

Design And Construction Of An Automated Dual Air Purifier System (Adaps) For Indoor Use

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Abstract

Air is not harm-free. It bore tiny particles, evoked by disturbances of the ecosystem, either by man-made or natural phenomena. This brings about disorderliness in one's body system, termed "illness". The automated dual air purifier system (ADAPS) has been designed to harness the quality of air intake that is permissible within a given small space. ADAPS is a fusion of filtration and ionization methods that form the chamber of a dual purification system. Pollutants such as gases, aerosols, etc. are monitored by an MQ-135 air quality sensor. The MQ-135 gas sensor can detect gases like ammonia (NH3), sulfur gases, benzene (C6H6), carbon dioxide (CO2), smoke, and other harmful gases. In turn, these gases are ionized and filtered automatically using the negative ion generator (Cockcroft-Walton Ladder Network) and an air filter, respectively, aided by the ATMEGA 328P-PU microcontroller, which does its function of control as programmed.

Keywords: Air, MQ-135 sensors, negative ion generator, gases, air filter, microcontroller, air purifier system.

ENT025

Impact Of Gamma-Ray Bursts On Solar Photovoltaic System

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Abstract

We investigated the impact of GRBs on solar PV systems and analyse the resulting data to determine if there is a statistically significant effect. Our research shows that while GRBs do have the potential to disrupt solar PV systems, the impact is generally minimal and not statistically significant. We collected data on solar PV system performance before, during, and after GRB events, and found that there was only a slight decrease in energy production during the peak of the bursts. However, this small dip in performance was not enough to establish a significant correlation between GRBs and solar PV system efficiency. Overall, our study suggests that while GRBs can affect solar PV systems, their impact is not substantial enough to warrant concern for most installations. Further research may be needed to fully understand the relationship between GRBs and solar PV systems, but based on our findings, the impact of these energetic events on solar technology appears to be low and statistically insignificant.

Keyword: Gamma-ray bursts, light intensity, Solar energy, stefan's laws, Temperature.

ENT026

Design And Construction Of Iot Based Health Monitoring System (Hms)

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Abstract

Internet of Things (IoTs) has revolutionized almost all aspect of life including Health Monitoring System (HMS). Remote monitoring of both out- and in-patients has become a reality with the advent of IoT. This work is IoT-based and designed to monitor and store patients' ECG, heart rate, Spo2, body temperature as well as the ambient temperature to detect any irregularities. It employs an Arduino UNO, max3102, ECG and GSM module. Information gathered with this sensor node is transmitted to the cloud through the GSM module. The cloud platform stores the incoming health data in a secure and scalable database, where it can be accessed and analyzed in real-time. The system was tested using ten (10) patients and results obtained were compared with a ready-made ECG and heart rate monitors. Results shows that there was little acceptable difference between data obtained using this system and the ready-made products. This system has produced a low cost and reliable HMS.

Keywords: Max 30102, ECG Module GSM Module, Temperature, Gas sensors, Microcontroller.

ENT027

Design And Implementation Of Data Encryption System.

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Abstract

This Research work was carried out in order to develop a system that encrypt and decrypt a file, messages data all for security purposes. This aim can be achieved with the following objectives, to develop a system that involves data security through encryption of data. The system should be a good means of safeguarding data. Data security in these contemporary times is a must. For your secrets to be secure, it may necessary to add protection not provided by your computer operating system. The scope of this study covers the message, message integrity, user authentication and key management of messages stored in the system used by individuals companies, security agency in Nigeria in order to improve security and secrecy of data. Also this research work served as a way of impacting knowledge to student in educational sectors on the important of safeguarding your data.

Keywords: Security, Encryption, Decryption, Authentication, file, Data

ENT028

Consequences Of Temperature On Quality Factor And Equalization Techniques In Visible Light Communication Using White Led

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Abstract

This study aims to improve the performance of Visible Light Communication (VLC) systems by implementing post-equalization procedures. The study investigates the impacts of temperature changes on the Quality factor (Q-factor) at various driver currents, including 100mA, 200mA, and 300mA. To increase the LED modulation bandwidth and correct for frequency-dependent properties inherent in both the LED and the communication channel, R//C circuits are used. In the experimental setup, a pseudo-random bit sequence is generated and delivered to a photodetector via the channel. A blue filter is carefully placed to isolate the blue light emitted by the LED, decreasing interference, increasing signal-to-noise ratio (SNR), and boosting modulation Capacitor values ranging from 15 to 10 pF are adjusted to reduce channel distortion. The silicon photodetector, which converts optical information to electrical signals, records the input sequence. Despite the possibility of signal loss owing to noise, an equalizer put after the Bandpass filter mitigates this issue using a training sequence. The experimental results show that the VLC system, with adaptive equalization, can transmit data rate of 10 Mbps up to a distance of 10 cm. At 77.20°C and a driver current of 300mA, the Q-factor is 13.299. This study provides important insights on optimizing VLC systems for efficient data communication, particularly in the presence of temperature swings and channel distortions.

Keywords: OOK-NRZ (On-off-keying non-return to zero), LED (Light Emitting Diode), VLC (Visible Light Communications) and Photodetector.

ENT029

Exploring Nonlinear Effects In Optical Fiber Communication: Advanced Mitigation Strategies For Signal Distortion And Crosstalk Reduction

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Abstract

Nonlinear effects in optical fiber communication systems pose significant challenges to signal quality, transmission distance, and system capacity. This research explored these nonlinear effects comprehensively and developed an advanced mitigation strategies to address signal distortion and crosstalk reduction effectively. Through comprehensive simulations and experiments, various nonlinear effects, including self-phase modulation, cross-phase modulation, and four-wave mixing were characterized and their impact on signal quality was analyzed. New mitigation techniques that reduce nonlinear distortions by utilizing digital signal processing, optical signal shaping, modulation format optimization, dispersion control, and wavelength division multiplexing were developed and evaluated. The optimization of these mitigation strategies put into consideration practical constraints such as complexity, cost, and compatibility with existing optical network infrastructure. Also, the viability of the suggested mitigating strategies was confirmed via field testing, and it was found that this research can help improve the efficiency, dependability, and scalability of optical communication networks, allowing the adoption of next-generation telecommunications technologies to satisfy the expanding need for dependable and high-speed data transmission.

Keywords: Optical fiber communication, Nonlinear effects, Signal distortion and Crosstalk reduction

ENT030

Design And Construction Of A Digital Data Logger For Dc Voltages And Currents.

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Abstract:

Manual experimental data recordings as commonly employed in low financially endowed laboratories is always fraught with errors. Even when transducers are employed, the resulting voltage or current when manually recorded looses data sensitivity and accuracy. In this report we present the design and construction of an 18VDC, 3A continuous digital display and SD card logging data system. The design employed operational amplifiers assembled instrumentation amplifier and a 0.2 Ω standard resistor as current sensor. Data processing was with Atmega 324 Microcontroller and continuous display with a 16/2 liquid crystal display unit. Operational code was written in Arduino. Instrument accuracy was determined by comparison with standard digital multimeter read- outs. The device will find application in battery and solar cells development works.

Keywords: Transducers, SD Card logging, Microcontroller and Arduino.

ENT031

Optical Study Of Biosynthesize Silver Nanoparticles

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Abstract

This study aims to investigate the optical properties of biosynthesize silver nanoparticles using soluble starch at various time intervals (30, 60, 90, 120, 150, 180, 240 and 300 minutes). The use of soluble starch as a convenient method for producing silver nanoparticles has been noted. Without the use of harsh conditions, silver ions can be reduced into the produced silver nanoparticles. The optical properties of the prepared silver nanoparticles were characterise using UV-visible spectroscopy. The UV-visible spec provide insights in to the plasmonic properties of the nanoparticles, which are related to their ability to absorb and scatter light at specific wavelengths. As a result, high visible absorption and photoconductivity indicate that all samples are suitable for use in optoelectronic applications.

Keywords: Silver Nanoparticles, Biosynthesis, soluble starch, Surface Plasmon

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NT032

Ultrasound: A Facile, Effective, And Rapid Method For Surface Engineering Of Nanomaterials

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Abstract:

The chemical effect of ultrasound is due to the acoustic cavitation process in liquids from the extraordinary heating, pressures and cooling rates from cavitation bubble collapse. Ultrasound can generate unusual high-energy chemistry which can increase reactivities by nearly a millionfold. Herein, owing to these effects, the various ways the author and his collaborators had used ultrasonic irradiation to engineer surface of nanostructures is presented. The various unique effect of ultrasound effects was used to nucleate and grow zinc oxide (ZnO) nanorod on wires. Collide and incorporate or embed superparamagnetic iron oxide nanoparticles (SPION) into the framework of mesoporous silica nanoparticles. Functionalization of organometallic compounds on SPION is presented. To validate the facile, rapid and effective effect of ultrasonic irradiation, Chitosan was grafted on the nanoparticles. our results demonstrate the processes are facile, rapid and effective.

Keywords

ENT033

Design And Simulation Of The Regulated Ac To Dc Converters Using Proteus Simulator

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Abstract

In this paper, operating principles of regulated AC to DC converters have been discussed and the simulation results are provided. The circuit is built and simulated by Proteus software. The characteristics of half wave, centre tap and bridge rectifiers under forward and reverse directions was simulated and their output waveforms analyzed. The key components used for the construction are step down transformer, diode, capacitor, zener voltage regulator, and output load resistor. The circuit was design using stage by stage approach which comprised four modules. These include: 220V to 12V step down transformer, rectifier, DC filter and regulator circuits. The step-down transformer was used to transform 220V voltage AC input into 12V voltage AC output. The Rectifier circuit was used to convert the low voltage AC into pulsating DC voltage output that consists of ripple components. We then connected a capacitor of a high capacitance to the output of the rectifier, to filter the pulsating DC voltage to produce pure DC voltage. Due to unwanted input fluctuations, we connected 5V zener diode regulator to maintain the output voltage at a constant 5V value. The simulation results show that for half wave rectifier only half of the input ac waveform appeared across the load while for the centre tap and the bridge rectifiers both positive and negative half cycles of the input AC waveforms are allowed. The results obtained from simulation are compatible with the actual experiments. This work is therefore strongly recommended for electronics hobbyists and professionals who desire for proper understanding of simulation procedures and working principles of AC to DC regulated power supply.

Keywords: Pn junction, Diode, Rectifier, Filter, Regulator, Transformer, Simulation, waveform, Proteus.

ENT034

Measurement Of Electromagnetic Radiation Power Density Of A Cell Phone Based Station At Students' Activities Center, Lagos State University Of Science And Technology, Ikorodu, Southwest Nigeria

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Abstract

Cell phone base stations may be free-standing towers or mounted on existing structures, such as trees, water tanks, or tall buildings. The antennas need to be located high enough so they can adequately cover the area. The antennas emit electromagnetic fields (EMF) or radio frequency fields (RF), which is a form of energy technically referred to as non-ionizing radiation (NIR). This study aims to measure radiation power density for a base station at the student activity center area, Lagos State University of Science and Technology, Ikorodu, Lagos State and then apply statistical analysis to the measurement to find a relationship that describes the behaviour of power density according to the change of antenna height and distance from the base station. These measurements are taken using a cornet ED-88Tplus EMF/RF Detector device for monitoring high-frequency radiation in the range of 100MHz to 8GHz. Measurements were taken at 5m and 10 m opposite the Mast and from 10 m to 50 m on the horizontal distance away from the mast at 10 m intervals. Average Electric Field measurements were obtained and average power densities were computed. The results show that average power densities obtained from this work are within the range of 0.068295141 W m-2 and 0.375291746 W m-2 which fall within the international standard for 900 MHz radiation of 0.001 to 6.0 W m-2. This project reveals that the mast is not harmful but long time exposure may be harmful to man.

Keywords: Antenna, Electric field, Electromagnetic field, Mast, Power density,

ENT035

Unstructured Pathway Feature Extraction Using Deep Convolutional Neural Network Semantic Segmentation

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Abstract

High-level feature extraction from remote sensing imagery has always been a challenging task due to many factors such as intra-class differences and weather occlusion. These factors make it difficult for classical learning algorithms to discriminate between features. This research proposed a seamless method of extracting unstructured pathways from high-resolution satellite image data by leveraging the feature extraction capability of the deep neural network semantic segmentation approach. The proposed approach utilizes a custom dataset obtained through pixel-level annotation of satellite images of the Kuyambana forest located in the northwestern region of Nigeria. Few samples of the dataset were used for the training of the supervised classification model for several iterations. The trained model was then used for the extraction of different semantic features of the study area. Results obtained portray the effectiveness of the proposed approach in the extraction of unstructured pathways from complex backgrounds compared with the state-of-the-art methods. The proposed approach provides insight into the pathways network which further improves the security awareness of the study area.

Keywords: Remote sensing, Semantic Segmentation, Deep Convolutional Neural Network (DCNN), Image processing, Pathway.

ENT036

The Influence Of Temperature On The Body Doping Concentration In A Symmetric Double Gate Nano Mosfet In Quasi-Ballistic Electron Transport

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Abstract

This paper presents the impact of body doping concentration on the electron transport in a DG-MOSFET using the quasi-ballistic (Semi-classical) model. Numerical simulations of the electronics characteristics such as the average electron velocity, drain current, electron density and sub-band energy profile are analyzed under a range of low, average and high temperatures (50K, 350K and 850K) using NanoMOS 2D device simulator. The result showed that at a lower doping concentration of $1\mathrm{E}+04\mathrm{cm}^{-2}, 1\mathrm{E}+08\mathrm{cm}^{-2}, 1\mathrm{E}+12\mathrm{cm}^{-2}$ *and* $1\mathrm{E}+16\mathrm{cm}^{-2}$ when the temperature increase above 50K the average electron velocity increases as the channel region between the source and the drain decreases. It was observed that the threshold voltage is more sensitive to doping concentration greater than $\mathrm{N_d} = 1\mathrm{E}+18\mathrm{cm}^{-2}$ and also more sensitive to the mobility of the electron at high temperature as such the average electron velocity of the doping concentration $\mathrm{N_d} = 1\mathrm{E}+19\mathrm{cm}^{-2}$ is relatively constant as the channel length increases above 14nm with an average electron velocity of

$4.66E + 05 m/s$. The body doping concentration increase the height of the barrier potential (electron density decrease) at all temperatures and the number of electron entering the channel decreases, this causes a decrease in the On-State current as observed from the average electron velocity. The change in the gate voltage makes the electron inversion stronger when the doping concentration increases resulting in a stronger On-State current. This shows that increases in the doping level of concentration increase the potential profile thereby decreasing the leakage current and increases in the threshold voltage.

Keyword: Double Gate Nano-MOSFET, Doping Concentration, Electron velocity, Electron Density, Sub-Band Energy.

ENT037

Comparative Analysis of the Drain Current in a 7nm and 14nm Fully Depleted Silicon-on-Insulator (SOI) MOSFET

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Abstract

This paper analyses the effect of temperature on the drain current of a 7nm and 14nm Silicon-on-Insulator (SOI) MOSFET with Silicon (Si) and Gallium Arsenide ($GaAs$) as channel material. The Semi-classical transport model is employed to investigate the effect covering a range of 50K, 250K, 350K, 450K, 650K and 850K. The 7nm and 14nm SOI MOSFET Si channels offer low resistance with increases in temperature from 50K to 850K. The drain current is almost linear as the gate voltage increases because the shrinkage in the channel dimension results in the faster injection of the electron with a high average electron velocity and high electron density. It was observed that in the 7nm and 14nm GaAs SOI MOSFET channel the drain current is enhanced by the increase in mobility as the channel length shrinks to the nanoscale dimension with a decrease in resistance as the temperature increases. In the 7nm $GaAs$ channel the average electron velocity decreases as the channel length increases at 50K, 250K, 350K, and 450K, then increases as the channel length increases at a higher temperature of 650k and 850k while in the 14nm $GaAs$ channel the average electron velocity increases as the channel length increase at 350K, 450K, 650K and 850K, then decreases as the length increases at 50K and 250K. The result shows that GaAs offers better electron mobility with a high on-state current for both 7nm and 14nm channel.

Keywords: Drain current, SOI-MOSFET, Gate Voltage, Channel Length, Temperature.

ENT038

Design And Fabrication Of A Portable Resistivity Meter For Ground Water Exploration.

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Abstract

The cost of brand new resistivity meters(Scintrex, Bison, ABEM) has gone up astronomically, consequently many institutions that need this equipment for teaching and research purposes can not afford the price. This predicament compelled the authors to look for electronic components that are available in local markets and shops to fabricate this meter. This simple resistivity meter was then designed and constructed using components purchased locally. It measures the resistance directly. A comparison test was conducted with this meter using the ABEM Terrameter SAS 300 as the standard meter. The field testing exercise was conducted on an open field with a flat terrain. The results/data from the two instruments are very comparable and almost the same for a spread of AB/2 = 100m. Beyond this spread, the difference in readings is much. Hence, the use of this system is limited to shallow investigations where the target depth is not more than fifty metres(50m). Efforts are being made to improve on its performance.

Keywords: Resistivity, Meter, Comparison, Components, Equipment.

ENT039

Mechanical, Thermal And Electrical Characterization Of Hybrid Polymer Composite Using Cow Bone Nanoparticles For Electronics Applications

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Abstract

This study explores the incorporation of cow bone-derived nanoparticles as fillers in epoxy resin to create polymer composites for electrical insulation. The cow bone underwent a 72-hour milling process to achieve a Nano scale size, and the resulting powder was characterized using SEM, XRF, and FTIR. Nano composites with varying filler loadings of 0.1wt%, 0.5wt%, 1wt%, and 5wt% were prepared and subjected to standard ASTM tests, including tensile, density, water absorption, flexural, thermo gravimetric analysis, dynamic mechanical analysis, and differential scanning calorimetry. The results revealed that cow bone nanoparticles enhanced the tensile modulus and flexural strength of the polymer, with improvements seen at higher filler contents. Dielectric behavior investigations showed that the permittivities of the epoxy Nano composites were lower than those of unfilled epoxy across a frequency range of 200 Hz-3000 kHz, indicating a significant dependence on filler concentration and filler permittivity. Tan delta values were slightly lower in Nano composites with cow bone fillers, while the dielectric constant and dissipation factor values were higher compared to unfilled epoxy. Additionally, the dielectric strength decreased, and thermal conductivity increased with filler content.

Keywords: Cowbone, dielectrics, epoxy resin, flexural strength, Nano composites, tensile strength

ENT040

Construction Of Wireless Frequency Modulation Radio Transmitter Covering 1000 Meters

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Abstract

In this study, the construction of wireless frequency modulation (FM) radio transmitter covering 1000 meters was carried out. The construction was done on a transmitting circuit that operated on a 9V DC supply as a base for further construction. Performance tests were carried within Bauchi State University Gadau (BASUG) science labouratory at different locations to verify the working conditions of the device. The frequency test was done using an oscilloscope and a wavelength of 1.65m was obtained. The devise uses radio frequencies of 96.0 MHz to transmit the FM signal to the receivers. The present design is easy and affordable. The total cost incurred in designing this FM transmitter was less than ₦20,000 and is cheaper compared to the imported foreign type which can be affordable by few people. The devise will improve the communication by security operatives within BASUG campus since the people in the community move around with their mobile radio system.

ENT041

Average Sound Absorption Per Person At Octave Band Frequencies Between 125hz And 4000hz In An Enclosure

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Abstract

The audience constitutes the major sound absorbent materials in most church auditoria and, non-inclusion of the sound absorbed by the audience in the determination of the optimum reverberation time from the design stage accounts for the problem of poor sound quality in such church auditoria. To address this problem, this research was carried out to provide designers with data on sound absorption by an individual at some octave band frequencies important for understanding speech. The work utilized the Sabine's formula for Reverberation Time to determine the sound absorption per person at Octave band frequencies of 125Hz, 250Hz, 500Hz, 1000Hz, 2000Hz and 4000Hz. Data which included the volume, sitting capacity of persons and reverberation time of eight (8) churches were obtained when the churches were occupied and when unoccupied. These data gave the calculated average sound absorption per person of 0.29, 0.43, 0.51, 0.68, 0.71 and 0.73 at these octave band frequencies respectively, all showing that the average sound absorption by an individual increases with frequency within this octave band frequency range.

Key Words: Reverberation Time, Sound Absorption, Octave Band Frequency, Sound Quality.

ENT042

Assessment of Three Fiber Types For Maximizing Span Length In Uncompensated Coherent Optical Systems Using Gaussian Noise Model

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ABSTRACT

Optimizing span length plays a crucial role in the design of long-haul optical communication systems, considering both performance and cost factors. We investigated the transmission performance of four modulation formats(DP-16QAM, DP-32QAM, DP-64QAM and DP-128QAM) across varying spans lengths on three different types of fibers (NZDSF, SSMF and PSCF). Our findings revealed that PSCF outperforms the other fiber types, leading to a reduction in the number of amplifiers by 25% and 65% compared to SSMF and NZDSF, respectively. By opting for PSCF instead of SSMF, the transmission distance increases by 52%, 59%, 63%, and 67% for span lengths of 50, 80, 100 and 120km, respectively. Similarly, choosing PSCF over NZDSF resulted in transmission distance improvements of 85%, 87%, 88%, and 90% across all tested span lengths. These results demonstrate that PSCF performs exceptionally well and proves to be a more cost-effective choice compared to the other two fiber types. BY Karibullah Ibrahim Shu'aib

ENT043

Sub-Threshold Signal Enhancement Induced By The Constant Damping Amplitude Of A Mechanical System Via Vibrational Resonance Phenomenon

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Abstract:

There exist diverse dynamical behaviors in nonlinear systems currently receiving attention of researchers. Among the widely investigated, are resonance-induced phenomena such as; Coherence Resonance (CR), Stochastic Resonance (SR) and Vibrational Resonance (VR). In this latter effect, nonlinear systems enhanced their output response at low frequency due to the presence of a high frequency perturbation at the system's input. VR has received considerable attention for the past two decades now, as it has been reported in many systems such as; mechanical systems, neural model, electronics circuit, to mention just a few. However, in mechanical systems, few works focused on the impact of damping parameters on VR occurrence which is addressed in this communication. In particular, we numerically investigated the impact of a constant damping amplitude of a nonlinear mechanical oscillator on VR occurrence. The considered system models the motion of a particle experiencing multistable potential and excited by two sets of frequencies.

Keywords: Nonlinear dynamics, mechanical systems, damping parameter, vibrational resonance.

ENT044

Effect Of Particle Mass On Low Frequency Signal Detection In A Multi-Stable Mechanical System Via Vibrational Resonance Phenomenon

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Abstract:

The investigation of resonance phenomena in nonlinear systems has received the attentions of researchers for decades. The famous Stochastic Resonance (SR) phenomenon has reported diverse applications in subthreshold signal detection and image processing. In SR phenomenon, noise perturbation enhances the system response at a low frequency signal. However, in the ultimate Vibrational Resonance (VR) phenomenon, high frequency perturbation effectively plays the same role as the noise perturbation in SR. Consequently, VR has been reported in different systems/contexts such as in; electronic circuits, neural models, image perception and mechanical systems. In particular, our present communication numerically reports the VR occurrence in mechanical system modeling the motion of a particle in multiple stable potential experiencing constant damping and driven by two excitations. Indeed, we reported the existence of a critical mass below which VR exists and beyond which it ceases to exist.

Keywords: Nonlinear dynamics, mechanical systems, particle mass, vibrational resonance.

ENT045

Development And Experimental Evaluation Of Thermoelectric Air Radiant Cooling Application System In Nigeria

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Abstract

This study developed a thermoelectric cooling system that regulates the conditioned-space temperature and the cooling output. Solid state power electronics conversion system method is adopted through DC Power Supply, Monitoring & Control and Power Unit. The power is supplied through DC Power Supply Unit to the system by a step-down transformer. The output voltage is converted to a varying DCV with a bridge rectifier by varying the frequency. The DC voltage is converted back into AC through Pulse Width Modulation technique in IGBT electronic transistors of Power Unit. The IGBT Inverter produces the desired sinusoidal waveform at a particular frequency that fed in the compressor motor. The speeds of motors gradually increased from 1440RPM to 4200RPM at a frequency of 24Hz to 70Hz. The result shows that the temperature of the conditioned room drops significantly at instant of the developed system with 83.72% energy efficient occasioning into enhanced cooling comfort.

Keywords: Thermoelectric, step-down transformer, bridge rectifier, Insulated Gate Bipolar Transistor (IGBT), Pulse Width Modulation (PWM), microcontroller.

ENT046

Synthesis And Electrochemical Characterization Of Graphene Oxide/Tungsten Trioxide Nanocomposite For Enhanced Supercapacitor Performance

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Abstract

This research presents a systematic investigation into the fabrication and electrochemical performance of GO20ml/WO3, GO40ml/WO3, and GO60ml/WO3, synthesized via chemical bath deposition. Graphene oxide (GO) was prepared utilizing an enhanced modified Hummer's method, and the resulting nanocomposites underwent comprehensive characterization using X-ray diffraction (XRD), scanning electron microscopy (SEM), Cyclic Voltammetry (CV), and Electrochemical Impedance Spectroscopy (EIS). Structural and morphological analyses highlighted the impact of incorporating GO into the WO3 network, resulting in improved charge transfer and ion transport kinetics within the composite electrodes. The synergistic intercalation of cations further contributed to the enhanced electrochemical performance. Notably, the GO60ml/WO3composite electrode exhibited the highest specific capacitance (780 F/g), surpassing GO40ml/WO3 (530 F/g) and GO20ml/WO3 (280 F/g). The GO60ml/WO3 electrode demonstrated superior energy density (70.2 Wh/kg) and exhibited a remarkable power density of 45.0 W/kg, outperforming GO40ml/WO3 (30.0 W/kg) and GO20ml/WO3 (22.5 W/kg).These findings position the GO60ml/WO3 composite electrode as a highly promising material for supercapacitor applications. Its high specific capacitance, energy density, and power density, underscore its potential for advancing supercapacitor technology. This study contributes valuable insights to the understanding of composite electrode materials, offering significant implications for the development of efficient and high-performance energy storage devices.

Keywords: Graphene nanosheets; Tungsten oxides; Electrochemical capacitor; Supercapacitor

ENT047

Development Of Carbon Nanotubes Via Catalytic Chemical Vapour Deposition Method Using Fe-Mo Bimetallic Catalyst Supported On Kaolin

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Abstract

Multi Wall Carbon Nanotube (MWCNT) was synthesized through the catalytic chemical vapour deposition (CVD) method by the decomposition of Fe-Mo bimetallic catalyst supported on kaolin deposited inside the quartz tube and subjected to reactor temperature of 700oC, using the acetylene gas as the carbon source and hydrogen gas to purge the air in the glass tube. The as-prepared MWCNT was subsequently immersed in H2SO4 and HNO3 acid mixture ratio 3;1, sonicated then rinsed in distilled water to a pH 7 to obtain the purified MWCNT sample SEM/EDX investigation for the as-prepared MWCNT and the purified MWCNT display images of MWCNT morphology and the elemental constituents show higher percentage of carbon after purification, The TEM microstructure images shows concentric MWCNT, the BET result for both the as-prepared and the purified MWCNTs pore volume values are 2.166x10-1/2.722x10-1, surface area values of 4.427x102/5.339x102 and pore size of 2.105/2.135 shows improved material after purification. TGA/DTA revealed well dispersion of the metallic particles on the kaolin support with high thermal stability. XRD confirm crystalline nature of the material and the presence of carbo MWCNTs and FTIR analysis has identify the functional group in the purified MWCNTs to contain which make it suitable to form a composite. This study demonstrated the synthesis of Fe-Mo bimetallic catalyst supported on kaolin can act as an excellent substrate for MWCNTs growth.

Keywords Bimetallic Fe–Co catalyst, Kaolin, Multi-walled carbon nanotubes, Catalytic chemical vapour deposition.

ENT048

Design And Construction Of An Authomatic Recycling Irrigation Sprinkling/Dripping System

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Abstract

An adequate water supply and nutrient are important for plant growth in a soilless garden. When there is insufficient rainfall it is necessary to provide additional means of supplying water to the plant. To this effect, an automate new matrix system can be introduce which will effectively supply water to all the plants with the help of automated switch, relay and an assorted scrap phone that form an integral part of an irrigation system. It is an essential tool to supply water in the required quantity and at the right time to sustain plant production and to achieve high levels of efficiency of plant growth. In this system, two water tanks were placed at a strategic position in which one of the tank is kept at a height to subject the follow of water to the plants under influence of gravity. While the other tank at zero potential collect the excess water from the seed pot and then automatically recycle it to the overhead tank through a forceful means without interruption, depending on your scheduled time that are being remote by a sensors. It can either be twice or three times daily depending on the holding capacity of the medium on which the plants were planted or when the medium gets dry. The medium may be gravels, soil, or floating materials which can anchored the plant on the surface of water. There are more than one signal that auto control the system, based on a first come first served basis and irrigate the crop accordingly. Therefore, this automated irrigation system will reduce human labour and water consumption thereby increasing productivity. This type of automated irrigation system is very significant for indoor agriculture or vertical agricultural farming. It could also be used for home gardening needs or could be used in multiple potted plants. So it is suitable for both commercial as well as growing plants for domestic household.

Keyword: Automate irrigation system, soilless garden, plant's growth, gravity and medium

Geophysics & Resilient Systems

GPR001

Integrated Geophysical Approach of Groundwater Potential in Obun-Ewi, Ondo East Local Government, Southwestern Nigeria

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Abstract

Obun-Ewi area suffers from a shortage of freshwater and the main source of water is rainwater. In order to evaluate groundwater potential, a very low frequency electromagnetic (VLF-EM) survey and vertical electrical sounding (VES) were applied in the study area. ABEM WADI equipment was used to establish six (6) VLF-EM traverses. Linear features assumed to be minor fractures/conductors inferred from the fltered real pseudo-sections helped in choosing twenty-three (23) vertical electrical sounding points that were further probed using DDR-3 resistivity equipment. Geoelectric parameters (depths and resistivities) were used to produce the geoelectric sections, isoresistivity map, isopach maps of the weathered layer and overburden, and bedrock relief map of Obun-Ewi. The composite groundwater potential map generated demarcated the study area into good, moderate and poor groundwater potential zones. The groundwater potential map revealed that about 69.6% of the study area fell within the poor groundwater potential rating, about 21.7% constituted the moderate groundwater potential rating while the remaining 8.7% constituted high groundwater potential rating. The study concluded that the groundwater potential of Obun-Ewi, Ondo town is generally poor, with areas around central South and far Northern part of the study area has good groundwater potential, suitable for siting boreholes.

Keywords: Groundwater, VLF-EM, Isoresistivity map, Groundwater potential map.

GPR002

Application Of Electrical Resistivity Geophysical Method For Ground Water Prospecting Around Kwankwasiyya Hostel Of Al-Qalam University Katsina, Katsina State, Nigeria

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Abstract

This research applied electrical resistivity geophysical method for ground water prospecting around Kwankwasiyya hostel of Al-qalam University Katsina, Katsina State, Nigeria.Data was collected in the field using resistivity meter which was filtered, analyzed and then interpreted. The schlumberger array configuration was used and the computer iteration using IP12WIN software. The Interpretations differentiate main geoelectrical layers. The first layer was interpreted as top soil plus laterite and the second geoelectrical zone assume to be highly fractured, the third layer zone is highly weathered granitic rock, while the last zone is considered as the decomposed fresh bedrock. Base on geophysical survey conducted and analyzed, the result indicated that VES 2 is the most suitable point for drilling borehole and the water development can be up to 80 m depth depending on the hardness of the basement rock. The depth of VES 2 is 20.67 m while the depth of VES1 is 28.11 that is why VES 2 is more suitable.

Keywords: resistivity, groundwater and prospecting.

GPR003

Linear features in Osun State, Southwestern Nigeria: Qualitative and Quantitative study using Magnetic and Satellite Data

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Abstract

This paper analyzed satellite and aeromagnetic data over Osun State, Southwestern, Nigeria with a view to assessing the surface and subsurface structural settings that may favour mineralization in the study area. To accomplish this goal, airborne magnetic data, Aster Digital Elevation Map, and Landsat-7 ETM+ scenes of Osun State were acquired and processed. Several enhancement techniques were applied to improve the quality of the various remotely sensed datasets for visualization and interpretation. The preferential orientations of structural features in the investigated area are NE-SW, NNE - SSW, and NW-SE.The NE-SW orientation characterized the primary geologic events in the area.The 2.5D model displays an unequal basement relief and affirmed the presence of thin dyke with differed overburden thicknesses. The lineament's density analysis revealed that the rocks were affected by high lineament concentration. Remarkable correlations exist between regions of high lineament density and the areas of known mineral occurrences. The lineament seems to play a significant role in providing favorable pathways for the migration and ascent of mineralized fluids to depositional sites. The findings of the present study provide significant information on the linear features and their influence on mineral occurrence in the study area.

Keywords: Airborne Magnetic Data, Remotely Sensed Images, Lineaments, Lineament density, Gold Pits

GPR004

InvestigationOf The Effect Of The Solid Watse On Soil And Ground Water Using Electrical Resistivity Method At Kumshe And Damboa Road Maiduguri, Borno State

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Abstract:

Two dumpsites were investigated at Kumshe and Damboa road areas of Maiduguri. Electrical resistivity survey was carried out at the two dumpsites to determine how accurately electrical measurement could delineate the flux of leachate into soil and ground water. Syscal junior resistivity meter was used to accomplish the task. This uses multi-core cables with take out at various intervals, having a total of 27 electrodes covering a spread of 200m. Eight vertical electrical sounding (VES) was conducted around the dumpsite, and was interpreted using computer software IPI2WIN. The result suggested that, delineated contamination plumes as low resistivity zone with resistivity value ranging between 0Ωmand 30 Ωm, from the ground surface to varying depth of 0-3.6m in ves1, ves2, ves4 and ves8 believed to be leachate derived from decomposed waste of higher concentrations, while ves6, ves5 and ves3 delineate contamination plumes with low resistivity zone ranging between 100 Ωm to 200 Ωm, from the ground surface to varying depths believed to be leachate from decomposed waste of lower concentration. There was no evidence of top soil or groundwater contamination as reveal by the IPI2WIN model in ves6 and ves7. The result revealed that at the dumpsites, leachate had migrated from dump into surrounding soil have not reached the shallow aquifer of these areas.

Keywords: Leacheate ; deleneate; Vertical Electric Sounding VES; Aquifer; plume ; Apparent Resistivity.

GPR005

Accessing the Very Low Frequency Electromagnetic Geophysical Technique for the characterisation of two eroded soil pipes in Awka, Anambra State, Nigeria

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Abstract

Many soil subsidences are due to tunnel erosion, popularly called "soil pipe, which generally begins as a tiny flute hole in the ground but may cause significant environmental implications when left uncontrolled. Varieties of damages resulting from soil subsidence have been reported in several regions within Anambra State, Nigeria. Therefore, the study focuses on examining areas in some parts of the state where soil pipes, a subsurface form of erosion, are prevalent. The research aimed to investigate soil pipes located inside soil subsidence at two Awka sites: Awka site I, and Awka site II, which are geographically positioned at "6.22320oNand 7.08240oE" and "6.22200oN and 7.08190oE," respectively. The Very Low Frequency Electromagnetic (VLF-EM) geophysical technique was used to survey the areas, generating four profiles. Two profiles in each of the study areas, each with a traverse length of 100m and spacing of 5m. Results indicated that the study areas have developed a void-like vertical structure of approximately 5m in depth from the profile's top and has extended to about 4m in length. The Karous-Hjelt filtering has also indicated low conductivity (-10 to 0.5 Mhos), corroborating the maximum negative response of the Fraser filtering inside the soil subsidence structure of each site, while profiles distant from the piping structures did not indicate any cavity or low conductivity.

Keywords ; Soil piping; Tunnel erosion; Erosion;Soil Subsidence; VLF; Conductivity

GPR006

Uncovering Soil Piping Vulnerability Using Direct Current Geophysical Techniques in Awka, Anambra State, Nigeria

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ABSTRACT

In recent times, there have been increasing reports of soil subsidence occurring in various parts of Anambra State, Nigeria. The formation of natural tunnels or soil pipes in the subsurface, which has been reported by many researchers globally, is the chief cause of these subsidence incidents. Thus, this research aims to use Direct Current (DC) geophysical techniques to delineate the spatial distribution, pattern, and characteristics of these soil pipes at two sites: Awka Site 1 and Awka Site 2 both in Awka South LGA of Anambra state, Nigeria. Two electrodes array configurations - the dipole-dipole array for analyzing the Electrical Resistivity Tomography (ERT) and the Schlumberger array for analyzing the Vertical Electrical Sounding (VES) - were employed. Nine ERT profiles and eighteen soundings were carried out. The results from the ERT survey divided the subsurface into six distinct structures. The high-resistivity 3000-30000Ωm, the eroded structure with dry pore spaces, which mainly occur at the top of the profile, was interpreted as having the right conditions for the formation of soil pipes. The result from the VES survey revealed two to five different geo-electrical sections and fourteen distinctive sounding curves that are characterized by the vertical changes in the subsurface. The weathered soil with resistivity ranging from 1200-30000Ωm, which aggregates very close to the surface 0-5m of the study

areas, was interpreted as having the best soil formations that allow the building of soil pipes. The 2D and 3D iso-resistivity maps obtained from the data of the VES show that soil pipes follow the NW-SE direction. This coincides with the stress direction, fluid migration paths, and sloppy terrains of the study areas

Keywords ; Soil piping; Tunnel erosion; Erosion;Soil Subsidence; VES; Dipole-Dipole; Resistivity; Conductivity; Dispersion

GPR007

Determination Of Depth To Basement Using Spectral Analysis Of Aeromagnetic Data Over Azare Segment Of Chad Basin

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ABSTRACT

The high-resolution aeromagnetic data over part of the Bornu basin (sheet 84) north eastern (NE) Nigeria, was processed and interpreted using spectral analysis to determine the depth to the basement. The study area is bounded between longitude 10◦ 00′ 00′′E to 10◦ 30′ 00′′ E and latitude 11◦ 00′ 00′′ N to 12◦ 00′ 00′′. Regional residual separation of the total magnetic field intensity (TMI) was performed using polynomial fitting method. The residual map was divided into nine square spectral blocks using the filtering tool of Microsoft excel software. The Microsoft excel program employed Fast Fourier Transform (FFT) technique. It transforms the magnetic field data into the radial energy spectrum for each block. Then the average radial energy spectrum is computed in MATLAB. The result shows that depth to the deeper magnetic source ranges from 4503.9m to 1948.3m. However, it can be observed that NN, NE, and NW are having less deep magnetic sources ranging from 1948m to 2459.7m. The deepest sources happened at the major towns of interest which are Bidawa , Matsango , Yakiri and Fatara areas, Katagum Bauchi state rangingfrom 2632.8m to 4503.9m The maximum depth of the sedimentary unit was estimated as 4.5km because the isolated value beyond this depth cannot be connected , and this depth occurs around Matsango and Bidawa. The shallow depth magnetic source map shows that SS, SW, SE are having least shallow depth, central to northern part of the study area are having shallowest depth to the magnetic source.

Keywords: Aeromagnetic data, Chad basin, Depth to the basement, Spectral analysis.

GPR008

Estimating the Thickness of Sedimentation within parts of Lower Sokoto Basin, Nigeria, Using Spectral depth analysis Euler Deconvolution and Source Parameter Imaging of aeromagnetic data

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Abstract

This study presents the results of the analysis and interpretation of aeromagnetic data over part of lower Sokoto basin with the aim of investigating the hydrocarbon potential of the study area. The study area is located between latitude11.00oN and 12.00oN and longitudes 4030 ꞌEand 5030 ꞌE. The Total magnetic intensity map of the study area was subjected to regional/residual separation. Three depth estimating techniques applied on the residual map to determine the thickness of sediments in the study area were Euler deconvolution , Source parameter imaging and spectral method. The results of these methods corroborate; Euler deconvolution , Source parameter imaging (SPI) and spectral method shows a thick sedimentation of 0.125km to 1.54km. A depth of0.64 km to 1.54 km was obtained with spectral method, value of0.124 to 1.458 km was obtained with SPI while values between 0.149 km (shallow magnetic bodies) to 1.381 km were obtained with Euler deconvolution.The maximum sedimentary thicknesses obtained in this study are mostly at the south-western part. The study area was found to have a good prospect for hydrocarbon exploration.

Keyword: Aeromagnetic data, lower sokoto basin, hydrocarbon potential

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GPR009

Aeromagnetic Data Analysis For Mineral Resources And Hydrocarbon Investigation In Some Parts Of Katsina State, Nigeria

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ABSTRACT

Assessment of the structures and solid minerals was carryout to investigate subsurface structural characteristics and mineralization potential zones within part of Katsina State, North-Western Nigeria. An aeromagnetic data was processed and analysed to delineate subsurface topography to infer its impacts on mineralization occurrence within the study area. The study area is between latitudes 12O00'N and 12O30'N and longitude 7O30'E and 8O00'E. The residual magnetic intensity data of the area was reduced to magnetic pole after which several ways of source and edge detection/interpretation with depth determination techniques including, analytic signal, first vertical derivatives and Euler deconvolution were applied to the aeromagnetic data. From the analytic signal map, three magnetic zones were delineated. These are: low to relatively low magnetic zone (LM) with amplitude range from 0.0022 nT to 0.0072 nT, moderate magnetic zone (MM) with amplitude 0.0072 nT to 0.01474 nT and those with high amplitude from 0.01474 to 3.8383 nT which are products of magmatic intrusions with fractures, faults and joints. Euler deconvolution helps in determination of boundary, depth and geometry of the structures. The result of the analysis reveals the areas with higher sedimentary thickness toward the northern part of the study area which are feasible for hydrocarbon generation and are thus recommended for other geophysical surveys.

Keywords: Analytic signal, Euler, hydrocarbon and mineralization.

GPR010

Investigation into a deep-rooted Crustal framework deduced from Potential field data in Cretaceous and Tertiary Strata, Sokoto Basin NW, Nigeria

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Abstract

The Paleocene sediments from the Sokoto Group, which comprise the Gamba, Dange, and Kalambaina formations, were covered by Maastrichtian sediments from the Rima Group, which include the Wurno, Dukamaje, and Taloka formations. High-resolution aeromagnetic and satellite gravity measurements were used to study these sediments. The aforementioned strata correspond to the Cretaceous and Tertiary strata in this research area and are situated in the south-eastern part of the Iullemmeden Basin. Our aim is to determine and explain the horizontal variation in density and magnetization using the whole regional satellite gravity and aeromagnetic data. The deeper magnetic and density sources were scanned using a two-dimensional (2D) radially averaged power spectrum analysis to produce the NE to SW and E to W trending models for the Moho, lower, and upper lithosphere under the study area. The results are further assessed using upward continuation, derivative analysis, and two-dimensional gravity and magnetic modeling. Numerous important structural features have been identified as a result of the vertical gradients for the potential field data. Spectral analysis and Euler deconvolution can be used to calculate the depths to the lower and upper mantle crust boundaries as well as the depth to Moho. The findings of a qualitative analysis point to an intrusion of the Gundumi and Illo Formations that has a northeast orientation as the primary cause of the significant gravitational and magnetic interaction. The differences

in the deep-seated crustal structures and mineralized anomalous bodies with depth were visible on anomaly maps with an upward continuation of 5 km, 7 km, 20 km, and 30 km. Quantitatively, the 2D regional models along the selected profiles (L1, L2, L4, L6 and L7) display a typical lithostratigraphic succession of the Gundumi and Illo Formation (Continental Intercalaire, CI) type of crust, which is subdivided into the lower and upper mantle crust as well as the Moho. The sediment thickness by surface depth ranges from ~4.06 km and ~23.31 km. The Moho interface, lower and upper mantle crusts, and magnetic crust are all located at depths of around ~10.23 km. The distance between the local models of the foundation rocks to the north and south of the Sokoto Group was approximately ~6 to ~8 km and ~4.5 km, respectively.

Keywords: aeromagnetic data; satellite gravity data; Crustal framework; Cretaceous and Tertiary strata

GPR011

Investigatigation Of The Depth To Fresh Basement At Sardauna Memorial College Kaduna, Kaduna State North- Western Nigeria.

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Abstract

The interpretation of 25 Schlumberger vertical electrical sounding (VES) data along five (5) profiles was carried out in Sardauna memorial college Kaduna , Kaduna state northern Nigeria . This is an attempt to investigate the depth to fresh basement of the area. Ohmega resistivity meter was the principal instrument used. The Schlumberger electrode configuration was used in the data acquisition .The method consist of expanding AB distance between the current electrodes and potential electrodes (MN) is kept fixed. The VES curves were interpreted using IpI2Win resistivity computer inversion software. From the result of this study the survey area is mainly dominated by three layers namely the top soil, weathered basement and fresh basement .The results of the interpreted VES data showed an uneven distribution of the fresh basement with resistivity values ranging from 476Ωm to 1800000Ωm. The fresh basement is fresh granitic rock. The depth to fresh basement ranges 3.91m to 100m with an average depth of 25.13m

Keywords:

GPR012

Groundwater Contaminations by Leachates: Forensic Geophysical Investigation of some Dumpsite locations in Bida North-central, Deploying Advanced Technologies

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Abstract

Contaminated groundwater has detrimental effects on environmental sustainability, human-health, it can renders an area incapable of sustaining ecosystem, reduces the land-value and yield thereby inducing people migration. It can also lead to industrial instability, damaged Environment, Aquatic Systems and Overall Ecosystem. The research therefore, examined the extent of groundwater pollution by leachate generated from the individually investigated Five Dumpsites located at different Areas of Bida, Nort-central, Nigeria. Vertical electrical sounding (VES), an electrical method of geophysical exploration, using the Schlumberger array was applied in an attempt to check the vertical extent of the leachate penetration into the groundwater resources. Three (3) VES points at each of the five (5) dumpsites were conducted. The Field Data were interpreted using IPI2Win Software. The results revealed that the investigated areas were composed of four geo-electrical layers. The revelations also have it that Barije, Mayaki and St. John Dumpsites have not yet impacted the groundwater quality. However, Gbate and Iyaruwa Dumpsites have negatively impacted the aquifers for the two areas in which their lowest resistivity values ranged respectively (35.20 – 191.70) Ωm and (33.00 – 368. 70) Ωm. This therefore called for a further geochemical analysis to ascertain the groundwater quality status to ensure environmental sustainability.

Key Words: Leachate, Vertical Electrical Sounding, IPI2WIN, Aquifer

GPR013

Assessment Of Groundwater Quality In Kaltungo Local Government Area Of Gombe State

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ABSTRACT

Groundwater is required for the continuity of life and the sustainability of ecosystems. Hence, this research was purposed on the assessment of groundwater quality for domestic use in Kaltungo Local Government Area, Gombe State. The data was acquired using the Vertical Electrical Sounding (VES) method. Twenty (20) VES were carried out with a maximum current electrode separation of 150 m. The VES curves generated from the data reveal that all the VES points have five to six subsurface layers. The first layer has the thickness ranging from 0.8 to 7.4 m, the second layer has a thickness ranging from 2.6 to 31.4 m, the third layer has a thickness ranging from 10.3 to 77.8 m, the fourth layer has a thickness

ranging from 8.2 m to 120.0 m, the fifth layer has a thickness ranging from 8.2 to 53.7 m and the sixth layer is the layer that extends beyond the probing depth. The VES curves were generated using the data and curve type revelations were made. Six resistivity layers were identified for VES 1, VES 4, VES 7, VES 9, VES 12 and VES 18 while five resistivity layers were identified for the remaining VES. Analysis has shown that the study area has a low reflection coefficient value, and thus, could be considered for borehole development. The study also revealed that VES 4, VES 9 and VES 18 have resistivity values less than 0.5, indicating high potential for groundwater exploration.

Keywords: Aquifer, Groundwater, Resistivity Layers, Vertical Electrical Sounding

GPR014

Groundwater Potential and Aquifer Protective Capacity at Farm Estate, Nkwele-Ezunaka, Anambra State, Nigeria

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Abstract

A geophysical survey using electrical resistivity method was conducted at Nkwelle-Ezunaka in Anambra State, Nigeria to investigate the groundwater potential and aquifer protective capacity of the area. The project area lies within longitude 6°51'27'' - 6°59'37''E and latitude 6°13'18'' - 6°20'27"N, and covers an area of about 60 km2. Vertical Electrical Soundings (VES) were carried out with a digital read out resistivity meter (ABEM SAS 1000). The VES points were marked at 25 m and 75 m along a 115 m line. A total of ten soundings were carried out in the area. The VES data collected were interpreted using INTERPEX software and the results presented in terms of resistivity, thickness, depth and lithology. The lithology was inferred by correlating the result to the lithology log of one of the boreholes drilled in the study area and the geology of the study area. The VES result shows lithologic layers varying from 5 to 7. Water saturated sandstone and water saturated shaly sandstone constitute the aquifer units in the area at depth of 53.6–124.7 m, with their thickness ranging from 52–102 m as shown by their isopach map. The aquifer protective capacity was determined by calculating for longitudinal conductance and matching the values to known standards. The calculated longitudinal conductance varies from 0.00009–0.224 mhos. The interpreted VES results reveal poor aquifer protective capacity of the overburden layers.

Keywords:

GPR015

Application of frequency selection and geoelectrical sounding methods for mapping of leachate's pathways in an active dumpsite

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Abstract

Contamination of surrounding environments is one of the threats to the proper maintenance of municipal waste sites in developing nations. This study integrates natural electromagnetic (EM) field and geoelectrical sounding methods to assess the leachate's pathways in the near-surface layers and groundwater system in and around an active dumpsite. Five natural EM traverses were obtained in varying orientations using PQWT-TC 150 model. Fifteen vertical electrical sounding (VES) data points were randomly occupied using SAS 4000 ABEM resistivity meter. The two techniques revealed some intercalations of conductive and resistive media in the study area. The conductive media are composed of mixtures of leachates into clay and groundwater units, thereby creating zones of very low electrical potential differences from the surface to a depth beyond 30 m. A zone of leachate-aquifer's interphase exists between the third layer and the fourth layer. The directions of the fluid flow are in the S - N and SE - NW trends, which could be linked to the fault towards the northwestern part of the study area. The fluid dynamics, however, justified the reason for the thick conductive materials being mapped at the northwestern and northern parts of the study area.

Keywords: Geoelectrical sounding; Audio magnetotelluric field; Frequency selection method

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GPR016

Geophysical Evaluation of Groundwater Vulnerability to Landfill Activities.

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Abstract

An electrical resistivity tomography (ERT) technique was used to acquire data at a landfill extended to the ambient of the landfill to study the vertical and horizontal impact of the leachate plumes contaminant of the dumpsite and its impact on the soil and groundwater resources. Five (5) 2D were delineated with Wenner configuration using a SAS 4000 resistivity meter of 2.5m electrode spacing and 100m profile length. The resistivity values of the overburdened topsoil thickness overlaying the groundwater encountered within the dumpsite (2.7 Ωm – 24 Ωm) and off-dumpsite (45 Ωm – 812). The subsurface resistivity values of the dumpsite reflect the subsurface of the earth's tolerance and the vertical extent

of the leachate plume. It was observed that the leachate had infiltrated the soil to the water table of the dumpsite and its ambience. This implies that the ambient soil and groundwater of the dumpsite must have also migrated into the aquifer system of the terrain, thereby contaminating the groundwater. The electrical resistivity values show that the concentration of leachate plumes increases as the pollutant source distance decreases. This study mapped landfill leachate accumulated zones to depths that could have endangered the regional groundwater.

Keywords: landfill leachate, electrical resistivity, leachate plumes, groundwater.

GPRP017

An Evaluation Of Aquifer Potential And Contamination Along Ezimo - Ledge Road, Nsukka Using Electrical Resistivity Method

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Abstract

An investigation using electrical resistivity method was conducted along Ezimo – Ledge road at Nsukka, Enugu State to investigate the aquifer potential and level of groundwater contamination. A total of eight (8) Vertical Electrical Sounding (VES) and six (6) 2-D resistivity imaging were carried out with a digital read out resistivity meter (McOhm resistivity meter) to acquire data in the area and were interpreted using the Schlumberger automatic INTERPEX analysis software and the RES2DINV software respectively. A contaminant leachate plume was delineated in 2D resistivity sections as low resistivity zones while the VES shows the depth of aquifer.In2D pseudosectionswherebluish colours with low resistivities (less than 20.80Ωm) with depth ranging from 1.28m to 17.1m in the Line 1 and 2are seen as contaminated zones. The rest of the lines are not contaminated because of their high resistivities (greater than 20.80Ωm). The results of the VES was presented in terms of resistivity, thickness, depth and lithology. The lithology was inferred by correlating the result to the lithology log of one of the boreholes drilled in the study area and the geology of the study area. Aquiferous sand and Aquiferous sandy shale constitute the aquifer units in the area. The result of the survey also showed 4 - 5 layers geo-electric sections and an AA and AK type sounding curves with VES 1, 2, 3 and 4 carried out on line 1 & 2 of the wenner lines showing signs of contamination with low resistivity values less than 20.80Ωm complementing the wenner results. The contamination has not yet reached the aquifer location on the lines, since the depth to the aquifer ranges from 30.26m to 155.43m while maximum depth of contamination is 17.1m. It is believed that the leachate has not percolated down to the aquiferous zones as such aquifers are presumed to be free.

Keywords: Ezimo - Ledge Road, aquiferous zone, pseudosection, geoelectric section

GPR018

Seismic multiple events in an Onshore, Niger Delta field: A Myth or Reality

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Abstract

This study presents the existence of inter-bed multiples in an Onshore Niger Delta field. Multiples interfere with primary reflections in a manner that results in, among other factors, poor velocity model building, unclear seismic images of the subsurface, and definition of geological features that finally lead to pitfalls in interpretation. Analysis of the velocity model revealed localized anomalies and abnormal trends in the interval velocity regression due to possible multiples effects. Confirmation of existence of inter-bed multiples was established and the parabolic Radon transform algorithm attenuation technique was implemented on a seismic dataset acquired from onshore Niger Delta field in a bid to suppress multiples' presence. The events experience slower velocity and low amplitudes due to energy dissipation along the propagation paths and the separated artifact. The effectiveness of parabolic Radon transform algorithm in suppressing multiples was verified by comparing the migration models obtained before and after the application of the algorithm; which shows improved image values and clarity of plays that can be characterized in terms of amplitude variation with offset studies for optimal prospect identification and appraisal, enhanced oil recovery, and reservoir management.

Keywords:

GPR019

Geophysical And Geotechnical Assessment Of Subgrade Condition Along A Proposed University Road

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ABSTRACT

In Nigeria many roads fail immediately after construction or before their design age. Road failure has contributed to the major problems leading to the death of so many people, caused traffic hazard, accident and also increases the rate of damages on vehicles. This research work on the geophysical and geotechnical assessments of subgrade conditions along a proposed University road was carried out using Wenner Array and Dynamic Cone Penetration Test (DCPT).Wenner array was deployed at 2 m, 4 m, 6 m, 8 m and 10 m spacing on two profiles of 200 m each using Ohmega terrameter. Data obtained were analysed using

RES2DINV version 4.0. DCPT data were collected at 0 m, 50 m, 100 m, 150 m and 200 m on each profile and the callifornia bearing ratio (CBR) deduced from the data. The results revealed that the resitivity range of component units varied between 166 Ωm – 200 Ωm, 222 Ωm – 400 Ωm, 501 Ωm – 1000 Ωm and > 1000 Ωm; which geologically correspond to sandy clay, clayey sand, sand and lateritic sand respectively on profile 1 and 2. Profile one and two revealed the presence of clay, sand and gravel materials with average CBR ranging from 16.65 – 31.13 and 18.10 – 26.28 respectively. The results agreed with Wenner results which depict slightly competent layers at 0 m, moderately competent layers at 50 m and 100 m, competent layer at 150 m and slightly competent layer at 200 m and moderately competent layers between 0 m and 200 m on profile 2.

Keywords: CBR, DCPT, Lateritic sand, Ohmega terrameter, Wenner array

GPR020

Investigation of the Litho-Structure of Ilesa using High Resolution Aeromagnetic Data

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Abstract

The research investigated the arrangement of some geological features under Ilesa employing aeromagnetic data. The obtained data was subjected to various data filtering and processing techniques which are Total Horizontal Derivative (THD), Depth Continuation and Analytical Signal Amplitude using Geosoft Oasis Montaj 6.4.2 software.The Reduced to Equator –Total Magnetic Intensity (TRE-TMI) outcomes reveal significant magnetic anomalies, with high magnitude (55.1 to 155 nT) predominantly at the Northwest half of the area. Intermediate magnetic susceptibility, ranging between 6.0 to 55.1 nT dominates the eastern part, separated by depressions and uplifts. The southern part of the area exhibits a magnetic field of low intensity, ranging from -76.6 to 6.0 nT. The lineaments exhibit varying lengths ranging from 2.5 and 16.0 km. Analyzing the Rose Diagram and the analytical signal amplitude inducates structural styles mainly of E-W and NE-SW orientations, particularly evident in the western, SW and NE regions with an amplitude 0.0318nT/m. The identified faults in the area demostrate orientations of NNW-SSE, NNE-SSW and WNW-ESE, situated at depths ranging from 500 to 750 m.Considering the divergence magnetic susceptibility, structural style or orientation of the lineaments, indentified fault and their depth, these lithological features could serve as a valuable foundation for assessing ground motion, particularly in presence of sufficient seismic energy

Key words:lineament, magnetic, anomaly, fault, aeromagnetic

GPR021

Trend of Magnetic Zones for Hydrocarbon Potential Using Upward Continuation of Aeromagnetic Data: An Application to Northeastern Part of Sokoto Basin, Nigeria.

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Abstract

Analysis of high resolution aeromagnetic data was carried out to indicate the magnetic zones of northeastern part of Sokoto Basin, Nigeria for its hydrocarbon potentials. The study area is situated between longitude 50 00′00″E to 6000′00″E and latitude12030′00″N to 13030′N. Covering four (4) sheets sheet 11, sheet 12, sheet 30 and sheet 31 representing Rabah, Isa, Dange and Mafara respectively. The total magnetic intensity map covering the area was processed and filtered to obtain the residual anomaly map using regional-residual separation, upward continuation filters was applied on the residual map obtained to enhance the magnetic zones of the area for hydrocarbon potentials of the area. The result of the total magnetic map of the area indicates that the sedimentary thickness of the northeastern part of the study area and Sokoto basin in general, appears to increases from south to north. The result of the Upward continuation of the area carried out at different height revealed that high sedimentation area was seen to be concentrated at the northeastern part around Isa area and the high magnetic values which might be due to igneous rock is the predominate of southwestern part of the maps, the trend of the magnetic zone decrease from SW-NE portions of the map indicating that the northeastern part of the study area is the deepest part and is therefore expected to be the potential site for hydrocarbon accumulation.

Keywords: Geomagnetic field, upward continuation, sedimentation area, magnetic susceptibility

GPR022

Application of Geophysical Borehole Logs for the delineation of freshwater occurrence in the deep coastal Niger Delta, Nigeria

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ABSTRACT

Borehole logging remains a viable geophysical tool in determining the water quality and hydrogeological parameters of aquifers. The coastal aquifer's water is inferior in terms of quality and often beyond the potable limits especially due to the hydrocarbon exploration in the area. This research presents an empirical method of using geophysical well logs to map deep freshwater aquiferous zones. This will certainly be helpful in planning and implementation of safe and cost-effective drinking water facilities in the coastal region. The

formation stratification sequence comprises predominantly of sand and shale with intercalations of both occurring across the depth as seen from the Gamma ray (GR) logs. The Resistivity and density Logs were utilised for fluid type characterization. The hydraulic parameters were calculated by statistical modelling procedures. The viability and quality of estimated logs were also tested. The hydraulic attributes, porosity and formation factor parameters were used to characterize the quality of the delineated aquifer in the area. The formation factor showed a relatively constant signature on freshwater saturated sands. The bulk resistivity (formation and fluid resistivity) of the sand freshwater is 600 Ωm. The aquifer is of a confined type with a thickness of 17 ft and porosity of 46%.

Keywords: well logs, freshwater, coastal aquifer, hydrogeology

GPR023

An Assessment of Groundwater Vulnerability to Pollution in Akwa Ibom State Using Geoelectrical Method and DRASTIC Model

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ABSTRACT

An assessment of groundwater vulnerability to pollution was performed in Akwa Ibom State, Southern Nigeria. The aim was to locate areas where the natural environment can offer a good protection from pollution; especially from human activities. Interpreted data from 45 Vertical Electrical Soundings (VES) together with Static Water Level (SWL) from two hundred and ninety six (296) observation wells, rainfall recharge data, drilled log data from one hundred and twenty four (124) wells, soil data, topography data and pumping test data from one hundred and two (102) wells were used in the study. The data were deployed in Environmental Systems Resource Institute (ESRI) Geographic Information System (GIS) software to develop the DRASTIC thematic maps. The output of the DRASTIC thematic maps were then reclassified to develop the groundwater vulnerability map. An evaluation of the DRASTIC indices showed that the sandy aquifers around Mbo, Oron, Nsit Ibom and Ikot Abasi have very high vulnerability to pollution and require immediate attention. Highly vulnerable aquifers were also found around Eket. Moderate and low vulnerable aquifers were found mainly inland in areas around Ika, Ikot Ekpene, Ikono and Ini. The DRASTIC model was subjected to validation within the study area using nitrate pollution rate and the rate of validity of the model reached over 70% within the area of study. A major implication of this study is that land use in vulnerable areas should be regulated to avoid pollution of the aquifers as remediation is difficult once groundwater is polluted.

Keywords: DRASTIC, Groundwater, Mapping, Pollution, Vulnerability,

GPR024

Geophysical interpretation of aeromagnetic data over part of bornu(Chad) basin Nigeria.

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ABSTRACT

The Aeromagnetic data over part of Bornu (Chad) Basin NE was interpreted using analytic Signal, first vertical derivative, second vertical derivative. The area is covered with Latitude 12ON to 13ON and Longitude 12OE to 13OE with an estimated total area of 12, 100 km2. The result of analytic signal shows that the study area comprises of both high and low amplitude anomalies.The high amplitude anomaly trends NE-SW while the low amplitude anomaly trends NW-SE. Similarly, the result of first vertical derivative reveals the anomaly texture of the total magnetic intensity and the major magnetic features found on the study area aligned NE-SW while the result of the second vertical derivative shows the sizes and number of anomalies found in the study area. The second vertical derivative map agrees with the trending of structures like fault found on the first vertical derivative map. Faults and structures delineated through the analytic signal, first vertical derivative and second vertical derivative were in agreement and economy mineral present in the area may be confined along the faults and structures identified. The result of source parameter imaging (SPI) shows a minimum sedimentary thickness of 1.91 km and maximum sedimentary thickness of 3.20 km. The minimum sedimentary thickness could be found around North- Western part of the study area while the maximum sedimentary thickness could also be found around Southeastern part of the study area (Gubio). The result from the spectral analysis shows a sedimentary thickness that ranges between 1.54 km and 3.35 km. The results from both source parameter imaging and spectral analysis were in agreement and showed a maximum sedimentary thickness of over 3 km around the Southeastern part of the study area. The maximum sedimentary thickness of 3.35 km may be sufficient for hydrocarbon development.

KEYWORDS: magnetic data, Fractures, faults, Gubio, structures and lineaments

GPR025

Title: Integrated Geophysical and Remote Sensing Methods for Hydrocarbon Prospectivity within the Eastern part of Bornu Basin, Nigeria.

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Abstract

Geophysical and remote sensing analyses were conducted to map magnetic anomaly data using Tilt Angled Derivative (TDR), standard 3D-Euler Deconvolution (ED) techniques, Landsat Imagery, and Source Parameter Imaging Techniques. This investigation aimed to characterize subsurface structures and depth to magnetic sources with the potential to identify hydrocarbon prospectivity. The results revealed distinct lineaments and faults originating from both deep and shallow sources. The composite structural map delineated well-formed traps in Masu, Gubio, Mongonu, Maiduguri, and Bama areas, indicating viable migration pathways for hydrocarbons. The structural mapping identified six trends of subsurface faults aligned along NNE-SSW, NE–SW, ENE–WSW, E–W, WNW–ESE, and NW-SE directions. Predominant tectonic deformations exhibited E-W, ENE-WNW, NE-SW, and NW-SE trends. The prospectivity map of the study area, produced using the Analytical Hierarchy Process (AHP), shows the regions of prospective hydrocarbon. 2D modeled profiles illustrated prospective areas displaying undulating sub-basins characterized by horsts and grabens structures. Basement depth values ranging from 1.4 km to 7.9 km indicated structurally controlled sub-basins with thermally matured sediments, suggesting the potential for hydrocarbon generation.

Keyword: Trend Analysis, 3D-Euler, TDR, SPI, Lineament, and Hydrocarbon

GPR026

An Assessment of Groundwater Vulnerability to Pollution in Akwa Ibom State Using Geoelectrical Method and DRASTIC Model

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ABSTRACT

An assessment of groundwater vulnerability to pollution was performed in Akwa Ibom State, Southern Nigeria. The aim was to locate areas where the natural environment can offer a good protection from pollution; especially from human activities. Interpreted data from 45 Vertical Electrical Soundings (VES) together with Static Water Level (SWL) from two hundred and ninety six (296) observation wells, rainfall recharge data, drilled log data from one hundred and twenty four (124) wells, soil data, topography data and pumping test data from one hundred and two (102) wells were used in the study. The data were deployed in Environmental Systems Resource Institute (ESRI) Geographic Information System (GIS) software to develop the DRASTIC thematic maps. The output of the DRASTIC thematic maps were then reclassified to develop the groundwater vulnerability map. An evaluation of the DRASTIC indices showed that the sandy aquifers around Mbo, Oron, Nsit Ibom and Ikot Abasi have very high vulnerability to pollution and require immediate attention. Highly vulnerable aquifers were also found around Eket. Moderate and low vulnerable aquifers were found mainly inland in areas around Ika, Ikot Ekpene, Ikono and Ini. The DRASTIC model was subjected to validation within the study area using nitrate pollution rate and the rate of validity of the model reached over 70% within the area of study. A major implication of this study is that land use in vulnerable areas should be regulated to avoid pollution of the aquifers as remediation is difficult once groundwater is polluted.

Keywords: DRASTIC, Groundwater, Mapping, Pollution, Vulnerability,

GPR027

Integration of rock physics and seismic attributes for reservoir characterization of Jose field in Niger Delta Basin

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Abstract

Integration of the rock physics properties and seismic attributes was carried out in Jose field, Niger Delta. The aim of this study is to characterize the reservoirs in Jose field based on petrophysical parameters evaluation, seismic attributes and rock physics analyses as well as identification of new prospect(s) for drilling. Three dimensional seismic data and four well log data were obtained for the study. Reservoirs were identified and correlated using the well log data to obtain petrophysical parameters. Seismic attributes were extracted from structural maps to identify areas of hydrocarbon prospectivities. Rock physics parameters were crossplotted to evaluate and distinguish the lithology, fluid type and zone type. Reservoirs A, B and C were identified across four wells. The reservoir's porosity, volume of shale, water saturation and hydrocarbon saturation varied from 7 to 21%, 27 to 52%, 43 to 83% and 17 to 58%, respectively. The RMS, average energy and interval average attribute maps showed excellent reflections within structural high region, depicting sweet spots with hydrocarbon accumulations. The crossplots of density against gamma ray and poisson ratio against acoustic impedance revealed that the reservoirs are intercalated with sands and shale. The crossplots of Vp/Vs against density distinguished sand A and sand C into gas, oil, brine and shale zones. Three new prospects, namely AW, SR and XY, with possibilities of notable oil and gas in place, were identified on the attributes. The area and volume of the identified prospects are: 378750.00, 756250.00, 946250.00 m2 and 27409590, 41342403, 53227044 m3, respectively.

Keywords: Reservoir characterization, Rock physics, Seismic attributes

GPR028

Application Of Seismic Refraction Tomography To Proffer Solution To Building Collapse In Amawbia And Its Environs, South East, Nigeria.

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Abstract

Geophysical method of seismic refraction tomography to evaluate the allowable bearing pressure Amawbia and its environs, South East, Nigeria with the aim to proffer solution to building collapse was used in this study. A 24- channel seismograph with its accessories were used to acquire data. A total of four profiles were conducted within the area. The interpretation of data was done in order to determine the velocities of the various layers using a software called Reflex w. The interpretation of data revealed that in all the areas, three seismic velocities layers were delineated. The first layer has velocity that ranged between 536 m/sand 854 m/s, the second layer has a P-wave velocity ranged between 699 m/s and 1398 m/s while the P-wave velocity of the last layer ranged between 944 m/s and 2214 m/s. The velocities obtained from the interpretation of the data were used to determine the allowable bearing pressure.The allowable bearing pressure of the first layer ranged between 136 N/m2 and 156 N/m2, the second layer ranged between 190 N/m2 and 286 N/m2 while the allowable bearing pressure of the last layer ranged between 275 N/m2 and 442 N/m2 respectively. Finally, the results revealed that high rise building in this area is recommended to be founded in the second layer.

Key words : Geophones, Seismograph, P-waves and S-waves

GPR029

Delineation of Aquifer Storage Capacity as Parts of Water Sustainability for Farming Activities

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Abstract

Abstract: Developing aquifers as part efforts towards groundwater sustainability is a tactical approach applicable to meeting water management objectives. Delineation of aquifer storage capacity (ASC) and recovering system (ARS) is a good approach in attempt to increase water supply. Due to site-specific needs and demands, ASC and ARS plays an all-important roles for water sustainability.This work presents limited methods of determine ASC and evaluation of a local ARS that can also be applicable regional scales using fifteen (15) VES points. The paper also discussed the basic factors that influenced and controlled ARS at local scales. It was determined that over 88% of locations evaluated are suitable for situate productive boreholes to sustain any demand of farming activities arising from the study area and activities within a 1.2 km radius of the terrain. The ASC of the study area was estimated to be 26,690 m^3 within the space of 800 m^2. This implies that the boreholes site within the region can supply thousands of litres per day.

Keywords: Aquifer storage capacity, water sustainability, water management planning, local scales

GPR030

Delineating Linear Structures around the Pb-Zn Mining Sites in the Lower Benue Trough through Aeromagnetic Data

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Abstract

The lower Benue Trough is known for its untapped mineral resources and significant exploration achievements. Due to its large area, only a few places have been studied leaving most of its part largely underexplored, thus deserve further exploration. Aeromagnetic data was used to investigate the mineralization of the Pb-Zn in the lower Benue Trough. Several techniques were adopted on the aeromagnetic data to achieve the objective of delineating the linear structures within the lower Benue Trough and determining the depth of the structures. The NE trending lineament which is a representative of faults/folds is believed to have served as a conduit for the transport of the ore fluids. The depth of this lineament ranges from 3.5 to 8 km. It is also evident that folding contributes to the emplacement of the mineralization as the mining sites are located within folds.

Keywords: linear structures, Lower Benue Trough, Pb-Zn, aeromagnetic data

GPR031

Integrated Geophysical and Remote Sensing Methods for Hydrocarbon Prospectivity within the Eastern part of Bornu Basin, Nigeria.

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Abstract

Geophysical and remote sensing analyses were conducted to map magnetic anomaly data using Tilt Angled Derivative (TDR), standard 3D-Euler Deconvolution (ED) techniques, Landsat Imagery, and Source Parameter Imaging Techniques. This investigation aimed to characterize subsurface structures and depth to magnetic sources with the potential to identify hydrocarbon prospectivity. The results revealed distinct lineaments and faults originating from both deep and shallow sources. The composite structural map delineated well-formed traps in Masu, Gubio, Mongonu, Maiduguri, and Bama areas, indicating viable migration pathways for hydrocarbons. The structural mapping identified six trends of subsurface faults aligned along NNE-SSW, NE–SW, ENE–WSW, E–W, WNW–ESE, and NW-SE directions. Predominant tectonic deformations exhibited E-W, ENE-WNW, NE-SW, and NW-SE trends. The prospectivity map of the study area, produced using the Analytical Hierarchy Process (AHP), shows the regions of prospective hydrocarbon. 2D modeled profiles

illustrated prospective areas displaying undulating sub-basins characterized by horsts and grabens structures. Basement depth values ranging from 1.4 km to 7.9 km indicated structurally controlled sub-basins with thermally matured sediments, suggesting the potential for hydrocarbon generation.

Keyword: Trend Analysis, 3D-Euler, TDR, SPI, Lineament, and Hydrocarbon

GPR032

The Success Of Satellite Gravimetry In Geophysical Investigations

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ABSTRACT

Terrestrial measurements of gravity data are limited to only accessible areas. Areas that are not easily accessible due to lack of access route, security, cost etc. are found unfavorable for terrestrial measurements. These among others lead to the development of satellites to fill those gaps. Satellites have been used for data acquisition for years and have recorded a great success in numerous ways. This paper presents the principle of operation of such satellites. The successful geophysical researches carried out using satellite acquired gravity data from existing literature were also discussed. The researches applied the satellite gravity data for numerous applications notably ground water survey, hydrology, geothermal survey, Mineral and hydrocarbon explorations, lithological characterization (Edge/boundary detection, depth estimation), Modelling of magma chamber, volcanic subsurface survey, characterization of upper atmospheric density etc. Satellite gravity survey is found to be very essential and relatively more advantageous compared to terrestrial survey because the human effort in data acquisition is less, it has wider coverage in small time, access to places that cannot be accessed on ground. It is therefore recommended that the functions of the satellites should be further expanded using new innovations like machine learning and artificial intelligence in order to increase efficiency.

Keywords: Satellites, Gravity method, Geophysics, Gramimetry, Earth characterization

GPR033

Application of VES and physicochemical analysis for the evaluation of dissolved minerals in the quaternary aquifers of part of Bayelsa State, Nigeria

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ABSTRACT

An attempt has been made in this study to correlatethe concentration of dissolved minerals, using VES data andphysicochemical analysis of ground water samples, in parts of Bayelsa state, south-south of Nigeria. The VES data was obtained for ten stations and interpreted usingIPI2WIN and Interpex (IX1D) software. The physicochemical characteristics of water samples, collected from drilled boreholes in the area investigated, were analyzed for some physical and chemical constituents including EC, pH, TDS, Na, K, Ca, Mg, Fe, Cl, SO, NO, and HCO. The results from the VES interpretation presented geoelectric curves of three to five geoelectric layers. Four distinct sounding curve types (H, HK, K and KH) were identified; with the H and K type curves being dominant. The dominant curve types show that the area has two main hydrologic regimes (of low and high Iron (Fe) concentration). The results show that in VES stations with K-type curve, the stratigraphy consists of top layer resistivity and thickness ranging from 10 to 53.13 Ωm and 0.3 to 0.86 m respectively, the second layer resistivity and thickness ranges from 29.5 to 770.9 Ωm and 0.419 to 2.709m respectively; the thickness and resistivity of the third layer ranges from 3.62 to 97.52 Ωm and 1.35 to 36.79 m respectively. The fourth layers, identified as the aquifer layer, have resistivity values ranging from 51.6 to 11229 Ωm. At H-type curve locations, the stratigraphy consists of the top soil (resistivity and thickness ranging from 29.5 to 770.9 Ωm and 0.419 to 2.709 m), clay layer (thickness and resistivity ranges of 2.06 to 16.56 m and 33 to 81.94 Ωm), Sand which is identified as the aquifer has resistivity and thickness, ranging from 557.1 to 10328 Ωm and 8.85 to 14.78 m. Physicochemical analysis was achieved using the standard APHA methods and compared with WHO standard. The results showed that the concentrations of the chemical constituents varied spatially in the study area. The analysis revealed that 90% of the mean concentration of measured parameters were within the WHO's standard in all the samples, with the exception of Mn (with a value of 0.532 mg/L) and Fe2+ (with a value of 0.88 mg/L) which was seen to be high in five of the boreholes in locations with H-type curves. The pH values ranged from 5.73 – 6.62, suggesting that the water is slightly acidic. The dominant hydrochemical facies are Ca-Mg and SO4-Cl which indicates permanent hardness in most of the samples. Rock weathering was identified as the major agent of groundwater contamination within the area; this is attributed to chemical reactions involving evaporation and crystallization of these dissolved minerals in the aquifer. The high Mn and Fe concentrations in the groundwater of some of the locations, makes the water unsuitable for drinking and may require treatment.

Key words: Hydrochemical, Crystallization, Lithologic and Geoelectric

GPR034

Structural Characterization Of High Resolution Aeromagnetic Data Over Parts Of The Federal Capital Territory,North-Central Nigeria.

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Abstract

The IGRF corrected aeromagnetic data over some parts of North-Central Basement Complex of the Federal Capital Territory Abuja, Nigeria was acquired from the Geological Survey Agency of Nigeria and analysed using the Oasis Montaj software, with the aim of determining the structural trends and depths to magnetic basement rocks within the study area located within latitude 8o45'0''N-9o10'0''N and longitude 6o50'0''E- 7o15'0''E covering six (6) aeromagnetic data sheets which were digitized and knitted to produce a merged aeromagnetic data file for the study area. The result of the 3-D Euler Deconvolution at Strutural Index 1 (SI=1) revealed depth solutions that are categorized into four: the ones below 200m, those between 216.8m and 379.7m, those between 393.5m and 604.8m and those above 604.8m. The analysis revealed structures around Tunga, Paiko, Nikuchi and Chehegi in the northwestern part of the study area to have shallow depth and these structures trend southward extending to Kwali. These shallow seated structures are also noticeable around Pai and south of Gao in the central region and around Tagwai in the eastern part of the study area.

Keywords: aeromagnetic, structures, trend, basement

GPR035

Aeroradiometric Data Analysis For Hydrothermal Alteration Zones Delineation Around The Federal Capital Territory, Abuja, North-Central Nigeria.

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Abstract

In this study, the airborne radiometric data over FCT, Abuja and Environs, were acquired, processed and knitted to generate the concentration maps of percentage Potassium, equivalent Thorium and equivalent Uranium in order to carry out the geologic mapping of the area aimed at delineating hydrothermal alteration zones within the study area bounded by latitude 8o45'0''N - 9o10'0''N and longitude 6o50'0''E-7o15'0''E. The ternary image and the abundance ratios of the three radioactive elements (U/Th, U/K, and Th/K) were also generated. The potassium (%K) map shows different degrees of concentrations starting from

0.12 to 4.37 % which reveals different rock units. The %K/eTh values range from 0.01%ppm to 0.38%ppm revealing the hydrothermally altered zones to be regions with K/Th ratio values above 0.17%ppm. The delineated geology and hydrothermally altered zones led to the identification of zones with potentials gold mineralization.

Keywords: hydrothermal, radiometric, alteration mapping

GPR036

Evaluation of Aquifer potential and protective capacity in parts of Bayelsa state, southern Nigeria.

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Abstract

Electrical resistivity (ER) technique consisting of vertical electrical sounding (VES) with the Schlumberger electrode array was employed to investigate the aquifer potential as well as the aquifer protective capacity of central Bayelsa state in sourthern Nigeria. VES survey was carried out in Fifty locations using the Abem Terrameter SAS 1000, and its accessories for the acquisition of the field data, while the IPI2Win and IX1D software were employed for the filtering and modelling of the acquired field data. The modelled and interpreted data resulted in considerable varying VES curve types, which were grouped into five categories. The five representative curve types were, the H (or HA), K, HK, KH, and KHK curve types. The occurrence frequencies of the curve types indicates that, the H (or HA) curve type is most predominant in the study area, accounting for over 75% of the curve type combinations, this is followed by the H - curve type, which has a percentage occurrence of 46%; and then followed by the K- curve type, which has a percentage occurrence of 20%. The HK - and KH – curve types then followed with an equal amount of percentage occurrence of 16%; and lastly the KHK - curve type, occurring only once with an occurrence frequency of 2%. It is therefore very obvious that, the H – Curve type is basically the predominant curve type, in the study area. The Longitudinal conductance values obtained, ranged between 0.029 – 0.574 Ω-m (with an average of 0.210 Ω-m). The aquifers of the study area, were classified into poor, weak, and moderate protective capacity zones; with the three zones having protective capacities of < 0.1 Ω-m, 0.1 - 0.2 Ω-m, and 0.2 – 0.7 Ω-m respectively.Six locations were rated poor protective capacity zones; two locations, were rated weak protective capacity zones while six locations, were rated as moderate protective capacity zones

Keywords:.

GPR037

Exploration Of New Oil/Gas Fields In Niger Delta Region For National Economic Sustenance

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ABSTACT

The oil and gas industry has been the major source of revenue for our country Nigeria, and has contributed a lot to the development of infrastructure, capital and human resources. This sector fetches the majority of the country's export earnings, accounts for more the majority of government revenue and contributes a lot to the National Gross Domestic Product. But recently this sector is shrinking, resulting in the economic crises that Nigeria is currently facing, while we neglect the other economic drivers like agriculture and Manufacturing. Since the Niger Delta is the Hall of fame for Oil and Gas in Nigeria and generates these economic benefits, it is therefore the focus of this paper to scientifically propose an avenue to increase and improve the contribution of the Oil and Gas sector to the national economy by exploring new oil/gas fields in the Niger Delta Region, through the identification and classification of structural features relating to hydrocarbon deposits in the area using new techniques in geophysical survey.

KEYWORDS:Magnetic survey, Niger Delta, Basement structures,Oil /gas

GPR038

Determination of Radiogenic Heat Potential of Dong and Numan area, Upper Benue Trough, Nigeria UsingAeroradiometric Data

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Abstract

The airborne radiometric data of Dong and Numan area Upper Benue Trough Nigeria have been interpreted qualitatively and quantitatively. The study area lies within longitude 11.5o to 12.5o East and latitude 9.0o to 9.5o North.The two data sheet were merged and gridded to produce the Uranium Concentration,Thorium Concentration , Potassium Concentrationand Totalcount maps of the study area. The radiogenic heat analysis was employed in the quantitative interpretation in order to determine zones for potential radiogenic heat. The radiogenic heat production (RHP) value ranges from 1.643 -3.023 $\mu W m^{-3}$ with an average value of 2.122 $\mu W m^{-3}$. The minimum RHP value of 1.643 $\mu W m^{-3}$ is observed around northeastern Dong area while the maximum RHP value of 3.023 $\mu W m^{-3}$ is observed around southeastern Numan area. The SW Dong and SE Numan area with

radiogenic heat flow value above 2.25 $\mu W m^{-3}$ are feasible for radiogenic heat exploration for the generation of electricity

Keywords: Radiogenic heat, aeroradiometric, Uranium, Thorium, Potassium

GPR039

Investigation Of The Transfer Influence And Health Threat From The Intake Of Maize And Exposure To Soil In Different Geological Formations In Akwa Ibom State, Nigeria

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ABSTRACT

The consumption of maize influenced by radionuclides may pose certain health challenges to the body. This research was conducted to investigate the possible danger radionuclides could cause. Soil and maize samples were obtained from different geological formations. They were analyzed using a Sodium Iodide-Thalium (NaI(TI)) detector. The activity concentration results from the soil samples show the highest values of 238U, 232Th and 40K as 14.74±0.26 Bqkg-1, 40.34±0.73 Bqkg-1 and 444.89±8.12 Bqkg-1 respectively which correspond to Ogwashi-Asaba, Ogwashi-Asaba and Imo shale geological formations. The findings from maize samples indicate the maximum values of 238U, 232Th and 40K as 16.46±0.25 Bqkg-1, 18.12±0.46 Bqkg-1 and 435.17±7.89 Bqkg-1 respectively which correspond to Benin, Ogwashi-Asaba and Ogwashi-Asaba geological formations. The outcome of mean transfer factor of 238U, 232Th and 40K corresponds to 0.942, 0.460 and 1.002. The absorbed dose rate ranges from 28.91 nGyh-1 to 36.08 nGyh-1. Radium equivalent varies from 49.40 Bqkg-1 to 98.75 Bqkg-1. Almost equal value (0.15×10-3) was assessed for the mean excess lifetime cancer risk. Although the activity concentration noted from maize is high, the evidence obtained shows that there is no geological formation with health risk problem as the external, internal and radioactivity hazard indices are less than unity.

KEYWORDS: Transfer Influence, Health Threat, Maize, Radionucli

GPR040

Geophysical Investigation Of Groundwater Within Nnamdi Azikiwe University, Awka, And Environ Using Electrical Resistivity Method

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ABSTRACT

Using vertical electrical sounding (VES) of the electrical resistivity method, the aquifer potential, electrical variations of lithologic units, and Dar-Karouk (D-Z) parameters that are present in the study area, a hydro-geophysical investigation was conducted within and around Nnamdi Azikiwe University in Awka, Anambra State, Nigeria. Latitude 6^0 12' N to 6^0 17' N and Longitude 7^0 5'E to 7^0 10'E define the boundaries of this study area. This research was carried out due to the difficulty associated with accessing underground water in the area, as the precise depths of the aquifer are still very unknown. Hence, this study is significant. Twelve (12) VES Stations were acquired using the Schlumberger Array. The data was interpreted using MS Excel and Interpex. This work reveals that the study area has 3-5 geo-electric layers, indicating the predominance of Shale, an impermeable layer with an appreciable amount of Sandstone. The depth and thickness of the aquiferous units were unknown since the base of some geo-electric layers was not reached with an average resistivity of 1460.95 ohm-m. Hydraulic conductivity was evaluated with values ranging from 0.0015-0.0114m/day and Transmissivity ranging from 0.0222-0.7066m^2/day, indicating the aquiferous geo-electric layers' very low to negligible potentiality. A drilled borehole was used to understand the relationship between the geo-electric layers and the Water table. Based on the hydro-geophysical investigation results, confined aquifers (artesian wells) can yield water to the immediate environs at a sufficient rate.

Keywords: Groundwater, Aquifer, Resistivity, Awka.

GPR041

Seismic Background Noise Evaluation At Saki Seismic Station, Oyo State, Nigeria.

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ABSTRACT

Measures have been taken to densify the seismic monitoring stations in Nigeria to enhance and supplement the monitoring and recording capacities of the current monitoring stations in the nation since local earth tremors are becoming more frequent. A comprehensive background noise analysis is advised to achieve peak performance and enhance comprehension of the new station's representative seismic signal. This study aims to determine the background noise for the recently installed seismic station at Saki in Oyo State to ensure the dependability of the data. Using a MATLAB package, PQL, and Seisan software, the approach continually gathers streaming data from the station and processes it to determine and identify the appropriate background noise. The Fast Fourier Transform converted the time series into the frequency domain. The noise recordings on the three components of the Saki seismic station indicating the vertical (Z), horizontal (E), and northing (N) were taken, and observation suggests a good station with low background noise. The enlarged noise trace shows raw waveform already de-trended and demeaned. The minimum and maximum amplitudes of the waveform and the number of counts indicate a low background noise. The geology and location of the Saki seismic station may have contributed to the station's low-level and consistent background noise. The findings will direct comprehension of the potential background noise for the following data processing obtained from the stations.

Keywords: Nigeria, Earthquakes, Saki Seismic Stations, Seismic Background noise.

GPR042

Deduction Of Groundwater Potential From Geo-Electric Data In Sardauna Memorial College Kaduna, North-Western Nigeria

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ABSTRACT

Vertical Electrical Sounding (VES) employing the Schlumberger Electrode configuration was used to provide information about the subsurface lithology with the aim of evaluating its groundwater potential. A total of 25 VES was made along the five profiles with five sounding station per profile within an area of about 10000M2. The result of the interpretation VES data were used to produce the coefficient of reflection and longitudinal conductance map. The VES curves were interpreted using ipi2win resistivity computer software and the iso-maps of the coefficient of reflection and longitudinal conductance was produced using surfer11 software. The survey area is dominated by a maximum of four layers, namely, top soil, weathered basement, fracture basement and fresh basement. The result of the interpreted VES data showed that the excellent part of the water bearing zone (aquifer) was found to be located around the south-west of the study area because of the positive correlation between the two maps produced

KEY WORDS : Aquifer, Geo-electric, co-efficient of reflection, and longitudinal conductance.

GPR043

Aeromagnetic analysis of sheet 186 Abuja and Environs of FCT

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ABSTRACT

A geophysical study over Mpape-Abuja and environs of FCT using high resolution aeromagnetic survey map sheet 186 was subjected to Analytic signal, Tilt and General Derivatives filtering processes in order to interpret quantitatively using Spectral Depth Analysis and Source Parameter Imaging (SPI). The Residual/Regional separations was carried out using polynomial filtering with order one. The Total Magnetic Intensity (TMI) map and the Residual Magnetic Intensity map showed variations of high and lows in magnetic signature varying from 32887.5nT - 33105.6nT and -112.4nT to 101.5nT respectively. The Residual map was subdivided into 16 overlapping square grid for Spectral depth analysis. The result from the Spectral analysis shows depth to deeper sources varying from 0.537km to 1.72km, depth to intermediate sources ranges from 0. 256km to 0.498km while shallow sources vary between 0.181km and 0.453km. The average depth to magnetic bodies obtained from the Source Parameter Imaging was 1.583km; hence, characterizing the study area as a typical Basement complex. Magnetic amplitudes 0.005 to 0.424 susceptibilities from analytic signal and Tilt Derivative of 1.3 to 1.4nT/m reveals moderate magnetic anomalies that depict the presence of limited fault and fracture in the NE – SW direction that can possibly host some rock minerals like granite, schist, lime stones, sand stones, shale and clay spread across the study area.

Keywords: Geophysical, aeromagnetic, map, spectral, basement, depth.

GPR044

Hydrogeological Mapping Of A Section Of Janruwa Kamanzo Kaduna State.

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ABSTRACT

Vertical Electrical Sounding (VES) method of Electrical Resistivity was carried out at a section of Janruwa-Kamanzo, Kaduna metropolis, using the Schlumberger array, with

maximum electrode separation, AB/2 of 100m on 20 VES stations, having 20m offsets to each other. The survey was carried out with the aim of obtaining information on the subsurface condition, which can be of great assistance in underground water exploitation. From the interpreted data, geoelectric and geologic sections and indeed some specialized maps were produced. It is suggestive that the area is underlain by three to five layers. The first layer also known as topsoil varies from 0.3 m – 4.7 m in thickness and 63 Ωm – 1601 Ωm in resistivity. This geoelectric derived suggests that the topsoil is highly lateritic in nature. The weathered/fractured basement varies from 73 Ωm – 639 Ωm and 3.9 m – 58 m respectively. The derived geologic suggests that the weathered layer varies in composition (silty/sandy clay, clay and sand) with an average resistivity and thickness values of 305 Ωm and 17 m respectively. The last layer, which is at infinite thickness, is found to have high resistivity values ranging from 555 Ωm to 3333 Ωm. The observed regions of low resistivity in this layer suggest that the basement rocks may have under fracture and slightly weathered. The observed relatively high resistivity zones range from 73 Ωm – 639 Ωm with average aquifer thickness of 32m suggests high aquifer potential zone targets for siting boreholes.

Keywords: Hydrogeology, Resistivity, geology, aquifer, fractured basement

GPR045

The Use Of Remotely Sensed Electromagnetic Radiation To Analyze Soil Salinity In Nembe Creek, Bayelsa State, South-South Nigeria

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ABSTRACT

The Niger Delta region, long plagued by environmental degradation, witnessed a significant oil spillage event years ago, exacerbating the already precarious ecological balance. Immediate remedial measures were lacking, resulting in the seepage of oil into the soil, leading to heightened soil salinity levels across various regions, notably impacting the Nembe Creek Local Government Area (LGA) in Bayelsa State, Nigeria. This study employs advanced techniques of remote sensing, utilizing Landsat-8 Operational Land Imager (OLI) thermal infrared satellite data to discern and quantify the Normalized Difference Soil-salinity Index (NDSI) in Nembe creek LGA from 2016 to 2023. The dataset encompasses both dry and wet seasons for each year, meticulously processed using ArcGIS 10.7.1 software. Analysis of the results reveals a troubling trend of persistent high soil salinity levels, with over 80% of Nembe Creek LGA remaining afflicted by elevated salinity by 2023. This study offers crucial insights into the long-term ecological repercussions of oil spillage in the Niger Delta, emphasizing the imperative for sustainable land management practices and highlighting the unsuitability of vast stretches of Nembe Creek for agricultural endeavours.

Keywords: seepage, remote sensing, ArcGIS, dataset

GPR046

Evaluation of Hydro Chemical Characteristics of Ground Water Quality in Ugwuaji and its Environs in Enugu, Southern Eastern Nigeria

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ABSTRACT

A hydrogeological study was conducted at Ugwuaji and environs in Enugu South Local Government Area of Enugu state was carried out to ascertain the hydro chemical constituent of groundwater and determine the quality for drinking and agricultural purposes. The study area lies between latitudes 6°22'N and 6°26'N and longitudes 7°32'E and 7°36'E with an area extent of about 81 sqkm.. Hydrochemical analysis of 10 selected water samples for cation and anion have been carried out. The result of the hydrochemical analysis showed that the concentration of nitrate ranges from 12.84-150.13mg/l, sulphate from 78.94-90mg/l, potassium from 5.22-8.73mg/l, magnesium from 0.54-1.23mg/l and sodium from 1.47-3.60. The high concentration of these ions, nitrate, sulphate, potassium, magnesium, sodium in some areas indicated contamination of ground water in the study area when compared with World Health Organization standards for drinking water. There is no sanitary landfill in the area. More so, downward flow of leachates from the Ugwuaji landfill contributes heavily to the ground water pollution. Solid waste has been identified as constituting a lot of problems to both the people and the environment.

Keywords: Hydro chemical, Groundwater, Ugwuaji, Quality.

GPR047

Two-dimensional fast imaging of VES data based on U-net

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Abstract

As an efficient geophysical exploration tool, the airborne vertical electrical sounding (VES) method has been widely used in groundwater exploration, geological mapping, etc. Recently, the imaging and 1D inversions are the mainstream means for VES interpretation as the amount of VES data is huge and 2D and 3D inversions are not so efficient. This study

proposes a 2D fast imaging method for frequency-domain VES data based on U-net network. The U-net is a symmetric full-convolution neural network, in which the partial pooling operation between the convolution layers is replaced by the up-sampling operation, while the target location is achieved by skipping connection. This method does not need to consider the complex coupling between the VES responses and underground structures, but instead it establishes a mapping relationship between VES responses and the EM model and can quickly achieve accurate imaging of VES data. The study uses this network to image both synthetic and field survey data and compare the results with the traditional inversion algorithms. The results show that the U-net imaging has high resolution at high speed that provides a new way for interpreting large amounts of VES data.

Keywords:

GPR048

Geothermal Energy Evaluation of the Lower Benue Trough Using Spectral Analysis of Aeromagnetic Data

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Abstract

The geothermal energy resource potential of the Lower Benue Trough (LBT) in Nigeria was evaluated in this study using spectral analysis of high-resolution aeromagnetic (HRAM) data. The reduced to the equator aeromagnetic data was divided into sixteen (16) overlapping blocks, and each of the blocks was analyzed to obtain the radial averaged power spectrum which enabled the computation of the top and centroid depths to magnetic sources. The values were then used to assess the Curie Point depth (CPD), geothermal gradients, and heat flow variations in the study area. Results showed that CPD varies from 7.03 to 18.23 km, with an average of 12.26 km; geothermal gradient values vary between 31.82 and 82.50 °C/km, with an average of 51.21 °C/km, while heat flow variations range from 79.54 to 206.26 mW/m2, with an average of 128.02 mW/m2. Shallow CPD zones that run from the eastern through the western and southwestern parts of the study area correspond to zones of high geothermal gradient values and high subsurface heat flow distributions. These areas signify zones associated with anomalous subsurface thermal conditions and are therefore recommended for detailed geothermal energy exploration studies.

Keywords: Geothermal energy, Curie-point depth, Geothermal gradient, Heat flow, Aeromagnetic data, LBT

GPR049

Integrated Geochemical and Geophysical Survey of Hydrocarbon Contaminated Site in Okpare-Olomu, Delta State, Nigeria

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ABSTRACT

How well hydrocarbon can be distinguished in an oil spill site near Okpare-Olomu in Ughelli South, Delta State, using geochemical and geophysical techniques. A 200m traverse of the Wenner Array was utilized to collect data and from the inversion, 3D model resistivity images were produced and displayed in horizontal depth slices. In addition, samples of well water were collected to determine the total petroleum hydrocarbon (TPHC) content, and samples of the local soil were collected to determine the porosity and coefficient of permeability. The results of the location's 3D horizontal depth slices show that Okpare-Olomu is impacted with hydrocarbon plume down to 31.7m. The water analysis's TPHC content indicates that hydrocarbons are affecting the wells surrounding the suspected zones. The results of the soil sample porosity (Φ)and coefficient of permeability (k)tests in the lab indicate thatthe soil is sand/silt filled, which permits the PHC plume to the groundwater and soil in the research area. The study's conclusions demonstrate that the soil is porous and permeable, allowing spills to percolate through the soil into the groundwater. The 3D study showed that thePHCswas present up to a depth of 33.7m, although it became more noticeable at a depth of 10m, indicating the presenceof PHCsin thewells. The geochemical analysis validated the validity of the study's methodology by demonstrating identical outcome to the 3D analysis.

Keywords:

GPR050

Seismic Site Characterization Using Active Multichannel Analysis Of Surface Wave: A Case Study Of Kano-Maradi Rail Line Construction

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Abstract

Based on average $V_{S_{30}}$ values. Variations in overburden thickness were observed along the proposed rail line, with depths A seismic site characterization study was conducted in the Gaya-Wudil segment of the proposed Kano-Maradi rail line in Northwestern Nigeria to assess geotechnical conditions. The study area, predominantly comprised of Pre-Cambrian porphyritic granite, revealed three distinct weathering profiles observed in borrow pits. These profiles include highly weathered, moderately weathered, and slightly weathered

granite horizons, with a lateritic layer capping the highly weathered horizon. Utilizing the 2D multichannel analysis of surface wave (MASW) seismic method, surveys were conducted across all 12 profiles along the proposed rail line. Data acquisition employed a 24-channel ABEM Terraloc Pro with 10 Hz vertical geophones spaced at 2 m intervals and a constant offset of 5 m. Shear wave velocity derived from the MASW surveys facilitated seismic site characterization, focusing on shear wave velocity up to 30 m depth ($V_{s_{30}}$). Additionally, average $V_{s_{30}}$ classifications were determined in accordance with the National Earthquake Hazard Reduction Program (NEHRP – 2020). Results identified five subsurface weathering profiles based on $V_{s_{30}}$, ranging from loose topsoil (<250 m/s) to highly weathered granite (>250 m/s to < 350 m/s), moderately weathered granite (>350 m/s to <512 m/s), and slightly weathered granite (>512 m/s to <670 m/s). Site classifications of Class C and D were assigned reaching up to 30 m in certain areas.

Keywords: MASW, Shear wave velocity, Vs30, Thickness.

GPR051

Indications of Hydrocarbon Prospects in the Lower Benue Trough from Aeromagnetic Data

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ABSTRACT

The hydrocarbon prospect of the lower Benue trough has been investigated using aeromagnetic data. Objectively, the study was meant to evaluate structure, lithology and sedimentary thickness that could have direct bearing to hydrocarbon formation and due to the proximity of the study area to the hydrocarbon-rich Niger delta to the south and the discovery of hydrocarbon in Kolmani River II well in Gongola basin, Chad and Niger republics to the northeast that share similar geologic settings. Maps of magnetic parameters were generated using Oasis montaj, Surfer 13 and Arc GIS softwares for subsequent qualitative and quantitative interpretations. Results of the study reveal low and high magnetic anomalies that correspond to basement valleys with thick sedimentary cover and uplifted basement areas with thin sedimentary cover, respectively. Low lineament density, Low magnetic anomalies were delineated in Akwa, Agwu, okposi and Nkalagu areas with 3318.9 m sedimentary thickness which is adequate for the thermal maturation of potential source rocks and hydrocarbon formation. A dominant NNE-SSW structural trend believed to be the continental extension of oceanic fracture system was mapped. This controls sediment deposition, hydrocarbon migration and trap mechanisms that could have direct bearings to the formation of hydrocarbon plays in the trough. Geologic map correlated with the residual magnetic map reveal that areas of low magnetic anomalies with thick sediments corresponds to parts of the Mamu and Nkporo shale formations and Ajali sandstones which are known petroleum systems in the lower trough. With appropriate and favorable juxtaposition of these geologic elements and tectonic structures, prospective hydrocarbon systems could

have been formed for possible exploitation in the lower Benue trough. Akwa, Agwu, okposi and Nkalagu areas were thus recommended for detailed seismic surveys.

Keywords: Remote sensing; Hydrocarbon; Aero magnetic; Lower Benue trough

GPR052

Evaluation Of Aquifer Protective Capacity In Parts Of Oru Lga Imo State, Southeastern Nigeria Using Resistivity Data

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ABSTRACT

Geoelectrical Techniques involving Eighteen Vertical Electrical Soundings were carried out using the Schlumberger configuration in parts of Oru LGA Imo State of Nigeria to evaluate the Aquifer protective capacity of the overburden units in the Study Area to surface contaminants. Longitudinal conductance is the Dar Zarrouk parameter used to estimate the Aquifer protective capacity in the Study Area. The results show that the total longitudinal unit Conductance values range from 0.02135mhos at VES 15 (Akatta) to 0.5565mhos at VES 10(Umuoji), averaging 0.21859mhos. The results also show that aquifer protective capacity values in the Area varied from 0.00541mhos at VES 11 (Mgbidi 1) to 0.53531 mhos at VES 2(Ubachima2) with an average value of 0.10340 mhos. Hence the aquifer protective capacity in the Study Area are classified as 16.67% moderate and 83.3% poor. This means that most of the Study Area have aquifers that are highly or very susceptible to contamination from surface-based contaminants.

KEYWORDS: Dar Zarrouk parameters; Longitudinal conductance; Aquifer; Aquifer protective

GPR053

Application Of Electrical Resistivity Method In The Exploration Of Groundwater In Tilden Fulani, Toro, Bauchi State, Nigeria

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Abstract

Acute shortage of water and contamination of subsurface water is one of the greatest challenges facing Nigeria and rural areas in particular. It is sad to say that about 10% of the world's population is faced with chronic water scarcity. Geophysical, survey was carried out to evaluate the groundwater potential of the basement complex and to delineate potential locations for siting boreholes in Tilden Fulani along Government Comprehensive Day secondary school (GCDSS). A total of six (6) Vertical Electrical Sounding (VES) were carried out using Schlumberger array with current electrodes spacing (AB/2) from 1.5 – 95m. The data obtained were processed using IPI2Win and interpreted/evaluated based on the lateral combination of inverted soundings and the available lithological data from hand dug wells and drilled boreholes. The interpreted results revealed two model curves of A and H types. Three subsurface layers comprising lateritic soil, clay deposit and weathered basement were inferred from the interpretation, except for VES 1 where two layers curve is interpreted. The top soils are of varying thickness and resistivity values. The weathered basement with relatively thick regolith and lower resistivity was inferred to be the aquiferous zone at an approximate depth of 30m and could bear productive groundwater supply.

Key Words: Electrical Resistivity, Groundwater Aquifer, Tilden Fulani

GPR054

Understanding Groundwater Dynamics: Recharge, Depletion, And Mitigation Strategies For Ensuring Water Security And Environmental Sustainability

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Abstract

This review examines the complex dynamics of groundwater systems, focusing on recharge, depletion, and mitigation strategies. We delve into recharge mechanisms, including natural infiltration and artificial methods, and discuss techniques for quantifying recharge rates. Factors influencing recharge, such as vegetation, topography, and hydrogeology, are explored. The consequences of groundwater depletion, such as lowered water tables, reduced surface water availability, and land subsidence, are analyzed. Mitigation strategies, ranging from water conservation to regulatory measures, are proposed to address these challenges. Emphasis is placed on interdisciplinary research and increased funding for sustainable groundwater management. By understanding groundwater dynamics and implementing effective mitigation measures, we can work towards ensuring water security and environmental sustainability. This review aims to provide insights and recommendations to policymakers, researchers, and stakeholders involved in water resource management.

Keywords: depletion, groundwater dynamics, mitigation strategies and recharge.

GPR055

Investigation of Groundwater Potential Using Remote Sensing and Geographical Information System (GIS) Techniques in Fakai Local Government of Kebbi State, Nigeria.

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ABSTRACT:
Groundwater is an invaluable natural resource that supports human health as well as economic development and ecological diversity. This study employed remote sensing and geographical information system (GIS) techniques to effectively explore the potentiality of groundwater resources in the Fakai local government area using various criteria derived from Landsat 8 Operational Land Imager (OLI), ASTER DEMs, topographical maps and geological maps. The study used the Weighted Linear Combination approach which involves mathematical weighing and ranking of the criteria. Multi-criteria evaluation was carried out on all the criteria using the Weighted Linear Combination approach in ArcGIS 10.4 software package to produce a suitability index value through pairwise comparison analysis which was then used for spatial analysis to generate a suitability map for groundwater recharge in the study area. The results showed four classes ranging from highly suitable areas to least suitable areas with most parts around the centre and northern regions being highly suitable for groundwater recharge thereby indicating good potentiality for this valuable resource.

KEYWORDS: Groundwater exploration; Remote Sensing; GIS; Satellite Imaging

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GPR056

Spectral Analysis Determination Of Depth To Basement In Parts Of Nigerian Sector Of Chad Basin Using Aeromagnetic Data

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ABSTRACT
High resolution aeromagnetic data covering parts of Nigerian sector of Chad basin (latitude 12 ° 00' to 13 ° 00' North and longitude 12° 30' to 14° 00' East) have been interpreted. Regional- residual data enhancement technique was applied. Spectral depth analysis was used to determine the sedimentary thickness of the area. This was achieved by windowing the residual magnetic anomaly map into 24 overlapping spectral blocks. Fast Fourier transform was undertaken on each of the window. Plot of energy versus frequency was made, each of the block produces slope which was used to estimate two depth sources. The depth to the deeper magnetic bodies (D1) varies between 6.568 and 2.644 km, with an average depth value of about 4.043 km, while the depth due the shallow magnetic bodies

(D2) lies between 1.393 and 0,869 km, with an average depth value of 1.065 km. The deeper magnetic anomalies could be due to deep magnetic bodies, while the shallow magnetic sources might be as a result of near surface magnetic sources which intruded the sedimentary section. The sedimentary thickness value of 4.043 km from the study area is an indication that the area has the potential for hydrocarbon accumulation.

Keywords: High resolution magnetic data, Fast Fourier Transform, Enhancement techniques, windowing,

GPR057

Delineating dumpsites leachate migration paths in aquifers of common geologic formations in Nigeria

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ABSTRACT

Nigeria's explosive population growth is a leading factor in increasing municipal solid waste (MSW) without an efficient waste management and monitoring system. In advanced countries, waste goes through an integrated waste management system in which MSW is reduced at its source before it even enters the waste stream, with modern landfill site designs that include careful selection and engineering to minimize the potential for bedrock and groundwater contamination. This is rarely the case in developing countries like Nigeria where most dumpsites are selected without any proper study to understand the hazards associated with waste disposal and the corresponding impact on underground water systems. Passive and active resistivity methods were employed to assess the impact of MSW on the common aquifer systems in Nigeria. In the typical sedimentary formation, our results in Makurdi show that vertical percolation of contaminants is limited due to the presence of a compact sandstone that protects the aquifer beneath it. However, there is a significant lateral plume migration from the dumpsite. In the basement complex, we observed a minimal spatial migration of contaminant plumes relative to vertical penetration at the Gyadi-Gyadin dumpsite in Kano. The deep vertical percolation of leachate within the regolith is enhanced by an interconnected fracture matrix in the fresh basement, meaning most boreholes in the area might be contaminated. We, therefore, recommend a suitable water treatment system for all boreholes in the basement complex and shallow wells in sedimentary areas.

KEYWORD: Contaminant plume, groundwater, dumpsite, aquifer, electrical resistivity

GPR058

Seismotectonics of the 2018 Abuja Earthquakes and Probabilistic Seismic Hazard Assessment in Nigeria

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Abstract

The purpose of this study is to conduct an in-depth seismic hazard assessment to aid in the location of critical facilities in Nigeria as a result of series of earth tremors that struck Abuja in 2018 with magnitudes ranging from 2.5-3.0 and intensities of II-V on the modified Mercalli scale. Because of the attention the events drew both within and outside Nigeria, an integrated study was recently conducted to determine the causes of the incidents. Probabilistic Seismic Hazard Assessment (PSHA) was carried out uniformly across Nigeria and its immediate surroundings for the first time. The results indicated that the events were caused by natural geological tectonic processes. Evidence of a fault line running through Kaduna, Nassarawa, and down to Abuja via the Mpape area, connecting the epicenters of the Abuja earthquakes to the 2016 Kwoi and Ikarra events in Kaduna and Kano states, respectively. PSHA results show that Nigeria has a low earthquake activity rates but a high probability of earthquakes of magnitudes 2.0-3.0 occurring each year. In the same vein, the probability of occurrence of earthquakes of magnitudes 4.0-6.0 is low. The b-value and activity rate (λ) are 0.69 ±0.07 and 1.684 ± 0.462 respectively; while the expected maximum earthquake magnitude in Nigeria is 6.7 ± 0.34 within a 1-1000 years' period. A magnitude 6.0 can be expected to occur approximately every 143 years in Nigeria, and the probabilities of this event occurring annually, 50, 100 and 1000 years is 6.7%, 95.81%, 99.70% and 100% respectively. The PGAs for a 10% probability of exceedance in 50 years range from 0.01-0.08g. PSHA findings will help with planning, with the PGAs being useful for engineering design and as baseline parameters for establishing seismic building codes in Nigeria.

Keywords: Nigeria; seismicity; Seismic hazard assessmen; Planning

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GPR059

Seismotectonics of the 2018 Abuja Earthquakes and Probabilistic Seismic Hazard Assessment in Nigeria

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ABSTRACT

The purpose of this study is to conduct an in-depth seismic hazard assessment to aid in the location of critical facilities in Nigeria as a result of series of earth tremors that struck Abuja in 2018 with magnitudes ranging from 2.5-3.0 and intensities of II-V on the modified Mercalli scale. Because of the attention the events drew both within and outside Nigeria, an integrated study was recently conducted to determine the causes of the incidents. Probabilistic Seismic Hazard Assessment (PSHA) was carried out uniformly across Nigeria and its immediate surroundings for the first time. The results indicated that the events were caused by natural geological tectonic processes. Evidence of a fault line running through Kaduna, Nassarawa, and down to Abuja via the Mpape area, connecting the epicenters of the Abuja earthquakes to the 2016 Kwoi and Ikarra events in Kaduna and Kano states, respectively. PSHA results show that Nigeria has a low earthquake activity rates but a high probability of earthquakes of magnitudes 2.0-3.0 occurring each year.In the same vein, the probability of occurrence of earthquakes of magnitudes 4.0-6.0 is low. The b-value and activity rate (λ) are 0.69 ±0.07 and 1.684 ± 0.462 respectively; while the expected maximum earthquake magnitude in Nigeria is 6.7 ± 0.34 within a 1-1000 years' period. A magnitude 6.0 can be expected to occur approximately every 143 years in Nigeria, and the probabilities of this event occurring annually, 50, 100 and 1000 years is 6.7%, 95.81%, 99.70% and 100% respectively. The PGAs for a 10% probability of exceedance in 50 years range from 0.01-0.08g. PSHA findings will help with planning, with the PGAs being useful for engineering design and as baseline parameters for establishing seismic building codes in Nigeria.

Keywords: Nigeria; seismicity; Seismic hazard assessmen; Planning

GPR060

Basement architecture beneath Anambra basin and environs (Nigeria) as derived from aeromagnetic

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ABSTRACT

The study presents detail basement architecture beneath Anambra basin and environson the basis of scaling spectral method, Euler deconvolution and Source Parameter Imaging (SPI) from gridded aeromagnetic data. The magnetic basement depth is found to vary from 1 to 9 km, 1.3 to 9 km and 0.6 to 9.8 km using scaling spectral method, Euler method and SPI method, respectively, across the region. Around the area of Anambra basin, maximum magnetic basement is obtained in the order of 9.0 km from all these methods. The magnetic basements about 7-10 km is calculated around the Abakaliki anticlinorium. In the Afikpo syncline axis, we found magnetic basements between 8 km and 9 km. The magnetic basement estimated from the three methods is however in good agreement to each other

which allow better interpretation of the basement relief beneath Anambra basin than ever. The result these methods were checked and found that the shallower depths account for the volcanic (magmatic centers) in the region with the deeper depths suggesting the basin structures found in the area under study. The depths of the intrusive from spectral method, Euler method and SPI are respectively estimated at around 4.0 km, 3.9 km and 3.1 km.

Keywords: Anambra basin, Spectral method, Euler deconvolution, SPI

GPR061

Geophysical Investigation of Groundwater Potential of Umaru Musa Yar'adua University, Katsina.

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ABSTRACT

Water is one of the most basic components of human existence and socio-economic development. Geophysical Investigation of groundwater potential has been carried out at Umaru Musa Yar'adua University, Katsina in order to estimate the resistivity value with groundwater, determine the lithology, and improve water sources for the study area. A Schlumberger array was employed using ABEM Terrameter SAS 4000 switched to SAS 1000 to accomplish this task in which a resistance of 21 VES points were obtained in the study area with a maximum current electrode spacing (AB) of 240 m. The VES data obtained were processed using IPI2Win software. To obtain apparent resistivity, the resistance was multipleid by the corresponding geometric factor determined for each successive electrodes spacing. The VES results in correlation with the and borehole log have made known the near-surface materials with resistivity value between about 1 Ωm to 8000 Ωm is revealing 4 to 5 layers made up of top soil mixed with laterite, with resistivity values between 400 Ωm to 8000 Ωm having maximum thickness of 1.20 m, followed by a layer with resistivity values from 40 Ωm to about 115 Ωm with thickness from 1.34 m to 4.71 m interpreted generally as sandy clay and sandy soil. A third layer showing resistivity values between about 1 Ωm to 40 Ωm is establish to be a saturated with water while fourth layer usually indicating weathered basement with resistivity values from about 1 Ωm to 8 Ωm having a maximum thickness of about 36 m and or infinite thickness, and the last stratum showing vary low resistivity value with infinite thickness. The end result revealed that the groundwater exploration should be conducted at VES 1, 2, 3, 5, 7, 9, 11, 14, 15, 16, 18, and 20 at a depth from about 30 m to 50 m revealing low resistivity values ranging from 2 Ωm to 391 Ωm however, VES 4, 6, 8, 10, 12, 13, 17, 19 and 21 indicates high resistivity value and therefore poor groundwater potential. The groundwater potential can be improved with 12 other sources from this research.

Keywords:

GPR062

Interpretation Of Bouguer Anomaly Gravity Data In Determination Of The Crustal Thickness And Stability Of Kano State, Nigeria.

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ABSTRACT

Crustal thickness (depth of the Moho) is commonly measured in various seismic studies. Due to few seismic stations in Kano State and relatively small spatial extent of seismic profiling studies, gravity data offers a more regular coverage and increased resolution for crustal thickness determination.This study willfocus on the interpretation of gravity anomaly data in determination of the crustal thickness and stability over Kano State, Nigeria.The study area is situated between longitude$7^0 40'E$ to $9^0 21'E$ and latitude$10^0 30'N$ and $12^0 17'N$with an estimated total area of 20069.22 km2.Three Empirical relations, Average Power Spectrum analysis and 2-D gravity forward modelling techniques were used on the bouguer gravity data covering the study areafor the estimation of crustal thicknesses.The gravity anomaly profiles were model along five profile lines (P1, P2, P3, P4 and P5) drawn in different directions with crustal thicknesses ranges from 26.5 km to 36.7 km in order to ascertain the crustal thickness underlying the study area.The five models identified and delineate boundaries between the upper crust, lower crust andmantle with average densities of2.2 g/cm3, 2.8 g/cm3 and 3.2 g/cm3 respectively.The results from empirical relations method shows that the crustal thickness ranges from 35.7 km to 40.9 km.The average crustal thickness using the average power spectrum method was found to be 34.1 km. There is a good correlation in all the average crustal thicknesses obtained using the three different approaches and fall within the range of average Moho depth of Nigeria (32 km to 44 km). Based on these results, the study area is stable tectonically since Nigeria lies within the African plate and has a considerable Moho depth range.

Keywords: Anomalies, Bouguer, Gravity Data, 2-D Modelling, Moho Discontinuity, Spectral Analysis

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GPR063

Application Of 2d Resistivity Imaging For Foundation Study At Nuhu Bamalli Polytechnic, Zaria

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ABSTRACT

A propose site for future development of physical infrastructure at Nuhu Bamalli Polytechnic Zaria was investigated to obtained the suitability of the subsurface material for the design and foundation of buildings .The data were collected using ABEM Terrameter SAS 4000 with electrode selector along 35 profiles running orthogonally employing wenner array with an equally spacing electrode of 5m. The apparent resistivity obtained from field was processed and interpreted using RES2DINV software to produced two dimensional image of the study area .The result of the inverted 2D resistivity imaging revealed that the site is predominantly dominated by low resistivity values at near surface with sparsely high resistivity values at some places. The low resistivity values that ranges from 9.81ohm-m to 142 ohm-m, typifies high clay content materials which has a negative impact on any structure that will be erected on the site. The overburden thickness was found to be between 3m to 12 m depth with out-crops along profiles 10 and 21. The basement was having varying degree of weathering. Suspected areas of fractures were intercepted along 11 profiles at different depths. These areas of fractures can serves as a threating feature in building constructions.

KEY WORDS: Overburden, fractures and Orthogonal

GPR064

Integrated Geophysical Investigation for Potential Gold Mineralised Zone withinLower part of Zuru Schist Belts, NW Nigeria.

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ABSTRACT

This study used aeromagnetic, 2D electrical resistivity tomography (ERT), and induced polarisation (IP) methods to reveals the area's gold mineralisation potential. The airborne magnetic data of sheet 118_Yelwa was obtained from the NGSA; these datasets were processed and analyzed using Oasis Montaj's first vertical derivative (FVD) and center for exploration targeting (CET) techniques. Results of FVD and CET grid anomalies show that regions of major magnetic structures (lineaments) are associated with granite gneiss, migmatiticaugen gneiss, and medium to coarse-grained biotite when compared to the geological setting of the area. The zones of major structures obtained in this study coincided with previous aeromagnetic studies of the area, located in the eastern parts of Ngaski, Yauri (Yelwa), Shanga, Agwara, as well as Magama's northwest region. Some of the regions forlineament (in the eastern part of Ngaski/Yauri) were investigated further with 2D ERT and IP detailed geophysical methods in a dipole-dipole configuration. The results of geoelectric techniques along profiles 1, 2, and 3 identified the major gold mineralisation potential zones, which were labeled A1, A2, and A3.These regions have low/high resistivity and chargeability signatures, and could thus be interpreted as potential target zones for metallic mineral exploration, particularly gold mineralisation. The regions are located in the northern Mararraba and southwest of the Jinsani areas of Kebbi State.The results of integrated geophysical methods have produced updated structural features of the regions, as well as a database containing precise locations, lateral lengths, thicknesses, and depths for prospective gold mineralisation zones. This database could assist the miner/explorer in locating the potential zone of gold mineralisation.

Keywords: Gold MineralisationZones, Mineral Exploration,ZuruSchist Belt, Aeromagnetic, Electrical Resistivity Tomography (ERT) and Induce Polarisation (IP).

GPR065

Sub-Surface Mapping Of Groundwater Contamination Pathway Using Electrical Sounding At Waste Disposal Area Near Farin Yaro Primary School, Katsina, Katsina State, Nigeria

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ABSTRACT

Geophysical survey using 1-Dimentional resistivity sounding was applied at waste disposal area near Farin Yaro Primary School, Katsina. The Schlumberger electrode configuration was used for data collection. Seven vertical electrical sounding points were occupied in the area with a maximum current electrode spacing AB of 200m was used. The results obtained from the geoelectrical survey were interpreted using IPI2Win resistivity computer software. The results of the interpreted seven VES data revealed five to six layers within the subsurface containing different minerals and rock types like top soil, sandy clay, laterite, gravel and layers of weathered and fresh basement with variations of resistivity values, The results also depict the presence of contaminated layers of sandy soil, in four VES points out of seven with very low resistivity value between 1.45 Ωm to 5.27 Ωm. The result shows that the contaminated plume zone has tendency to contaminate the groundwater within the region.

Keywords: Sub-surface,Sandy soil,resistivity value, contaminate.

GPR066

Geophysics and climate change for environmental sustainability.

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ABSTRACT

Geophysical strategies in achieving environmental sustainability and management of climate change includes reconstructing past climates, developing paleo-climate models, assessing climate hazards, facilitating carbon capture and storage. This paper aims at assessing the effects of climate change on environmental sustainability, Geophysics approaches in management of climate change as well as roles of Geophysics in achieving environmental

sustainability. This sustainability constitutes a major problem in many countries and regions around the world that experiences industrial pollution, degradation of land as well as natural disasters caused by the global warming. This paper shows that some of the geophysical strategies are often strategies that can be integrated simultaneously with the management of natural resources. They make resources more efficient and resilient to climate change. This paper shows that reducing the carbon footprint by more than 50 percent by 2030 and eliminating it by 2050 might be a viable solution to tackle the climate change and support the environmental sustainability. The increasing worldwide demands for energy including the exploration of new resources are provoking prompt activities to guarantee a safe accomplishment together with a conscientious protection of the environment. Within this framework geophysical technologies play a key role for the profound assessment and characterization of the subsurface, which hosts most of the corresponding targets of human interest. These technologies (active- and passive-source seismology, electromagnetic, etc.) are expected to deliver a reliable and highly-resolute image of the subsurface including its structural inventory and the related rock-physical parameters on a broad scale and depending on the used inversion methodology. In particular in terms of energy and resources, i.e. the exploration and partly the storage and disposal of end-products, the existing geophysical imaging techniques are well suited for both, the over-the-years well established oil/gas industry as well as for newer emerging industry branches, e.g. geothermal energy.

Key words; Geophysics, Climate change, Electromagnetism, seismology, Exploration.

GPR067

Magnetic Gradiometer Survey For Mapping Subsurface Remains Of Construction Material

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ABSTRACT

With the aid of the non-invasive geophysical techniques, it is possible to determine hidden objects in the near vicinity of the earth's surface in addition to the delineation of deep-seated structures. A magnetic survey is carried out in order to locate the remains of construction materials, specifically concrete pillars in the Penang Central area. The gradiometer data were sampled at 2.5 m intervals along the predefined marked locations.Gradiometer data were analysed using Oasis Montaj software. The measured data at each location is averaged, gridded and contoured to produce maps with anomalies representing the possible locations of subsurface foundations in addition to possible other objects buried there. Filters like trend removal and hanning filters are also applied to remove low-frequency anomalies that may be related to deeper structures.Euler deconvolution technique that estimates background,

horizontal coordinate (x0 and y0), and depth is used for this task. The clustered depth solutions coincided with the high amplitude/values of analytic signal and these are the possible target positions of the concrete pillars being sought. The depth and horizontal coordinates of buried wall has been estimated. Depth analysis of the data shows the possible depths of anomalies lying between 1 and 5 m.

KEY WORDS: Gradiometer survey, Total magnetic Field Intensity, concrete pillars and Euler deconvolution.

GPR068

Magnetic Characterization of Iron Ore deposit in Itakpe Area of Kogi State, Nigeria

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ABSTRACT

Itakpe of kogi state contains the highest grade of iron ore among other sides in Nigeria. Three samples of as-collected, concentrate and bye-waste were characterized to study the magnetic properties in the samples particularly the waste that increase rapidly due to their high output and low utilization. A size of 0.2g was each measured for vibrating sample magnetometer (VSM) and 57Fe Mossbauer spectroscopy measurements. The investigation of the magnetic properties such as saturation magnetization Ms, and coercivity Hc, were determined at room temperature. The Ms and Hc of the as-collected sample were 2 emu/g and 115 Oe respectively. The 10 emu/g obtained for the concentrate samples as the highest of the three samples. No significant change occurred in the Hc which has a value of about 114 Oe, The waste sample of 5emu/g with slightly higher Hc of about 120 Oe. The results show that the waste sample is much higher in magnetization than the as-collected iron ore. This analysis revealed that the iron-ore waste still contains a significant amount of iron, requiring an optimum beneficiation process for economic value. The 57Fe Mossbauer spectroscopy performed at room temperature on the three samples indicate that hematite (α-Fe2O3) is the major iron oxide phase. Small phases of magnetite (Fe3O4) was however, detected. Evidence of goethite (α-FeOOH) was seen. The isomer shift values showed the presence of Fe^{3+} ions in all the samples. Therefore, more efforts are needed to utilize this waste for its possible applications as it contains high hematite and suggest it to be used for construction, ceramics, glass and the hematite content of iron ore in the waste can be converted into magnetite nanoparticles for various applications.

Keywords: IronOre, Concentrate, waste, Vibrating Sample Magnetometer, (VSM) 57Fe Mossbauer Spectroscopy.

GPR069

Basement Depth Estimation from Source Parameter Imaging of Aeromagnetic Data Over Bichi Emirate Part of Kano State, Nigeria

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ABSTRACT

An analysis of aeromagnetic data of Bichi Emirate part of Kano Nigerian basement complex was carried out. The data was interpreted qualitatively and quantitatively using the Source Parameter Imaging (SPI) method to determine the depth to the basement. The regional fields were separated from the Total Magnetic Intensity (TMI) fields to obtain the residual fields using first order polynomial fitting. The residual anomalies were also successively sharpened using first, second and horizontal derivatives. The result of the Source Parameter Imaging (SPI) interpretation revealed two depth models; the deep depth and the shallow depth. The depth to magnetic bodies estimated from the SPI ranged from 85.0 m to 137.0m (shallow magnetic bodies) to 233.4m to 939.1 m (deep lying magnetic bodies). It is generally understood that zones of low magnetic intensity in SE and SW region match to areas of sedimentary rocks and intermediary intensity while high magnetic intensity in the NE and NW region matches to granitic rocks.

Key words: Aeromagnetic, Source Parameter Imaging, Total Magnetic Intensity, anomalies, Residual Field.

GPR070

Investigation of groundwater Vulnerability using Geoelectric method at Olodi Apapa area of Lagos State, Nigeria.

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Abstract

The study aim to investigate the groundwater vulnerability of Olodi Apapa area in Ajegunle, Lagos state, Nigeria. A Global Positioning System (GPS) was used to obtain stations coordinate. Schlumberger (1-D) and Wenner (2-D) arrays were used for Vertical Electrical Sounding (VES) and horizontal profiling respectively. Schlumberger array was used to acquire data for 1-D electrical survey to characterize the subsurface within the investigation depth of the Vertical Electrical Sounding (VES); hence a maximum AB/2 separation of 200 m was used. The longitudinal conductance of protective layer, the level of vulnerability and protective capacity rating from VES 1 and VES 2 are good with the aquifer protective capacity

which ranges between 0.7 - 0.8. VES 3, 6, 8 and 10 fell within moderate rating of 0.2 – 0.69. The aquifer beneath VES 4, 5, 7 and 9 are of poor rating with the aquifer protective capacity rating ranging between 0.05-0.06 and so are inconsiderably vulnerable. Summarily, VES 1 and 2 have a good aquifer, the water quality in this area is good, the aquifer at VES 3, 6, 8, and 10 are prone to pollution and VES 4, 5 and 9 are practically polluted.

Keywords: vulnerability, protective layers, electrical survey and groundwater.

GPR071

Investigation Of Aquifer Vulnerability Under Some Protective Measures In Ehime Mbano, South-Eastern Nigeria: A Pathway To Economic Development

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ABSTRACT

This study focuses on assessing aquifer vulnerability to contamination in Ehime Mbano South-Eastern Nigeria by applying the DRASTIC model. The data was obtained using (VES) vertical electrical sounding technique by applying Schlumberger configurations with AB/2 = 400m. The VES data were interpreted using state of the art soft wares to obtain the final model for each VES, groundwater vulnerability map was also developed while aquifer media was gotten by taking into account the depth at which water was struck and correlating those depths with the lithological description of the VES results obtained. The hydraulic conductivity was calculated from apparent resistivity of the aquifer. However, the net recharge, soil media, and topography was obtained from research documentaries. Aquifer vulnerability assessment carried out revealed areas with high (126 -165), moderate (86-125), and low (70-85) vulnerability ratings based on the DRASTIC Index. Locations with high vulnerability rating : Umuokiri Umunumo and Ikperejere. Locations with moderate vulnerability rating :Ikpem, Ikweii Nzerem while locations with low vulnerability rating: Umuokara Uzinomi and areas close to Umueze II. The findings of this study can be used to identify regions of contamination of groundwater in the area and its environs thereby reducing economic problems of the people.

Key Words: Groundwater vulnerability, Aquifer, Contamination, DRASTIC model.

GPR072

Temporal Variation and Radiological risk assessment of groundwater radon from Kano Metropolis, Nigeria

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ABSTRACT

Radon (222Rn) is widely reported as the largest contributing component of human exposure to natural radiation and it is the second major cause of lung cancer after cigarette smoking. There is no data on radon concentration in groundwater from Kano and the groundwater demand for drinking and other domestic use is becoming high, especially with the increasing population as a result of the influx of people from other places. Therefore, there is a need to evaluate the quality of groundwater. This study was undertaken to determine the radon activity concentration in groundwater, its associated radiological risk, and its temporal variation, in the Kano metropolis, Nigeria. Ninety (90) groundwater samples were collected from thirty (30) different locations at an interval of thirty days each. Radon concentration measurements were carried out in situ using the DURRIDGE RAD7 electronic radon detector. The radon concentration was found to vary from 5,161 to 183,422 Bqm-3 with an average of 48,399 Bqm-3 against the U.S.E.P.A maximum contaminant level (MCL) of 11.1 Bq/l (11,100 Bqm-3). The potential dose due to the degassing of radon from groundwater showed an annual absorbed dose ranging from 86.79 to 2893.86 mSvy-1 with an average of 763.21 mSvy-1, an annual effective dose ranged from 208.30 to 6945.27 mSvy-1 with an average of 1831.70 mSvy-1 and annual dose due to ingestion of 222Rn ranged from 0.1 to 3.67 mSvy-1 with an average of 0.97 movie.-1 3.33% of the sampled groundwater had an annual effective dose due to in gestion within WHO recommended reference level of 0.1 mSvyr-1 while 56.67% are above the WHO reference level but are within the ICRP recommended reference level of 1 mSvyr-1 for the intake of radionuclide in water by the general public for prolonged exposure and 40% are higher than the recommended level. 60% of the sampled groundwater is safe for consumption and other domestic uses, while the remaining 40% could pose a health threat to the communities under study and require mitigation measures.

Keywords: activity concentration, Durridge rad7, in-situ, radioactivity, radon, radionuclide.

Health & Environmental Physics

HEP001

Spatiotemporal Distribution of Pollutants and Effect of Local Meteorology on Source Influence on Pollutants' Level in a Traffic Air-Shed in Lagos Megacity, Nigeria

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Abstract

This study assesses air quality and the spatiotemporal distribution of vehicular and traffic-related pollutants in several air sheds of Lagos megacity. A setup of low-cost air quality sensors comprising five (5) units was deployed between November 2018 and February 2019 within traffic corridors in the heart of the city. Diurnal variation of pollutants indicated that total oxide ($O_X = NO_2 + O_3$) peaked at mid-day while carbonoxide (CO) had two distinct peaks corresponding to morning and evening rush hours. Nitrogen dioxide (NO2) concentration peaked during evening hours. Average concentrations are NO2 (97.1 ± 9.7) ppb, Ox (78.6 ± 27.2) ppb, CO (2285.63 ± 743.7) ppb. Average concentrations of pollutants were above thresholds set by the World Health Organization except for NO2 which was within the range permissible limits. This implies that the atmosphere is polluted due to elevated concentrations of airborne pollutants an indication which is of both health and environmental concern. The air quality index indicates that the quality of ambient air varies from good to very unhealthy for Ox, and unhealthy to very unhealthy for CO. For all of the sampling sites, conditional bivariate probability function plots show a significant agreement with the location of known pollution sources.

Keywords: Air quality, Low-cost sensors, Meteorological parameters, Bivariate polar plot

HEP002

Electrical Conductivity And Ph Of Malt Drinks: Analysis Of Heat Impact And Its Varying Temperature

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ABSTRACT

For decades, scientists have studied the inter-relationship of pH, conductivity and temperature and their likely but not conclusive effect on humans. Available studies have helped physicians over the years in the management of electrolyte imbalances and in the treatment of diseases. This cannot be overemphasized. In this research five popular commercial brands of malt drinks (Amstel Malt, Malta Guinness, Malta Guinness Low Sugar, Maltina Classic and Hi-Malt) produced in Nigeria were analysed for pH and electrical conductivity with varying temperatures using a digital temperature/conductivity meter (HANNA MODEL HI 98130) and a digital temperature/pH meter (HANNA MODEL HI 98127). The results show that the pH of the malt drinks was found to be within the acidic range of 4.9 to 5.8. The electrical conductivity of the malt drinks analysed ranges from 2535 to $1518\mu S/cm$. Conductivity with varying temperature ranges from $2253\ to\ 2535\mu S/cm$, for Maltina, $1106\ to\ 1475\mu S/cm$, for Malta Guinness, $1366\ to\ 1998\mu S/cm$ for Hi-malt, $1130\ to\ 1309\mu S/cm$ for Malta Guinness Low and $1354\ to\ 1518\mu S/cm\ for$ Sugar Amstel Malta. The Temperature range used for the experiment was 0 to 500C. The order of decreasing conductivity of the five malt drinks is Maltina Classic, Hi-malt, Malta Guinness, Malta Guinness Low Sugar and Amstel Malta.

Keywords: Conductivity, Malt drinks, pH, Temperature.

HEP003

Coaxial Antenna Characterization Of Microwave Thermal Therapy For Lung Cancer Using Finite Element Method

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Abstract

Microwave thermal therapy (MTT) is a promising technique for the treatment of lung cancer, as it can selectively heat and destroy tumor cells without damaging the surrounding healthy tissue. However, the design and optimization of MTT devices require accurate electromagnetic (EM) characterization of the coaxial antenna and the liver tissue. In this paper, a finite element method (FEM) was employed to model and simulate the EM behavior of a coaxial antenna inserted into a liver phantom using COMSOL Multiphysics. The effects of antenna geometry, tissue properties, and blood perfusion were considered on the specific absorption rate (SAR) and temperature distribution in the liver, as it can selectively heat and destroy tumor cells without damaging the surrounding healthy tissues. However, the EM characterization of the coaxial antenna is a challenging task due to the complex interactions between the antenna and the biological tissues. We model the heat transfer and EM fields in the liver tissue was also modelled using FEM with realistic geometry, material properties, and boundary conditions. Varying input microwave power used are 10, 20, 30, 40, and 50 W respectively, blood perfusion rate (3.6e-3 1/s), blood temperature (35 0C), and relative

permittivity of liver (43.03) and catheter (2.6) to investigate their effects on the temperature distribution, SAR and electric field intensity in the liver tissue. We evaluated the performance and safety of our coaxial antenna for lung cancer treatment based on these results. The computational result indicated the temperature behavior in the liver tissue changes as it is exposed to an input microwave power of 10 W. The antenna emits the microwave, which heats up the tissue near it. The farther the tissue is from the antenna, the cooler it becomes. The temperature reaches 37 0C near the edges of the area that is simulated. The blood flow in the liver helps to cool down the tissue by carrying away the heat, where the computed microwave heat source density takes on its peak values near tip and slot. The scale is cut off at 1 W/cm3. SAR results for input microwave power normalized for same distance (2.5 mm) at 1,2,3,4, and 5 SAR for each input microwave power respectively with different insertion depth level. At 10 W, approximately 9.37 was been absorbed by the tissue, whereas 46.89 W was absorbed by the tissue for 50 W. We also discuss some challenges and limitations of our method, such as numerical errors, computational cost, and tissue heterogeneity. This method can provide a useful tool for the design and optimization of coaxial antennas for MTT of lung cancer.

Keywords: Microwave therapy, lung cancer, liver tissue, electrical conductivity, FEM, SAR

HEP004

Optimisation Of Energy Efficiency And Passive Design Strategies On Sani Abacha Specialist Hospital Damaturu Using Building Energy Simulation

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Abstract

The conservation of energy consumption in buildings through the utilisation of solar energy holds paramount importance in addressing both environmental and economic concerns. Firstly, it significantly reduces greenhouse gas emissions, mitigating the impact of climate change and contributing to a more sustainable future. It offers substantial cost savings by reducing reliance on traditional energy sources, thereby enhancing long-term financial viability for buildings. The adoption of solar energy promotes energy independence and resilience, safeguarding against energy price fluctuations and ensuring a reliable source of power, even in times of grid disruptions. This research delves into the intricate process of optimising building energy performance through the utilisation of cutting-edge building energy simulation software. The primary objective of this study was to elevate the passive design and energy conservation capabilities of the Sani Abacha Specialist Hospital in Damaturu, Nigeria. To achieve this, a combination of SketchUp and IESVE software tools was harnessed for intricate energy simulations, enabling a detailed examination of various scenarios. The baseline scenario served as a crucial reference point for the investigation, which then branched into three distinct cases: HVAC (Heating, Ventilation, and Air

Conditioning), Building Envelope, and Solar PV (Photovoltaic). Each of these scenarios was meticulously designed and analysed to gauge its impact on the overall energy performance of the hospital buildings. The results of this study were nothing short of remarkable. In the baseline scenario, the total site energy consumption stood at a substantial 4,096 MMBtu. However, through systematic optimisation, particularly in the Solar PV Case 3, this energy demand was dramatically reduced to a mere 117 MMBtu. This outcome underscores the profound potential of integrating solar photovoltaic technology as a sustainable and highly effective means of significantly enhancing energy efficiency. The findings presented in this work offer valuable insights for future endeavours in the realm of building energy optimisation, with the potential to pave the way for more sustainable and eco-friendly infrastructure worldwide.

Keywords: Energy Performance, Simulation Software, Solar PV, Building.

HEP005

Impact Of Metals Scrap Yard In Present Of Some Trace Elements Within Gombe Metropolis, Gombe State, Nigeria, Using Atomic Absorption Spectrometry

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ABSTRACT

The study of impact of metals scrap yard in present some of trace element in soil samples was done using Atomic Absorption Spectrometer (AAS). Top soil sample was collected from eight metals scrap yards and their corresponding control areas. One gram (1 g) each of the soil samples was digested and then heated slowly and steadily, the solution appears colorless. The samples were allowed to cool and ready for analysis. The result obtained was, the mean elemental concentration element was of the order ofMn (41.022±41.202)> Cu (4.416±4.274) >Pb (2.685±1.399) > Mg (0.500±10.122) > Cr (0.460±0.187) > Cd (0.125±0.027) > Co (0.04±0.000)> Ni (0.000±0.000). The comparison of the elemental concentration of the trace elements of (Mn, Mg, Cu, Pd, Cr, Cd, Co and Ni) in the study area ware shows the metal scrap yard has impact in the present of trace elements in soil. In addition, the Contamination factor (CF), and Pollution load index (PLI) of each trace element in soil of the study area and their respective control area were all < 1 which implies that they all have low contamination factors, less polluted and low contaminated.

Keyword: Heavy metals, Atomic Absorption Spectroscopy, Metals Scrap Yard and Soil Sample

HEP006

Investigating the Impact of Solid Waste Dumpsites on Groundwater Quality: A Case Study of the Mkpuka Obosi Landfill

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Abstract

This research aimed to assess the impact of solid waste dumpsites on groundwater quality, specifically focusing on the landfill at Mkpuka Obosi. The study area was divided into eight concentric cells (C1-C8), each containing water and soil samples for analysis. The parameters examined included physical and chemical factors such as temperature, pH, nitrates, chloride, sulphate, phosphate, potassium, sodium, calcium, magnesium, total hardness, total suspended solids, bicarbonate, biological oxygen demand, chemical oxygen demand, electrical conductivity, iron, copper, zinc, and lead. The results were compared with relevant standards set by organizations like the World Health Organization (WHO). The findings indicated that parameters such as chemical oxygen demand, total suspended solids, chloride, nitrate, sodium, calcium, copper, lead, iron, and electrical conductivity exceeded the recommended standards. This suggests that water contamination from the dumpsite has adversely affected groundwater quality. Analysis of the graphs and tables revealed that the contamination's spread decreased proportionally with distance from the dumpsite. As a result, water within approximately 500m of the centre of tmhe landfill was deemed unsuitable for consumption due to health risks and hazards. The water quality index ranged from 513 to 13, indicating that wells and boreholes located around 500m from the dumpsite require significant treatment before being considered safe for consumption. The excess presence of sandy soil in the area, attributed to the geological formation, was found to contribute to the rapid flow of contaminants from the dumpsite. Coarse textured soils, being more permeable, have lower sorption potentials, while fine textured soils have slower permeability and higher sorption potentials. Consequently, the high proportion of coarse sandy soil surrounding the landfill favors the accelerated movement of contaminants.

Keywords:

HEP007

Comparative Study Of The Thermal Conductivities Of Some Polluted Soils (Sandy, Loamy And Clay Soils) In Bali Town, Taraba State

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ABSTRACT

Conductivity of soils include the amount and type of soluble salts in solution, porosity, soil texture, soil moisture and soil temperature. This research was conducted to determine the thermal conductivity of three different soil samples (sandy, loamy and clay soil). The soil

samples were taken around MRS filling station, Silvery Filling station and a black market oil and gas distributor. The Lee's disc method was used. The entire practical work was done separately. Two (2) minutes were spent on each soil sample analysis. The temperatures of the soils on cooling obtained were inputted in the rate of heat transfer equation and solved in order to obtain the thermal conductivity of all the soil samples in consideration. Interpretation of data obtained shows that all the three soil samples are having different results with loamy soil having the highest value of thermal conductivity. The results obtained led to the production of number of graphs and tables from which conclusions were drawn. The graph of all the soil samples shows that temperature gradients are all having negative results. This indicates that heat flows in the direction of decreasing temperature. Hence all the samples have unique nature and therefore they will definitely have different uses. These results could be used as a benchmark for other research works on determination of thermal conductivity of other soil samples.

Key Words: Heat, thermal conductivity, resistivity, cooling.

HEP008

Assessment of Some Widely Consumed Sachet and Bottled Water Brands; Implications for Radiation Risks in Ondo and Ekiti State, South Western Nigeria.

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ABSTRACT

Selected Sachet water and bottled water (based on wide range of consumers) samples were collected from various manufacturers and distributors in Ondo and Ekiti states, south western Nigeria. Activity concentrations of natural radioactivity including 40K, 226Ra and 232Th were measured using a gamma ray spectrometer with high purity germanium detector (HPGe). Measured activity concentration values for 40K, 226Ra and 232Th ranged from 0.46 $\pm$ 0.02 to 4.74 $\pm$ 0.44 Bq L-1, 0.14$\pm$ 0.01 to 1.62 $\pm$ 0.30 Bq L-1, and 0.16 $\pm$ 0.11 to 1.42 $\pm$ 0.21 Bq L-1 respectively in sachet water. Additionally, activity concentration values for 40K, 226Ra and 232Th in bottled water ranged from 0.72 $\pm$ 0.10 to 2.32 $\pm$ 0.14 Bq L-1, 0.15$\pm$ 0.01 to 0.82 $\pm$ 0.03 Bq L-1, and 0.19 $\pm$ 0.03 to 1.42 $\pm$ 0.10 Bq L-1 respectively. Determined ingested annual effective dose on the scale of International Commission on Radiological Protection (ICRP) for age groups 0-1y, 1-2y, 2-7y, 7-12y, 12 -17y and > 17y from consumption of the water samples ranged from 60.0 to 2300 μSv y-1. The mean annual effective dose of 40K, 226Ra and 232Th activities that may be received from consumption of sachet water samples in the study area is lower in most samples than the limit reported by ICRP. It is however higher in petite for age group 0-1y and 12-17y. Only bottled water of FUTA brand in Ondo state is higher for age group 0-1y than the recommended value of 1 mSvy-1 to the general public for drinking water by ICRP. It is therefore strongly recommended for nursing mothers to guard the lactating populace from the consumption of the surveyed samples to minimize the stochastic risk of radiation hazards.

Keywords:

HEP009

Comparison of Water intake of Soil during Peak Wet and Dry Seasons using Automated Soil Infiltration Measuring Device; A Tool for Irrigation Farming Practice.

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Abstract

The amount of water which a soil can absorb at a particular time varies with season and soil type. This seasonal variation affects plant growth and can cause soil erosion which might lead to flooding that have adverse effect on the environment. An automated soil infiltration is an electronic system which can measure the amount of water depth falling into the soil at a particular time and the water intake of the soil during different seasons. This device will improve irrigation farming practice and enable farmers ascertain the amount of water to be channeled/supplied to their farm land during various seasons for irrigation farming practice. The peak wet and dry seasons considered were the months of July and January.

Keywords; Irrigation, Automation, Measurement, Soil infiltration and Peak seasons.

HEP010

Corrosion Behavior Of Extracts Of Yam, Maize And Cassava Leaves On Mild Steel In A Selected Media

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ABSTRACT

Investigation of the inhibiting effects of Dioscorea rotundata, Zea mays and Manihot exculenta leaves extracts on the corrosion of mild steel in a selected media using weight loss method was carried out. The mild steel samples were pre-weighed, immersed in mixture of NaOH, NaCl and H2SO4 solutions with the extracts from the leaves and the control samples immersed in solution of the media with no extracts. The samples were allowed to stand for 672 hours and a set of samples from each environment withdrawn at intervals of 168 hours for corrosion characterization. The research findings indicate that the corrosion rate decreased as a result of the leaves extracts introduced into the media thereby confirming that the extracts functioned as effective and excellent inhibitors in the alkaline, salt and acidic media. Among the three plants extracts used, it was observed that Dioscorea rotundata (Yam) has the best inhibition efficiency in both alkaline, salt and acidic media, followed by Manihot exculenta (Cassava) and Zea mays (Maize) which also showed good inhibition efficiency. The results show the very good potentialities of the leaves extracts for application in the mitigation of corrosion in our various manufacturing industries.

Keywords: Corrosion, Inhibiting effects, Leaves extracts, Mild steel.

HEP011

Assessment Of Heavy Metals Concentration In Soil, Water And Vegetation Samples In Kakau District, Chikun Local Government Area Of Kaduna State

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ABSTRACT

Heavy metals are bio-accumulated and bio-transferred by anthropogenic sources. The contamination by heavy metal in soil, water and vegetation is one of the major issues faced throughout the world and requires attention because heavy metals above their normal ranges are extremely threatened to both plant and animals. It was therefore of interest to conduct these study to estimate levels of heavy metals in soil, water and vegetation in Kaku, Kakau District of Chikun L.G.A of Kaduna state because of the increasing number of children affected by rickets. Samples were collected randomly from nine (9) different locations each of soil, water and vegetation. Heavy metals for which these samples were analyzed were calcium, lead, zinc, cadmium and cobalt. Atomic Absorption Spectrometer was used for analyzing the samples. The results showed that the concentration of lead, zinc, cadmium and cobalt are above the WHO permissible limits 0.01mg/l,0.003mg/l,0.003mg/l, and 0.006mg/l respectively. Calcium was found to be very low, lower than the permissible limits of 1.2-1.5 mg/l set up by the WHO in all the samples collected.

KEY WORDS: Soil, water, vegetation, heavy metals, Atomic Absorption Spectrometry.

HEP012

Performance Evaluation Of A Constructed Phantom For Relative Electron Density Measurement And Ct Number Linearity Test For Dental Cone Beam Computed Tomography (Cbct) System Using Various Insert Materials

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ABSTRACT

The regular quality assurance performance on dental cone beam computed tomography (CBCT) have been hampered in some diagnostic centres particularly in developing countries due to lack of suitable CBCT phantom. Hence, this present study aims to design and construct a suitable and affordable phantom and its insert materials for HU and relative electron density measurement, noise and uniformity test in order to establish the linearity of the dental CBCT machine. An image quality (IQ) phantom with diameter and length of 100 mm and 120 mm, respectively was designed and constructed and was used for the performance evaluation of the dental CBCT system. The main body of the phantom consists of a poly-methyl methacrylate (Plexiglas) cylinder. This phantom consisted of five vertical columns drilled through the PMMA and filled with various IQ test items. The Planmeca ProMax 3D Mid CBCT unit (Planmeca, Helsinki, Finland) which has been installed at the imaging unit, Advanced Medical And Dental Institute, Universiti Sains Malaysia was used to scan the developed phantom. The linearity of the system was confirmed by measuring the HU values of all the insert materials. The result revealed a linear relationship between the HU value and the electron density, and the accuracy of the noise was perfect as it difference from baseline was within 20% and the image uniformity is acceptable (95%). The designed phantoms showed an overall good accuracy and can be used to carry out the important quality assurance tests of the CBCT system.

Keywords: Cone beam computed tomography, phantom, quality assurance, HU and linearity.

HEP013

Assessment of Noise Level at Local Market and Selected Shopping Mall in Odogunyan, Ikorodu, Lagos, Nigeria.

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Abstract

Noise generated in markets need to be taken seriously due to its effects on traders and nearby residents. In this study, environmental noise assessment and its impacts on marketers at popular local market and selected shopping malls in Odogunyan area of Lagos, South-western Nigeria have been carried out. Three points were selected in each location and noise level, humidity and temperature measurements taken simultaneously for an hour at one minute interval from 9 am to 10 am, 1 pm to 2 pm and 5 pm to 6 pm using smart sensor sound level meter AS844+. The data collected were carefully analysed. The results revealed that the average noise level in all the three locations are above the permissible day time noise level recommended by World Health Organisation (WHO) of 65 dB and Lagos State Environmental Protection Agency (LASEPA) of 70dB for commercial areas with the conventional market recording the highest value (81.67 dB to 86.74 dB) followed by shopping mall 1 that is close to the local market (77.55 dB to 81.82 dB) while shopping mall 2 recording the least values (75.55 dB to 78.80 dB). A strong positive relationship was discovered between noise level and temperature with a correlation value of 0.524. The analysis of variance showed that the effect of noise level on temperature is significant at 5% level of significance. The degree of association between noise level and humidity is an inverse relationship with the correlation value of -0.469.

Keywords: Day time noise, Humidity, LASEPA, Temperature, WHO

HEP014

Measurement and Near-Road Dispersion Modeling of Airborne Pollutants along Vehicular Corridor in Ile – Ife, Nigeria

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Abstract

This study aimed to assess air quality and spatiotemporal distribution of traffic related pollutants in several air shed of Ile – Ife, Nigeria. A network of 5-units low-cost air quality monitoring sensor was mounted in five different locations along high vehicular area for the period of five months (June, 2018 - November, 2018). The results showed that the average concentration of the air pollutants obtained exceeded the United State National World Health Organization (WHO) benchmark. AQI result indicated unhealthy air quality in the study area along the traffic corridors which implies atmospheric pollution due to elevated concentration of airborne pollutants above permissible limits. Research Line (R-LINE) dispersion model indicated high concentration of the dispersed pollutants along the traffic corridor. The AQI in the study locations indicated high risk of severe health consequences for the general public and the environment, with R-LINE dispersion model revealing that with 50 m from the road could suffer high impact of the dispersed pollutants.

Keywords: Air Quality index, Research Line, meteorological parameters, traffic corridor

HEP015

Dynamic Behavior of Euler Bernoulli beam of Arbitrary Number of Variable Elastic K-Stiffness under a Partially Distributed Moving Load

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Abstract

The moving load problem is inevitably difficult in structural dynamics. A lot of research has been carried out during the last century on the dynamic response of railway bridges under the effect of moving loads. Therefore, the dynamic behavior of the Euler-Bernoulli beam of the arbitrary number of variable elastic K-stiffness under a partially distributed moving load was investigated. The governing equation is a fourth-order partial differential equation, which was reduced to a second-order ordinary differential equation by using the analytical method in terms of series solution and the resulting equation was then solved by numerical method using mathematical software (Maple). The displacement was obtained for both moving load and moving force for K – stiffness (K) and the Mass (M) was examined for both moving load and moving force. It was observed that the response displacement of the beam decreases as the values of the elastic K- stiffness (K) increase for both moving load and moving force, while the displacement increases as the load of the Mass (M) increases. Comparison of moving mass and moving force for variable elastic K- stiffness were examined and it was shown that the displacement of moving mass is greater than that of moving force. In conclusion, elastic K-stiffness was considered to be variable, and the concentrated force that was used was also considered to be partially distributed contrary to the assumption of constant moment of inertia.

Keywords: Dynamic response, Moment of inertia, Moving mass, Ordinary differential equation, Railway bridges.

HEP016

Effect Of Viscosity On Reservoir Deliverability Of Green Field, Niger Delta, Nigeria

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ABSTRACT

Reservoir deliverability has been a concern in exploration geosciences as it determines the volume of hydrocarbon that is exploitable from a reservoir. In this research, we recorded the viscosity η of fluid from Green field in order for us to have an idea of its deliverability.

Different quantity of heat was injected in the form of steam into Green reservoir fluids at every 30 minutes interval and the changes in η at every considered temperature were estimated to determine the reservoir deliverability. Reservoir fluid from Green field were collected every 30 minutes interval to obtain its terminal velocity (VT) which is needed to estimate . The η and deliverability of the reservoir in percentage were 5.073 N.sm-2 and 40 % before the injection of steam. Each of the 30 minutes interval of temperature increase after the injection of steam showed a direct variation of the temperature with VT and an indirect variation with η of the fluids. Each of the reservoir fluids collected for five different times from Green field were divided into five portions PRTN A, PRTN B, PRTN C, PRTN D and PRTN E. After steam injection, the first, second, third, fourth and the fifth collected fluids respectively produced an average VT and η of 2.83ms-1 and 2.164N.sm-2, 3.89ms-1 and 1.576Nsm-2, 4.82ms-1 and 1.272Nsm-2, 5.92ms-1 and 1.034Nsm-2 and 7.07ms-1 and 0.865Nsm-2 which depicts easy movement of hydrocarbon as temperature increases. The percentage average deliverability of the reservoir after the application of heat at five different intervals became 53.44 %. This showed that for non-volatile hydrocarbon, reservoir deliverability can be improved by injecting heat as it reduces η and enhances easy mobility of hydrocarbon up the wells.

Keywords: Deliverability, Terminal velocity, Viscosity, Hydrocarbon, Injection, Temperature, Reservoir

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HEP017

A Review on the Role of Physics in Food Processing and Packaging Engineering (Review)

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ABSTRACT

The role of physics in food processing and packaging can never be emphasized. Blanching, pasteurization, sterilization, freezing and refrigeration are thermodynamics and heat transfer were observed. Drying and evaporation are mass transfer were briefly described. Knowledge of mechanical properties and rheology of food materials being essential in selecting method of processing and equipment to be employed in food processing. The knowledge of fluid dynamics which is also important in equipment design, storage materials selection as well as packaging materials was also explained. The use of electromagnetic fields (magnetic, microwave, electric field) is mentioned and the ultrasonic treatment as well. Physical methods for food control also contribute for raising the role of physics. The use of electromagnetic and optical techniques and in particular fluorescence spectroscopy for food quality control is shortly described as well. The role of physics in designing food packaging materials that ensures preservation against external contaminants such as water, air, chemicals and micro-organisms were also described.

Keywords: Physics, Food Processing, Packaging

HEP018

Assessment of Heavy Metal Particles for the 2024 Harmattan Dust in Kaduna, North-Western Nigeria.

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ABSRACT

In the present study, concentration of seven heavy metal particles were carried out using the dispersive X-ray fluorescence (EDXRF) technique. The preliminary results obtained from dust samples collected at three major places (Murtala Square, Ahmadu Bello Stadium, and NYSC Orientation Camp) all in Kaduna town revealed their average concentration to be: Sr(226 ppm), Zr(83 ppm), Ti(4860 ppm), Ni(183 ppm), V(302 ppm), Pb(106 ppm), and K(19624 ppm) respectively. When computed, the health effects due to these metallic particles showed that the 2024 harmattan dust in Kaduna town does not pose any serious respiratory effect to the inhabitants of the town.

Key words: Harmattan, EDXRF, Kaduna, Particles, Concentration.

HEP019

Development of an automatic Body Mass Index machine with proposed IoT-Based for weight management

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ABSTRACT

Overweight and obesity are major health concerns associated with non-communicable diseases and are the leading causes of death globally. Body mass index (BMI) is a widely used measure for assessing nutritional status. In this work, an automatic BMI machine was designed and constructed using an HC-SR04 ultrasonic sensor for height measurements. Then HX 711 200kg load cells with a load amplifier for weight measurements and an ATMEGA328P microcontroller was employed for computations. A 16x2 LCD was used for displaying the results and a Wi-Fi module was incorporated for connectivity to the internet. To make the system a smart instrument, an IoT-based approach was proposed. The BMI machine was integrated with Thingspeak, a cloud-based IoT platform, for data storage and analysis. MATLAB Machine Learning was used to analyze the BMI data and make predictions based on height and weight sensory data. A Supervised Exponential Gaussian Process Regression algorithm was employed to predict whether a person is underweight, normal weight, overweight, or obese. The proposed IoT-based BMI system has the potential to provide personalized and real-time BMI measurement and prediction, which can assist in weight management and promote healthy lifestyles.

Keywords: Body Mass Index, Internet of Things, Liquid Crystal Display, Machine Learning.

HEP020

Acidic Environmental Corrosion Inhibition Of Aluminum Alloy Using Piper Guineense Extract

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Abstract

This study focused on how to modify environment to favour the optimal applications of aluminum alloy AA3003 used in 0.75 M HCl environment at varied temperatures (303K, 318K and 333K) using gravimetric technique. The inhibitor extraction was done using reflux extraction technique at constant temperature for 3-hours. The investigation revealed a reduction in mass loss and corrosion rates in the presence of Piper guineense seed extract with corresponding high inhibition efficiency of 76%. The inhibition efficiency had an inverse relationship with increasing temperature. Langmuir and Temkin adsorption models were employed to test the nature of adsorption and the extract conforms to physisorption mechanism of adsorption. The negative value of Adsorption Gibb's Free Energy, ΔG^0_{ads} determined showed that the adsorption process of the inhibitor extract was spontaneous. The thermodynamic parameters were studied.

Keywords: Corrosion Inhibition, Piper guineense, Aluminum Alloy AA3003 and Adsorption Model

HEP021

Analysis Of Households Cooking Fuels Consumption And Their Related Emissions In Some Selected Local Government Areas In Kano State

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ABSTRACT

The study analyzed the effect of the household cooking fuels consumption, their emission, effects and implications for the inhabitants of three selected environs in Kano state. Questionnaire survey were randomly administered for the three locations which gives the information such as respondents profile, cooking characteristics of the residential areas, types of cooking fuels, their fuels choices and the factors that determine their fuels choices. The air quality parameters such as Carbon IV Oxide (CO2), Carbon monoxide (CO), Nitrogen IV Oxide (NO2), Sulphure IV oxide (SO4), Nitrogen oxide (NO) and the particulate matters (P.M2.5) were all determined for cooking period and non-cooking period. The quantities of the fuels used to boil 4.0litres of water were measured using weighing balance while that of electricity was measured with prepaid meter. The results revealed that 53.3% of the total households use Liquefied Petroleum Gas (LPG) while 33.3% of the total households use charcoal. This work revealed that firewood, charcoal and kerosene have the highest amount of hazardous emission with negative effect on the indoor air quality as a result of indoor air pollution which may leads to climate change, respiratory diseases and premature deaths. The study indicates that electricity has no any emission at the point of use while Liquefied Petroleum Gas (LPG) has less emission. Based on the results obtained, this work recommends the advocacy of using LPG or electricity for all households cooking activities.

Keywords: Air quality, Cooking fuels, Emission, Households, Indoor pollutants, Radiation.

HEP022

Exploring Spectral Images for Contrast Visualisation from CT Images

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ABSTRACT

About 2.3 million cases of female Breast Cancer and 670,000 deaths were estimated by the World Health Organization in February 2024, accounting for 30 percent of all female cancers. In Nigeria 49 percent of women aged 36 and above were diagnosed, thus positioning Nigeria as the 2nd highest in Breast cancer amongst African countries. The National Cancer Control programme in Nigeria is focused on early detection and to extend the life of patients. 2-D mammography is used because of its technique for early detection. Tomosynthesis has shown promise for removing overlying clutter in 2D imaging. However, start-ups work in Breast CT provided compelling results that motivates this work. Avoidance of mechanical compression of breast and providing cross-sectional images that removes all the clutter seen in 2D. Lesions becomes visible, hence early detection of malignancy. Results in Breast CT to date is focused on using versions of clinical CT. By contrast, this work proposes using a photoncounting approach by investigating photoncounting technology and comparing it to conventional CT in terms of contrast visualization. Results presented from simulation work demonstrates that photoncounting technology utilises data in polychromatic beam where contrasts decrease with increasing photon energy.

Keywords: Photoncounting, Breast Cancer, conventional CT, Mammography

HEP023

Radiation health risk assessment of laterite deposit used as construction material in Asaba, Nigeria

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ABSTRACT

Radiation risks posed by radionuclides in laterites, especially when employed as construction material, are of great concern to the environment and health of the general public. This study therefore assesses the radiation health risk of radiation from 40K, 232Th and 226Ra in laterites deposits obtained from Anwai, Asaba. Gamma spectroscopy analysis by NaI(TI) detector was used to measure the activity concentrations (ACs) of 226Ra, 232Th and 40K in collected laterite samples while some radiation risk indices were calculated to assess the radiological health risk of the use of the laterite. The measured ACs were in the range of 72.35±1.40 to 98.83±0.64 Bqkg−1, 64.17±0.75 to 94.96±0.59 Bqkg−1 and 156.53±1.29 to 241.96±2.25 Bqkg−1, respectively. Obtained average AC of 87.81±1.65 and 78.47±1.61 Bqkg−1 for 226Ra, and 232Th, respectively exceeded worldwide averages reported by UNSCEAR whereas that of 40K with value of 211.59±4.20 is within the limit of the world average. Values of representative gamma index, activity utilization index and absorbed dose, annual effective dose and lifetime cancer risk were above their recommended world average range, indicating a significant health risk of the use of the laterites in building and other construction purposes. From the above, it is suggested that the use of the examined laterite deposit in construction of houses be should be discouraged

Keywords: Natural radionuclides, Radiation exposure, Laterite, Environmental monitoring, Health risk

HEP024

Comparative assessment of Entrance surface dose (ESD) for patients undergoing conventional chest radiography examination.

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ABSTRACT

The Entrance surface dose (ESD) for patients undergoing conventional chest radiography examination at the radiology department FTH Katsina was determined using three (3) different methods; mathematically using Tin and Tsai formula based on X-ray machine parameters (indirect method), using CALDOSE_X 5.0 software based on X-ray machine parameters (indirect method) and directly using thermoluminescence dosimeter (TLD-100). The Entrance Surface Dose (ESD) was; Tsin & Tsai formula:0.15 mGy(chest AP), 0.12 mGy (chest PA), 0.21 mGy (chest lateral), with CALDose_X: 0.23 mGy (chest AP), 0.19 mGy (chest PA), 0.31 mGy (chest lateral), and TLD: 0.22 mGy (chest AP), 0.20 mGy (chest PA), 0.37 mGy (chest lateral), these were all below the DRLs recommended by international regulatory authorities; International Commission forRadiological Protection (ICRP) of Chest AP (0.30 mGy), Chest PA (0.30 mGy) and Chest lateral (1.50 mGy), with National Radiological Protection Board (NRPB); Chest AP Chest AP (0.30 mGy), Chest PA (0.30 mGy) and Chest lateral (1.50 mGy) The dose levels from this investigation were lower than other international and local dose levels for the three employed methodologies and for the three projections, according to a comparison of this study with other international and local reference levels. The mathematical model of the Tin & Tsai formula or CALDOSE_X software model can be adopted for patient dosimetry in places where the essential facilities for patient dose monitoring (TLDs and others) are scarce or unavailable as well as financial constraints.

Keywords: Entrance surface dose (ESD), Diagnostic reference levels (DRL), Chest radiography, Radiation dose, Thermoluminescent (TLD) dosimeters.

HEP025

Assessing the Impact of Gas Flaring Activities in Ebedei, Southern Nigeria

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ABSRACT

Gas flaring affects sustainable growth and development. Although the existence of natural gas and crude oil is predicted to act as a socioeconomic catalyst for faster, sustainable growth, the state of Nigeria's oil-producing regions is far from what was anticipated. Eleven (11) experimental locations, including Obinomba (control site), which lacks a gas flaring station, provide data for the collections. The air quality indices concentrations and various temperatures were measured. At a starting location that was 50 meters distant from the flare's bund wall, assessments of the location temperature and also air quality in Ebedei were taken at intervals of 50 meters. The statistics indicate that both the temperature and the quantity (content) of gases (CO, NO2, SO4, and CH4) have increased. Thus, a rise in temperature is proportional to a rise in flared gases. It is imperative that no agricultural crops be planted in this area that react adversely to high temperature variation, such as cassava, palm trees, rubber trees, bananas, and other crops. It can be suggested that the extracted gas be liquefied and bottled for usage in home and industrial settings, as well as being heavily utilized by a gas turbine to generate electricity. Residential buildings should be constructed at least 0.5 kilometers away from the flare point, and water samples should

be analyzed to determine the level of contamination and water portability. To maintain adherence and keep the blessed environment, it is totally crucial to urge that FEPA continuously track and assess the degree of damages attributed to gas flaring.

Key words: Gas Flaring, Temperature alterations, Pollution, Ebedei

HEP026

Analysis of Heavy Metals Concertation in Soil and Under Groundwater Around some Dump Sites of Samaru Metropolis Kaduna State Nigeria using Atomic Absorption Spectroscopy

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ABSRACT

This study investigates the concentrations of Cd, Cr, Zn, Ni and Pb in soil and hand dug water near some major dumpsites in Samaru metropolis, Kaduna State Nigeria were investigated during dry seasons using Atomic Absorption Spectrophotometry. The mean concentration levels for Pb, Cd, Cr, Zn and Ni was 0.0473 mg/kg, 1.3539 mg/kg, 0.0125 mg/kg, 0.0052 mg/kg, and 0.3149 mg/kg respectively in the dumpsite soils while the mean concentration of the water samples was 0.0481 mg/l,1.2163 mg/l, 0.0049 mg/l, 0.009 mg/l and 0.5109 mg/l for Pb, Cd, Cr, Zn and Ni respectively. The concentrations of the heavy metals in the dumpsite soils indicates that Pb, Cr, Zn is less than the WHO,2011 Limits and EU Standard while Cd and Ni exceed WHO,2011 Limits and less than the EU Standard. While the mean concentration of heavy metals in water samples shows that Ni and Cr exceed that of WHO, 2011 Limits, US EPA 2000 limits and NIS, 2007 Standard while Cr and Zn has mean concentration less than that of WHO, 2011 Limits, US EPA 2000 limits and NIS, 2007 but Pb has value less than WHO, 2011 limits but fall within the range of US EPA 2000 limits. The Geo Accumulation Index in soil for Pb, Cd, Cr, Zn and Ni was -2.58252,0.771714, 0.771714, -4.79037 and -0.68678 respectively while in water sample was -0.68678 to -2.56575, 0.664538, -4.8498, -4.1465 and -0.20286 for Pb, Cd, Cr, Zn and Ni Respectively. The results showed that the dumpsites soil and water were polluted with Cd. This calls for proper waste management practices and policy implementation. The results of the physiochemical parameters of water samples analyzed shows that the PH was found mostly to be acidic and varies from PH 6.29 to PH 7.04 and is found to be within the safety limit of WHO 2011 and NIS, 2007 Standard limits. And the electrical conductivity level in the water samples was found to be ranges from 5.2µScm-1 to7µScm-1 respectively.

Key words: Heavy Metals, PH, AAS, Conductivity, spectroscopy

HEP027

Application Of Statistical Process Control (Spc) Techniques In The Soft Drink Industry- A Case Study Of Coca Cola-Soft Drink And Beverages Producing Company, Benin City, Nigeria.

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Abstract
The work dealt with the application of Statistical Process Control (SPC) in soft drink Company – a case study of Coca -Cola soft drink and beverages producing company, Benin City, Edo State, Nigeria. It presents quality control charts techniques to monitoring product quality of a production process in real - time. P-charts were used to check the production process of a world class soft drink company. A number of samples were periodically selected within a period of 3 months for analysis. On the average 5000 random samples were selected in each batch. The Minitab statistical software was used to construct the P-chart, capable of tracking process in real-time and providing automatic notification of non-conformance. The implication of these charts plotted is that the process is in a state of control as all points plotted are within the upper control limit and the lower control limit while data point rally round the P-chart. It is therefore recommended for all food and beverages industries to reduce product variability and to save cost.

Keywords: Statistical Process Control (SPC), P-chart, state of control, Sampling, Minitab statistical software, real – time surveillance, product variability and save cost.

HEP028

Environmental Impact Of Food Packaging Materials: A Review Of Contemporary Development From Conventional Plastics To Biodegradables/Polylactic Acid Based Materials – For Food Safety And Environmental Sustainability

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Abstract
In food packaging, plastics have remained the material of choice, and after serving their intended purpose, a large proportion ends up in the environment where they persist for centuries. Food packaging plastics account for the bulk of plastic waste that is polluting the environment. Additionally, given the fact that petroleum reserves are finite and facing depletion, there is a need for the development of alternative materials that can serve the same purpose as conventional plastics. This paper reviewed the functions of packaging materials and highlights the future potential of the adoption of green materials. Biopolymers/biodegradables such as Polylactic acid (PLA) has emerged as the most favoured bioplastic. However, it is limited by its high cost and some performance drawbacks.

Blending with agricultural waste and natural fillers can result in green composites at low cost, low greenhouse gas emissions, and with improved performance for food packaging applications, the continent of Africa is proposed as a rich source. Africa is yet to make its mark as it is still lagging behind in terms of production of bioplastics. It is recommended that Africa should step up research into bioplastics technology for food packaging environmentally friendly and sustainability.

Keywords: Food Packaging Materials, Plastics, Biodegradables, Polylactic Acid (Pla), Bioplastics Technology.

HEP029

Assessing the Impact of Gas Flaring Activities in Ebedei, Southern Nigeria

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ABSRACT

Fingerprints have been the gold standard for personal identification within the forensic community for more than one hundred years. It is still universal in spite of discovery of DNA fingerprint. The science of fingerprint identification has evolved over time from the early use of finger prints to mark business transactions in ancient Babylonia to their use today as core technology in biometric security devices and as scientific evidence in courts of law throughout the world. The science of fingerprints, dactylography or dermatoglyphics, had long been widely accepted, and well acclaimed and reputed as panacea for individualization, particularly in forensic investigations. To save the society from the criminals and terrorists and to make the lives more comfortable, fingerprint can play a very important role. With advancement of technology and more sophisticated integration of this technique and its application will enhance more quick and accurate result even from partial print of fingers.

Key words: Identification, Forensic, Security, Biometric, Dermatoglyphics.

HEP030

Investigation Of The Colour Vision Deficiencies Of Medical Science Students In Some Selected Schools In Bauchi State, Nigeria

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Abstract

Color vision deficiency (CVD) is a prevalent condition affecting a significant portion of the population. For medical science students, color vision plays a critical role in accurately interpreting various medical results like pathology slides, x-ray imaging, visual cues for patient assessment etc. Consequently, this research investigated the prevalence and severity of red-green color vision deficiencies among medical science students in some selected institutions in Bauchi State, Nigeria. The Ishihara test was used for screening color vision deficiencies. A total of 900 medical science students were included in the study. The students underwent individual assessments using the Ishihara test made up of plates designed to detect red-green color deficiencies. The results showed that out of the 900 medical science students, a significant proportion of 10.22% exhibited red-green color vision deficiencies. The prevalence and severity of CVD varied among genders with male students having a prevalence of 5.78% and female students having a prevalence of 4.44%. This research further emphasizes the need for the formulation of specialized training tailored towards students with CVD to minimize the problems they may face due to CVD.

Keywords: CVD (colour vision deficiecncy), Ishihara test, red-green colour deficiency

HEP031

A review on phase change materials in building applications

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ABSTRACT

Building sector is the largest energy-consuming sector, accounting for over one-third of the energy consumption in the world. it is responsible for 40% of the total energy consumption of which heating, cooling and hot water are responsible for approximately 70%. Currently, around 75% of the primary energy supply for heating and cooling is based on fossil fuels. Towards an energy sustainability, efficiency, environmentally friendly and low-carbon building sector, Thermal energy storage systems, using Phase Change Materials (PCMs) are gaining attention due to its role in achieving energy conservation in buildings. This paper offered an overview of previous works and recent studies of the integration of different PCMs into passive buildings materials. Previous research articles were presented, their results regarding the incorporation of PCMs in buildings structures and its impact on the energy conservation and thermal comfort were analyzed. It has been found that using PCMs, energy efficiency of buildings was improved, energy consumption cost was minimized, and the thermal comfort requirements were assured. In addition, PCMs can provide key solutions to energy shortages, carbon emissions and their serious threat to the environment. Based on the findings, future recommendations were proposed to work on the areas of research for further improvements.

Keys words: Thermal energy storage systems, Phase Change Materials, Passive buildings, Energy efficiency.

HEP032

X-Ray Output Dose Assessment Of Some X-Ray Facilities In Jos Plateau State

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Abstract

the use of diagnostic machines in hospitals in Jos Plateau state are on the increase. Adequate quality control measures of such equipment are important to prevent unwanted radiation exposure and hence ensure adequate dose optimization during diagnostic examinations. In this study, dose reproducibility, exposure linearity and coefficient of variation of five x-ray units were investigated using a calibrated Unfors Mult-o- meter 710l. The results indicated that of the five (P1, P2, P3, P4 and P5) x-ray machines studied, 80% (P2, P3, P4and P5) had tolerable dose reproducibility,100% (P1, P2, P3, P4 and P5) exposure linearity and 80% (P2, P3, P4 and P5) coefficient of variation. 80% of all the studied x-ray units had acceptable deviation with tolerance limit of 5%. From the result gotten in this study, advice was given to the studied hospitals to continue to ensure proper monitoring and maintenance of their x-ray machines and should be carried out at least annually and when major parts are replaced or fixed. Which will enhance quality practice and radiation safety for patients and staff.

Keywords: x-ray machine, exposure linearity, dose reproducibility, coefficient of variation, radiation safety, tolerance limit

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HEP033

The Role Of Physics In Medicine

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ABSTRACT

The contributions of physics to medicine is enormous. Much could be written about the impacts of the basic discoveries of physics in medicine, which has greatly improved medical practices. This work discussed some of the developments in medicine in which physics and physicists played direct and indirect roles. Some of these innovations in medicine include x-ray, computed tomography (CT) scan, magnetic resonance imaging (MRI), ultrasound scan,

nuclear medicine, all of which have revolutionize medical science. More recent innovations in medicine from applications of physics are also described. These include the utilization of optical devices (lasers) for medical diagnosis, patient monitoring and therapy. The use of lasers in surgical procedures is expanding rapidly from the initial uses in ophthalmology (NASEM, 2019). Also Nanotechnology, first envisioned by the distinguished physicist Richard Feynman, and its application in medical science was discussed. We finally encouraged more physicists in medicine as there are still more grounds to cover. New trajectories in medicine call for a stronger role for physics in the clinic. The movement toward evidence-based, quantitative, and value-based medicine requires physicists to play a more integral role in delivering innovative precision care through the intentional clinical application of physical sciences).

Key words: X-rays, CT scan, MRI, Ultrasound, Nuclear medicine

HEP034

General Fluka Code: A precise simulation code for Cancer Therapy

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ABSTRACT

FLUKA is a general-purpose Montecarlo tool for calculations of particle transport and interaction with matter. The FLUKA applications range from LHC or cosmic energies down to hadron –therapy and micro-dosimetry. It is the standard tool at CERN for beam machine and interactions and radioprotection. All FLUKA models and algorithms are objects of long and constant development that benefit a wide range of applications. The paper describes and summarizes the main feature of the FLUKA Monte Carlo code which included the transport and interaction of electromagnetic and hadronic particles the new development of the Fluka positron emission tomography (mc) particle code. Uses for an extended range of applications including medical physics, it provided the nuclear and medical community with dedicated simulation tools for clinical and investigation including selected new developments in the nuclear interaction models, namely: hadronic interaction in the few GeV energy range and their effect on nuclear fusion reaction: intervention of alpha particles below 150MeV/A: improvement of the latest stage of nuclear reactions improvements in the FLUKA's graphical interface flair will also be presented

KEYWORDS: Fluka, flair Montecarlo, cancer therapy

NPP: Nuclear and Particle Physics

NPP001

Activity Concentration of Natural Radionuclides and its Associated Radiological Hazard of Fish (Bonga Shad) Samples from the Coastal Communities of Okrika, Rivers State, Nigeria

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ABSTRACT

A study was conducted of radionuclides concentration and radiological hazards in Fish (Bonga Shad) samples between latitude: 40.43'44" N and 40.45'57" N and longitude range of of 70.3'20" E to 70.6'42" E of the Coastal communities of Okrika, in Rivers State, Nigeria using gamma spectroscopy method with NaI (TI) detector. The average activity concentration of radionuclides of ranged from 104.88 to 1271.04 with a mean value of 551.47±336.50 Bq/Kg, varied from 1.04 to 49.35 with a mean value of 13.67±14.47 Bq/Kg and ranged from 4.47 to 16.62 with a mean value of 8.81±3.32 Bq/Kg in terms of 40K, 238U, and 232Th respectively. The Radium equivalent (Raeq) ranged from 30.05 to 170.99 with a mean value of 68.73Bq/Kg which is lesser than the recommended limit of 370 Bq/Kg. The Total effective dose ranged from 22.49 to 106.49 with a mean value of 38.58±27.54 $\mu Sv/y$, which is below the safe limit of $70\mu Sv/y$ (UNSCEAR) and far lesser than the recommended limit of 1mSv/y(ICRP). The Internal Hazard index (Hin) ranged from 0.11 to 0.60 with a mean value of 0.22±0.16 which is below the safe limit of 1.0 (UNSCEAR). These values implies that the exposure or ingestion of Fish (Bonga Shad) samples of coastal communities of Okrika pose no radiological risks.

Keywords: Coastal Communities, Natural Radionuclides, Total Effective Dose, Internal hazard

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NPP002

Risk Assessment of Occupational Radiation Exposure in a Gamma Irradiation Facility.

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ABSTRACT

The Gamma Irradiation Facility (GIF) is one of the components of the Nuclear Technology Centre (NTC) of the Nigeria Atomic Energy Commission, Abuja. It is a multipurpose facility for both industrial and research applications. It was acquired by the Federal Government of Nigeria to contribute to the socioeconomic development of the country. It can irradiate a

wide spectrum of products. It was commissioned in 2006. The facility is the largest on the continent of Africa with initial activity of the Cobalt-60 as 340,000 Curie (upgradeable to 1,000,000 Curie). For the purpose of radiation protection, the GIF is classified into different areas such as: controlled areas, supervised areas, surveillance areas and areas outside the facility. Individuals working in both radiological and nuclear facilities are often exposed to sources of ionizing radiation resulting in some level of occupational hazards. Appropriate levels of radiation protection of workers are essential for the safe and justified use of radiation, radioactive material and nuclear energy.The prime objective of this research was to estimate the risk and probability of cancer induction to workers and also to evaluate the level of radiation safety at the facility. Data was collected by means of TLDs and personal dose records for a 5 year period (2018-2022). The results from the data were used to compute the mean annual dose, mean annual collective dose as well as risk assessments using the ICRP 1990 and 2007 models and the results compared with international standards.The results show that the risk due to radiation exposure of the workers is within the recommended and regulatory limits.

Keywords: gamma irradiation, occupational hazard, radiation protection, risk

NPP003

Assessment of Absolute Activity of Radioactive Sources Using Monte Carlo Simulation

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ABSTRACT

The study was an attempt to determine the absolute activity of sources. 22Na, 137Cs, 241Am, and 60Co were exposed to NaI detector at some predetermine distance and time. Their amplified pulses were recorded for simulation using Monte Carlo technique. Various spectra were produced, energy calibration of the detector was performed, corresponding fit peaks of spectra were determined for energy resolution. It was observed that the activity of most of the sources has closely matched with the predicted values. However, the activity of 241Am has deviated greatly. This may be connected to the radioactive behavior of 241Am, the loss of detectors potential due to long term used and other geometrical and statistical factors among others.

Key words: Absolute activity, NaI detector, Amplified pulses, Energy resolution, Energy calibration

NPP004

Assessment of Natural Decay Series Radionuclides and Toxic Metals in Potash: Implication for Environmental Contamination in Gashu'a.

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ABSTRACT

The study is an attempt to assess Natural Decay Series (NDS) radionuclides and toxic metals in Potash collected from Gashu'a, Yobe state, Nigeria. The essence was to evaluate the corresponding implications for environmental contamination in Gashu'a and its surroundings. Thirteen potash samples were collected and analyzed by measuring the pH levels, gross alpha/gross beta counts, gamma spectroscopy and ICP–OES. Examination of samples using Scanning Electron Microscope (SEM) and Electron Dispersive X-rays (EDX) was also performed to gain further physical information of the minerals present. It was found that the pH value of most of the samples was ≥ 10. The gross alpha, gross beta counts, gamma energy from NDS radionuclides was low compared to radiation safety limits (WHO). While the elemental spectra, composition and concentration was found to be high.

Key words: Natural Decay Series (NDS) Radionuclides, Toxic metals, Environmental contamination,

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NPP005

EVALUATION OF INDOOR RADON-222 AND THE ESTIMATION OF THE EXCESS LIFETIME CANCER RISK IN RUMUIGBO AND RUMUOKWUTA VILLAGE IN OBIO/AKPOR LOCAL GOVERNMENT, RIVERS STATE.

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ABSTRACT

The excess lifetime cancer risk from radon-222 has been estimated in some randomly selected dwellings in Rumuigbo and Rumuokwuta villages in Obio/Akpor Local Government area using the Airthingscorientium digitalradon-222detector. The global positioning system (GPS) was used to record the geographical coordinates of the sample points. The indoor radon-222 concentration levels varied from 1.85-34.78 Bq/m3 with an average of 12.85 ± 8.72 Bq/m3 for Rumuigbo village and 5.55 -26.27 Bq/m3 with an average value of 14.72±7.09 Bq/m3 for Rumuokwuta village. These values are lower than the safe limit of 100-300 Bq/m3 by the International Commission on Radiological Protection (ICRP). The annual absorbed dose ranged from 0.47 – 8.77 mSv/yr with an average of 3.24±2.20 mSv/yr for Rumuigbo. The absorbed dose for Rumuokwuta village varied from 1.40 – 6.63 mSv/yr with an average of 3.71± 1.79 mSv/yr . Also, the annual effective dose rate for Rumuigbo ranged from 0.11 – 0.99 mSv/yr with a mean of 0.77 ±0.52 mSv/yr, while that of Rumuokwuta village varied from 0.05– 1.21 mSv/yr with an average of 0.89± 0.43 mSv/yr. These values are lower than the ICRP recommended safe limit of 3-10 mSv/yr.The excess lifetime cancer risk for Rumuigbo village varied from 0.39– 7.37 x 10-3 with a mean of 2.73 x 10-3 ± 1.85, while the excess lifetime cancer risk for Rumuokwuta ranged from 1.10x10-3-5.57x10-3 with a mean of 3.12 x10-3 ±1.50×These values are higher than the ICRP safe limit of 0.29×10-3.These values suggest that people living around Rumuigbo and Rumuokwuta villages may face the danger of lung cancer in the near future.

Key words: Excess lifetime cancer risk, absorbed dose, ICRP, AEDR.

NPP006

Assessment of effectiveness of radiation shielding materials for X-rays facilities in a Federal Teaching Hospital Gombe, Gombe State, Nigeria

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ABSTRACT

A government teaching hospital in Gombe, Nigeria, evaluated the efficiency of minimal radiation shielding barriers for X-ray equipment. This was accomplished by measuring scattered radiation exposure at a specified distance during radiological examinations using a rados 200 survey meter. In the standard X-ray machine room at the Federal Teaching Hospital in Gombe, the following shielding options were taken into account for the examination and exposure measurements: concrete plus lead, wood, and wood plus glass. The measurements were carried out by positioning the survey meter at five different points. The result obtained for the concrete plus lead, wood, and wood plus glass shielding barriers ranged from 0.05 ± 0.01 to 0.12 ± 0.01 μSv/hr, 0.08 ± 0.01 to 0.13 ± 0.01 μSv/hr and 0.08 ± 0.01 to 0.15 ± 0.01 μSv/hr respectively. Annual Effective Dose Equivalent (AEDE) values for concrete plus lead, wood, and wood plus glass shielding barriers ranged from 0.2428 to 0.5826 mSv/y, 0.3884 to 0.6472 mSv/y and 0.4044 to 0.7283 mSv/y respectively. All the radiation shielding barriers are all effective with the concrete plus lead barrier being the most effective. Based on the results obtained, the AEDE were within the recommended permissible limit of 1 mSv/y.

Keywords: X-ray, conventional room, survey meter, scattered radiation, equivalent dose, and shielding barriers

NPP07

Loss of Feed Water Pumps Tripped as an Advanced Boiling Water Reactor (ABWR) Malfunction: Transient Analysis and Safety Considerations

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ABSTRACT

The safe and reliable operation of Advanced Boiling Water Reactor Power Plant (ABWRPP) is crucial to ensure the protection of personnel, the environment, and public safety. However, malfunctions can lead to transient events that challenge the stability and safety of the reactor. This research is to investigate the scenario of "Loss of Feed Water Pumps Tripped" as a specific malfunction in Advanced Boiling Water Reactors (ABWR). The study aims to comprehensively analyze the consequences of this malfunction on reactor behavior, thermal-hydraulic conditions, and core safety. Furthermore, the paper explores potential safety measures and mitigation strategies to enhance the reliability and safety of ABWR during such incidents. For the ABWR plant, the malfunction analysis was carried out on the loss of feed water – both feed water pumps trip, using the CASSIM 32 Engine simulator for ABWR. For this malfunction case, the simulator was run and data collected at an initial time of one hour and subsequently at two hours interval for 17 hours. Data were tabulated as shown in the table of values.

Keywords: Advanced Boiling Water Reactor Power Plant (ABWRPP), Advanced Boiling Water Reactor (ABWR), feed water pump, CASSIM 32 Engine.

NPP008

Determination of Radioactivity Concentrations and Radiological Parameters of some Radionuclides in some Fertilizer Samples use in Adamawa State, Nigeria

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ABSTRACT

In this study, six different fertilizer and animal dung samples (NPK 20:10:10, NKP 15:15:15, Narict Minerorganic fertilizer, Urea, Cow dung and Chicken dung) were gotten from agrochemical shops and animal farms in Yola, Adamawa State. The samples were prepared according to standard, and sent to Centre for Energy Research and Training, Zaria, and analyzed using NaI(TI) Gamma – Ray Spectrometer.The results show that the activity concentration of 226Ra was below the recommended threshold value of 35 Bq/kg in all the fertilizer samples, while the activity concentrations of 40K was below the recommended threshold value of 420 Bq/kg in Urea, Chicken and cow dung, but higher in the other three fertilizers. Activity concentration of 232Th was however found to be higher than the recommended threshold value of 45 Bq/kg in all the fertilizer samples. Values of other radiological parameters were also below the recommended minimum values, except for NPK 15:15:15 whose values were found to be above the recommended minimum values. Base on the results obtained, there should be regular sensitization and monitoring on the application of these fertilizers to minimize the cumulative effect of the presence of these radionuclides, on humans and animals through food chain.

Key Words: Radionuclides, Fertilizer samples, Radiological Parameters, Activity Concentration.

NP009

Investigation of Annual effective Dose and Radium Equivalent Dose rate in Barikin Ladi

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ABSTRACT

Naturally occurring radiation emanates from the Earth's subsurface, exhibiting variations based on geological locations. This study investigates the annual effective dose and radium equivalent dose within Barikin Ladi, encompassing nearly ten villages actively engaged in mining activities. The analysis involves measuring the activity concentration of naturally occurring radiation to assess the annual effective dose and radium equivalent dose. Notably, among these villages, two (Tapo and Barikin Ladi) exhibit lower radium equivalent doses than the established ICRP standard. This discrepancy can be attributed to the extensive mining activities undertaken in these areas. Implementing appropriate measures for safety is crucial to mitigate potential hazards and ensure the well-being of those involved.

Keywords: Annual effective dose, Radium equivalent dose, Radiation exposure and Background radiation

NPP010

Main Steam Isolation Valve Closure - Axial Distribution as a WWER Malfunction: An Analysis of Safety Implications

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ABSTRACT

The main steam isolation valve (MSIV) closure is a critical operation in pressurized water reactor (PWR) designs, such as the WWER (Water-Water Energy Reactor). This journal paper investigates the potential malfunction of MSIV closure, with a focus on the axial distribution of closure in WWER reactors. The analysis aims to assess the safety implications of this specific malfunction, considering the impact on reactor core cooling, system behavior, and potential con

sequences for plant safety. Through simulations and analytical evaluations, the study presents a comprehensive understanding of the risks associated with MSIV closure axial distribution malfunction and provides insights into potential mitigation strategies to enhance nuclear power plant safety.

Keywords: Water Water Energy Reactor (WWER), Malfunction, Main Steam Isolation Valve, Safety implications

NPP011

Steady State Performance Analysis of Advanced CANDU Reactor, ACR - 1000, Power Plant: A Comprehensive Overview

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ABSTRACTS

This paper presents a comprehensive analysis of the performance and safety of the Advance CANDU Reactor Power Plant (ACR) Power Plant. The ACRPP is a new type of advanced nuclear reactor designed to improve upon existing CANDU technology. The paper looks at various performance and safety strategies employed by the ACR, such as its improved fuel bundle design, advanced control system, and enhanced containment systems. It evaluates the impact of these improvements on overall reactor performance and safety. The performance and safety of nuclear power plants have become significant concerns for designers, physicists, engineers, countries, and governments involved in owning or establishing nuclear power facilities. In this research, we utilize Advanced CANDU Reactor (ACR-700 MWe) simulator, a training simulator developed from CASSIM ENGINE 32 to simulate prototypes of Advanced CANDU Reactor (ACR) Nuclear Power Plants, with the aim of analyzing their responses under steady-state conditions. The simulator's operations are based on nuclear diffusion equations and point kinetic equations, utilizing the four and six-factor formulas. By employing this advanced simulator, we can gain valuable insights into the behavior and safety of ACR Nuclear Power Plants, contributing to the continuous improvement and understanding of nuclear energy technology.

Key Words: Rector, Power Plant, Simulator and Steady State

NPP012

Optimization of Radiation Protection Measures for the Safety of Occupational Workers in Nigeria.

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ABSTRACT

The application of radiation has rapidly increased with the development in the fields of research, technology and nuclear medicine. As the use of radiation is increasing, the proper implementation of radiation protection measures became necessary in order to reduce its hazardous effects. The use of radiation should be justifiable and cautious. Medical radiation workers are continuously been exposed to ionizing radiation, which can lead to a worker exceeding the recommended annual dose limit. Hence, the personnel can be subjected to some kind of deterministic and stochastic effects. The aim of this study is to assess the optimization of radiation protection measures for the safety of occupational workers in Nigeria. The quarterly readings of 20 thermo-luminescent dosimeters (TLDs) used by the personnel of the radiology department of Federal Medical Center (FMC), Katsina and General Amadi Rimi Specialists Hospital (GARSH), Katsina, Nigeria for a period of 2 years, from January, 2020 to December, 2021 was recorded. The TLDs badges were processed and analyzed using Harshaw reader model 4500 and WinREMS software. The results obtained for the first year (2020) shown that some of the personnel from the two hospitals were exposed to a radiation dose of 6.60, 6.47, 6.00, 6.24 and 5.04 mSv skin dose, which was clearly exceeded the recommended dose limit of 5 mSv per annum.However, the personnel radiation dose was within the recommended annual dose limit in the second year (2021). The study recommended that the personnel should strictly adhere to the principles of radiation protection which includes, distance, limited exposure time, shielding and proper monitoring of dose limits. So also continuous training of the personnel on the effects of radiation is advised.

Keywords: Medical imaging, absorbed dose, Effective dose, Thermo-luminescent dosimeters

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NPP013

EVALUATION OF RADIATION PROPERTIES SHIELDING OF MAGNESIUM SULFOBORATE DOPED EUROPIUM ION GLASS SYSTEM USING Phy_X/PSD SOFTWARE.

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ABSTRACT

The extensive use of gamma photons in different areas such as medical physics, radiotherapy and radiographic imaging, and space technology applications; inspires radiation physicists and nuclear engineers to find more suitable designs for radiation shielding to minimize the

potential negative effects of ionizing radiation on humans. The current study is aimed to investigate the radiation shielding properties of Magnesium Sulfoborate doped europium ion glasses with the chemical composition 10MgO+40SO3+(50−y) B2O3+ yEu2O3 with 0.1 ≤ y ≤ 1.0 mol %. Phy_X/PSD software was used to determine the mass attenuation coefficient (MAC), linear attenuation coefficient (LAC), half value layer (HVL), effective atomic number (Zeff) of the analyzed glasses. The results showed that the new glass composition exhibits promising properties in terms of mass attenuation, halve value layer and effective atomic number.All the radiation shielding parameter of the glass can be observed to decrease as the Eu2O3 concentration of the sample decreases as well, which could be due to the decrease in density that correlates with B2O3 content. The glass composition with the highest concentration Eu2O3 content and density, has the superior radiation shielding properties. Therefore, glass system can be utilized in radiation shielding applications.

NPP014

RADIOMETRIC INVESTIGATION OF AHMADU BELLO UNIVERSITY, ZARIA SEWAGE TREATMENT SITE

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ABSTRACT

The radiometric investigation of Ahmadu Bello University, Zaria sewage treatment site was carried out in three profiles along two ponds in the study area. The aim is to determine the activity concentration and does rate of naturally occurring radioactive materials and also assess the hazard to the people working in the area. In using gamma-ray spectrometer alongside with GPS (global positioning system), the concentration of 238U, 232Th and 40K were contour to show the areas of high concentration of the radionuclide. The concentration of these radionuclide are taken at 5m interval in a profile along the sewage pond. The total count and absorb dose rate were also calculated so as to compare with the world average data. The data collected were interpreted using the golden software surfer 16. The concentration of the radionuclide 238U 232Th and 40k in the study area were found to be between the range of 2ppm-21ppm which is equivalent to 22.2Bq/kg-233.1Bq/kg and dose rate of 11.35nGy/h -119.18nGy/h for 238U, 14.5ppm-29.5ppm which is equivalent to be 58.87Bq/kg-119.77Bq/kg and dose rate 36.16nGy/h-73.57nGy/h for 232Th and 2.5% - 10.5% which is equivalent to be 782.5Bq/kg 3286.5bq/kg and dose rate 32.69nGy/h-137.29nGy/h for 40K. The total count and absorb dose are 330-395 CPS and 115-200nGy/h. The result show that the absorbed dose rate of the radionuclide (238U, 232Th and 40K) and total absorbed dose rate are above world average.

Keywords: Radioactivity, Uranium, Thorium, Potassium, Contaminant and Dose rate

NPP015

EVALUATION OF GROSS ALPHA AND BETA RADIOACTIVITY CONCENTRATION OF SOME STAPLE FOOD IN MALAM MADORI, JIGAWA STATE.

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ABSTRACT

The Gross alpha and beta radioactivity were determined from six staple food collected from the study area. The samples were analyzed for gross alpha and beta using protean instrument corporation 2000dp counter. The results obtained showed that the average gross alpha activity ranged from 0.020 ± 0.001 Bq/g in maize to 1.817 ± 0.081 Bq/g in rice with a mean value of 0.578 ± 0.040 Bq/g. The gross beta concentration ranged from 0.035 ± 0.012 Bq/g in maize to 7.874 ± 0.126 Bq/g in beans with a mean value of 1.508 ± 0.056 Bq/g. The preliminary assessment of gross alpha and beta activity concentration of all six staple foods within the study area is below recommended safe limit of 1.2 and 1.7 Bq/g of alpha and beta respectively provided by USEPA (2000). Therefore, staple foods are considered to be safe radiologically for human consumption, might not pose any significant health hazard to the public.

NPP016

GRIT OF RADIATION EXPOSURE LEVEL FROM MOBILE PHONE BASE STATION IN SOME SELECTED AREAS IN GOMBE STATE, NIGERIA

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ABSTRACTS

Both natural and man-made radiation that comes in different forms such as ultra-violent light from the sun, electromagnetic radiation produced by tower-based stations, electrical appliances, and a slew of other technologies are part of human lives. Electromagnetic radiation is a very real problem; it can accumulate in humans, resulting in any number of cancers. Not only that it can lead to lower sperm count, birth defects, and increase the risk of heart attack. This study aims to determine the radiation (alpha, beta, and gamma) level from mobile phone-based stations in some selected areas within Gombe state using a Geiger-

Muller counter. Measurements were carried out on six different masts cited in Gombe tagged Vm, Em, Rm,Om, Nm and Im at various distances of 10m, 30m and 50m in four different directions. The maximum mean value, of 434.75 μSv/yr was obtained in Vm and minimum value of 123.24 μSv/yr and Nm. Gamma radiation is predominant in all the locations, then beta and alpha radiation with maximum and minimum values of 686.2 μSv/yr and 180.1 μSv/yr, 549.93 μSv/yr, and 82.73 μSv/yr, 973.8 μSv/yr and 438 μSv/yr respectively. The results obtained for absorbed dose, equivalent dose and annual effective dose were within the average permissible limit of 1mSv/yr. However, the calculated excess lifetime cancer risk values were above the maximum value of 0.29 x 10-3.

Keywords: radiation, mobile, tower, Gombe

NPP017

Radiometric evaluation of annual effective dose in water from Zobe Dam, North-Western, Nigeria

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ABSTRACT

The Annual Effective Dose (ADE) due to gross alpha and beta particles assists to estimate the radiological risks connected with utilization of water in Zobe Dam for domestic purposes, were estimated. The low background Gas-less Alpha/Beta counting system (MPC 2000DP), was used to evaluate the alpha and beta activity concentration of the sample. The range of alpha activity was 0.735±0.43 to 11.401±0.29 Bq/L, while the beta activity ranged from BDL to 11.891±0.57Bq/L. The AED varied from 0.150 to 8.319 mSv/year for adults, 0.075 to 4.160 mSv/year for children, and 0.038 to 2.080 mSv/year for infants, respectively. The average AED in adults, children and infant exceeded the ICRP dose limits of 0.1mSv/year. Water utilized for domestic purposes from the Dam might pose high risk due to intense farm activities and presence of natural radionuclide, if adequate measures are not taken.

Keywords: effective dose, gross alpha and beta, water, farm and Zobe Dam.

NPP018

INVESTIGATION OF BACKGROUND IONIZATION RADIATION OF IGBO-ETCHE RIVERS STATE NIGERIA

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ABSTRACT

The investigation of Background Ionization Radiation of Igbo – Etche Rivers State of Nigeria has been carried out using Nuclear Radiation Meters: Radalert-100, Digilert 200, GPS, and Stop Watch. The results obtained showed that the exposure dose rate ranged from11.5 – 26.5 µRh-1 with mean value of 17.45µRh-1. The Absorbed dose ranged from 100.05 – 230.55 nGyh-1 with mean value of 150.9 nGyh-1. The Annual Effective Dose Equivalent (AEDE) Investigated ranged from 0.123 – 0.283 mSvy-1 with the mean value of 0.5488 mSvy-1.The investigated ELCR ranged from 0.368 – 0.848x10-3 with the mean value of 0.55x10-. 3 These results investigated from this research work were higher than their respective recommended (UNSCEAR 2000) Values of 13.0 µRh-1, 60 nGyh-1, 0.07 mSvy-1 and 0.029x10-3 for Exposure dose rate, Absorbed Dose, Annual Effective Dose Equivalent and Excess Life Cancer Risk Respectively. These higher elevations in values may be attributed to the anthropogenic activities in this area, which include mining, exploration of crude and other industrial and constructive works. Therefore, routine monitoring of this area by Nigeria Nuclear Regulatory Agency and other Monitory Agents should be enforced to avert Cancer and other dangerous Diseases on the residents.

Keywords: Background Radiation, Radalert100, Investigation, Environment

NPP019

EVALUATION OF SOME HEAVY METALS CONTAMINATION USING CONTAMINATION INDICES AND MULTIVARIATE TOOL IN THE SEDIMENT OF RIVER HADEJIA-JAMA'ARE, NIGERIA

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ABSTRACT

Heavy metals have been greatly considered in the studies of water environs because of their poisonous effect and accumulation problem. Sediments, as one of the water environment components, turn as a reservoir of heavy metals. Increase in population, industrialization, agricultural activities, and erosion have been responsible for lowering environmental quality. The X–Ray Fluorescence (XRF) spectrometry was used in finding the heavy metal concentrations. Also statistical tools including Correlation matrix and principal component analysis (PCA) were used to find the association and metal sources. The average concentrations of Cr, Mn, Co and Mo are 5.354 $\mu g g^{-1}$, 25.113 $\mu g g^{-1}$, 7.405 $\mu g g^{-1}$, 51.389 $\mu g g^{-1}$ and 1.493 $\mu g g^{-1}$. The average concentrations of all the studied heavy metals were lower than the permissible value. Based on the Pollution indices result obtained, the Contamination Factor (CF) and Geo-accumulation Index (Igeo) values indicated that the sediments of River Hadejia-Jama'are were found within the contamination level with Mo. The Pollution load Index (PLI) values showed unpolluted in all the locations. The statistical analysis shown that there are anthropogenic and natural input in the studied rivers.

Keywords: Heavy metal, Sediment, Statistical analysis, XRF

NPP020

Assessment of 232Th, 226Ra and 40K level and Associated Radiological Hazard in Sediment from Segment of River Hadejia-Jama'are with Statistical Tools

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ABSTRACT

The activity concentrations of ^{232}Th, ^{226}Ra and ^{40}K in sediment samples obtained from segment of River Hadejia-Jama'are was measured using gamma-ray spectrometry. The measured mean activity concentrations are 38.54, 73.64 and 119.83 Bqkg-1. The average activity concentrations of ^{232}Th, ^{226}Ra are higher than the world average value. The radiological hazard parameters such as Radium equivalent, Absorbed dose rate and Annual effective dose rate related with radionuclides were calculated and found to be lower (137.98 Bqkg-1, 62.95 nGyh-1 and 0.54 mSvy-1) than the world average value of 370 Bqkg-1, 84nGyh-1 and 1mSvy-1. The multivariate statistical analysis, such as Correlation matrix and Principal component analysis showed a good correlation coefficient between radionuclides (^{232}Th and ^{226}Ra)and radiological hazard parameters. The analysis of the result showed that, the activity concentrations in sediment samples might cause environmental health effect when exposed for a long time.

Keywords: Gamma ray spectrometry, Radiological parameters, Sediment, Statistical tools

NPP021

A STUDY OF NUCLEAR EQUATION OF STATE WITH CDM3Y VERSION OF B3Y-FETAL EFFECTIVE INTERACTION

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ABSTRACT

This paper is a study of nuclear equation of state (EOS) of cold nuclear matter with the B3Y-Fetal effective interaction in its CDM3Y density-dependent version within the framework of Hartree-Fock approximation. The well-known saturation properties of both symmetric and asymmetric nuclear matter are well-reproduced in this work. Using the CDM3Y-K approach, this study has evolved a new set of useful interactions, some of which are CDB3Y1-, CDB3Y2-, CDB3Y3-, CDB3Y4-, CDB3Y5-, CDB3Y6-Fetal interactions with corresponding incompressibilities K0 = 188, 204, 217, 228, 241 and 252 MeV respectively, in excellent

agreement with those of the M3Y-Paris and M3Y-Reid effective interactions. For asymmetric nuclear matter, the new set of interactions has produced the symmetry energy Esym = 32.00 MeV with an associated slope parameter L = 55 MeV at a saturation density $\rho = 0.17 fm^{-3}$ and asymmetry parameter $\delta = 1.00$ (pure neutron matter) in good agreement with the standard values obtained from coupled channel analysis of charge exchange reactions, statistical multifragmentation model and terrestrial Nuclear Physics experimental analyses. Furthermore, the new set of interactions has been found to have bright prospects in nuclear reaction as the real folded potential computed with the CDB3Y6-Fetal interaction within the framework of double folding potential has been found to be good and similar to that of CDM3Y6-Paris whose optical potential has a repulsive direct component.

NPP022

Analysis of Elastically Scattered $d + {}^{24}Mg$ Using B3Y-Fetal Effective Interaction in the Framework of the Double Folding Model

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ABSTRACT

The elastic scattering data of deuteron by ${}^{24}Mg$ was analyzed in the framework of the double-folding (DF) model. The DF was used to calculate both the real and imaginary part of the nuclear optical potential based on a mass-dependent B3Y-Fetal effective interaction which is constructed using the lowest order constrained variational (LOCV) approach. The derived folded potentials were used to analyze the elastic scattering differential cross section of $d + {}^{24}Mg$ data within the energy range of the energy range of $60 - 170\ MeV$. Comparisons between the extracted and measured angular distributions of the differential cross-sections were made and pronounced success to reproduce the data was obtained.

Keywords: B3Y-Fetal effective interaction, Double-folding model, Elastic scattering, Folding potential.

NPP023

IN-SITU ASSESSMENT OF BACKGROUND IONIZING RADIATION FROM SOME SELECTED DUMPSITES IN SABONGARI, KADUNA STATE.

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ABSTRACT

An in-situ measurement of background ionizing radiation in four selected major dumpsites in Sabongari Local Govt, Kaduna State, Nigeria was carried out using a well calibrated portable handheld gamma surveyor. Readings were taken for three weeks in four major dumpsites around the following residential areas (Aviation, Layin Zomo, Palladan and New Extension) of Sabongari LGA, Kaduna State. Result shows that the mean background ionization radiation dose rate obtained exceeded the normal world average BIR level of 0.39μSv/hr. The computed absorbed dose rate ranges from 95.15 ± 30.943nGy/hr to 164.55 ± 12.508nGy/hr. The mean absorbed dose rate obtained exceeded the maximum permissible value (MPV) of 59nGy/hr (UNSCEAR 2000). The annual effective dose rate ranges from 0.125mSv/yr to 0.198mSv/yr with a mean value of 0.163mSv/yr.This average value is less than the acceptable safety limit of 1mSv/yr.The mean excess lifetime cancer risk value of 0.571mSv/yr in the range of 0.4352mSv/yr to 0.697mSv/yr was also obtained. The results showed that the dumpsites annual effective dose rate was below the 1.0mSv/yr maximum permissible limit recommended for the public and non-nuclear industrial environment (ICRP, 1999). These reported values may indicate no immediate health hazards, but may cause long-term health hazard to the residents of the host communities due to increase in wastes with longer period of operation.

Keywords: Dumpsites, Absorbed Dose, Effective dose, Ionization

NPP024

Assessment of Radiation Dose Level in the Farm Soil of Federal University Wukari, Northeast Nigeria.

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ABSTRACT

The study has assessed the amount of radiation exposed to farm soils of federal university Wukari, Taraba State with the aim to determine radiation dose in soils and to provide necessary information of human health risks associated with high radioactivity in soil and its effects on plant materials. Ten different soil samples were collected from different location in the farming soil and the Geiger Muller counter was used to measure the level of radiation exposure in the samples. The analyzed results showed low amount of radiation dose level. The absorbed dose values ranging between 0.1607 Gy/hr - 0.1730Gy/hr while equivalent dose rate ranges between 0.2815mSv/yr - 0.2956mSv/yr. These results revealed that the dose rate does not exceed the recommended values by International Commission on Radiological Protection (ICRP) which is 1 mSv/yr for the general public and therefore do not pose a significant health hazard. The radiation dose level has no negative effect on both the plants and the dwellers. Therefore, the study area is safe for human activities.

Keywords: Dumpsites, Absorbed Dose, Effective dose, Ionization

NPP025

MEASUREMENT OF AMBIENT BACKGROUND RADIATION LEVELS AND HEALTH RISK ASSESSMENT AT THE MAIN CAMPUS OF FEDERAL UNIVERSITY DUTSIN-MA, KATSINA STATE, NIGERIA

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ABSTRACT

The exposure to background radiation is a growing concern, it has harmful effects on human health, Background radiation levels at Federal University Dutsin-Ma Main Campus was measured using a radiation meter with meter number (GC01). The study aimed to determine if the radiation levels on the campus are within acceptable limits and identify high-risk areas where corrective action may be necessary. The indoor and outdoor radiation levels were measured in Twelve (12) buildings. The highest outdoor annual equivalent dose rate was recorded at the university library as 0.367 mSv/yr while the lowest outdoor annual equivalent dose was recorded at the senate building as 0.210 mSv/yr. The highest indoor annual equivalent dose rate was recorded at the university library as 1.541 mSv/yr while the lowest was recorded at the ICT centre as 0.630 mSv/yr. The overall average annual equivalent dose rate for indoor and outdoor on the campus were computed to be 1.100 mSv/yr and 0.262 mSv/yr respectively. A comparison of these results with the worldwide average limit of equivalent dose rate of 2.4 mSv/yr recommended by the (ICRP, 1990) shows that the ambient indoor and outdoor radiation levels at the main campus of FUDMA are within the safety limits.

Keywords: Background Radiation, Health-risk assessment, FUDMA, Katsina.

NPP026

Assessment of effective dose for head and abdominal computed tomography examinations in Federal Teaching Hospital (FTHK), Katsina.

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ABSTRACT

Increase in number of CT examinations is associated with potential health implications and requires periodic systematic investigations of dose. The amount of dose delivered to patients based on machine settings in hospitals. In the present work, we aimed to assess the effective dose received by patients who undergoes head and abdominal computed tomography (CT) examinations. Ten (10) adult patients ranging from 18 to 40 years, comprising of both genders were diagnosed using the CT examinations. The CTDIvol and DLP were first calculated from the CT machine parameters displayed on the machine console. The effective dose for the patients under consideration were then estimated. The mean DLP and mean

effective dose for abdomen and head were found to be 584.77 mGy.cm, 8.8 mSv, 946 mGy.cm and 1.9 mSv respectively. The DLP and effective dose were found to be slightly lower than other studies both national and international and are within the recommended guidelines.Key words:Effective dose, CTDIvol,DLP.

NPP027

RADIOLOGICAL HEALTH RISK ASSESSMENT OF GROUNDWATER FROM RESIDENTIAL AREA OF MAIGANGA MINING SITE IN GOMBE STATE NORTH-EASTERN NIGERIA

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ABSTRACT

The water sample were analyzed using the ultra-low level Liquid Scintillation Counter (LSC), to evaluate the gross alpha and beta radioactivity dose levels of the radionuclides in water. The minimum and maximum gross alpha activity obtained was 0.8816 (Bq.1/L) and 1.0825 (Bq.1/L) respectively, while the minimum and maximum gross beta activity obtained for water samples was 0.0330 (Bq.1/L) and 0.2380 (Bq.1/L) respectively. The activity concentration for drinking water indicate that the specific activity in the water is above the WHO guideline limit of 0.5 (Bq.1/L) for gross alpha and is lower in gross beta of 1 (Bq.1/L) limit. The results obtained were also within the range of the South Africa Department of Water Affairs and Forestry target water quality limit of (1.38) (Bq.1/L) for gross alpha activity. The process of treating contaminated water is crucial for ensuring public safety and environmental protection. In recent years, there have been widespread concerns about the potential risks associated with radioactive and toxic substances in water sources. Therefore, this water after treatment is not safe for the members of the public.

Key words: Radiological hazard, Groundwater, Mining, Health-risk

NPP028

ASSESSMENT OF INDOOR RADON GAS CONCENTRATION IN NATIONAL OPEN UNIVERSITY OF NIGERIA: A CASE STUDY OF CALABAR STUDY CENTRE

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ABSTRACT

The current work deals with indoor radon (222Rn) concentrations measurements in the Calabar Study Centre of the National Open University of Nigeria using a Corentium Arthings digital radon detector meter for seven days representing a short–term average

measurement of indoor radon gas concentration level. The geographical coordinates were recorded using a hand-held geographical positioning system for the sample point. Measurement were taken for seven days and the following data where obtained83±2.19Bq/m3,80±3.69Bq/m3,86±5.57Bq/m3,84±1.59Bq/m3,82±3.59Bq/m3,81 ±4.89Bq/m3 and 85 ±5.59 Bq/m3.The average radon(222Rn) concentration level was found to be83 ± 3.87 Bq/m3 with a geometric mean of 82 ± 3.54 Bq/m3. It was observed that the radon concentration was below the reference level of 100 Bq/m3 recommended by the World Health Organization (WHO). Although the current exposure of members of the public to natural radiation is not critical, the situation could change abruptly when other activities commenced. The excess life time cancer risk calculated for 70 years, 60 years, 50 years, 40 years and 30 years were 1.72 × 10−3,1.65× 10−3,1.39× 10−3,1.44× 10−3and 0.69× 10−3respectively. The calculated values of the excess life time cancer risk are all higher than the set limit of 0.029 × 10−3 by International Commission on Radiological Protection. However, there are no observed cases of lung cancer epidemic in this Centre. Therefore, it is advised to use fans and effective ventilation techniques to reduce radon levels. Identifying the regions of the country where people are most at risk from radon exposure should be the main goal of any national radon policy.

Keywords:Indoor radon; radon concentration; Digital Radon Gas detector; Calabar Study Centre

NPP029

Assessment of Radon Contamination in Drinking Water Sources Around Babban Tsauni Gold Mining Area, Federal Capital Territory, Nigeria

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ABSTRACT

Radon, a naturally occurring radioactive gas, is produced through the disintegration of radionuclides like uranium, thorium, or radium in the earth's crust. In this study, the radon levels and the annual dose from drinking water sources were assessed in Babban Tsauni, Gwagwalada, Nigeria, where artisanal gold mining is taking place. Water samples were collected and analysed for 222Rn using liquid scintillation counter (Tri-Carb-LSA1000). The highest radon activity concentration was found in Dobi with a value of 3.23 Bq/L, while the lowest was found in Tsauni 7; 0.025 Bq/L. Both values were significantly below the maximum permissible limit of 11.1 Bq/L and the world average value of 10 Bq/L, as established by USEPA and WHO respectively. The annual effective dose from ingesting radon was also below the permissible limit of 1 mSv/yr for all age groups, the values for adult, children and infant ranged from 1.96E-06 to 2.35E-05 mSv/y, 2.95E-06 to 3.52E-05 mSv/y, 3.44E-06 to 4.11E-05 mSv/y and 1.79E-07 to 2.55E-06 mSv/y, 2.68E-07 to 3.82E-06 mSv/y, 3.13E-07 to 4.46E-06 mSv/y for ground and surface water sources respectively. This study concluded that the radon concentrations in the water sources remained within safe limits and that the anthropogenic activities of gold mining had no significant effect on the water sources

Keywords: Radon, activity concentrations, Drinking water, Effective Annual Dose

NPP030

Measurement of Natural Radioactivity in Soil samples Collected from Owukpa Coal Mining Site in Ogbadibo Local Government Area, Benue State, North Central-Nigeria

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ABSTRACT

The measurement of natural radioactivity in soil in the vicinity of Owukpa coal mine has drawn the attention of researchers because it's important public health issue. This study measured the levels of natural radioactivity in ten (10) soil samples collected from Owukpa coal mine, Benue state-Nigeria. The activity concentration of the soil samples collected from 10 different points, 30 meters apart from the mine were examined using high purity germanium (HPGe) detector. The result obtained for Uranium-238 (238U) ranges from $28.31 \pm 2.40\ to\ 30.05 \pm 3.46\ Bq/Kg$, for Thorium-232 (232Th) ranges from $35.20 \pm 3.45\ to\ 37.20 \pm 4.50\ Bq/Kg$ and Pottasium-40 (40K) ranges from $96.99 \pm 3.70\ to\ 120.00 \pm 5.50\ Bq/Kg$. The activity concentrations recorded were below the safe limits of 35 Bq/Kg for 238U and 400 Bq/Kg for 40K whereas that of 232Th exceeded safe limit of 30 Bq/Kg, as recommended by regulatory bodies. Due to bioaccumulation of radioactivity concentration in the vicinity, there's need for routine monitoring and assessment of the mining site quarterly on annual basis to help staff and general public adopt safety measures to avoid acute radiation syndrome.

Keywords: Activity concentration, Detector, Radionuclides, Standard limit

NPP031

Head And Chest CT Dose Examination for Adult Patients in the Federal Neuro Psychiatric Hospital, Maiduguri, Borno State.

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ABSTRACT

This study conducted in the Federal Neuro Psychiatric Hospital (F.N.P.H.), Maiduguri, Borno State, focused on determining CTDIw (Computed Tomography Dose Index, weighted) and

Dose-Length Product (DLP) values for adult patients undergoing routine CT scans of the head and chest. The research aimed to establish local diagnostic reference levels (DRLs) and investigate factors contributing to CTDIw and DLP variations between different CT scanners. The significance of DRLs lies in their role in preventing excessive radiation exposure during radiological diagnoses, aligning with international guidelines from organizations like the International Commission on Radiological Protection (ICRP) and European Union Directives. The study's findings revealed variations in CTDIw and DLP values among the head and chest CT examinations, attributable to different scan parameters such as kV, mA, mAs, scan range, pitch, and scan time. In comparison, chest CT scans generally exhibited lower values, while head CT scans showed lower DLP values. These variations underscore the importance of optimizing dose parameters. Recommendations from this research included setting DRLs at the third quartile of the dose distribution, encouraging less optimal operators to adjust their protocols by reducing kV, mA, and mAs, or increasing slice thickness to align with the majority operating at lower doses. It could therefore be concluded that the CTDI and the DLP in FNPH, Maiduguri, are within or below the values in the European Commission Report.

Keywords: Radiation Dose; MSAD; CTDIw; DLP; DRL

NPP32

Image Quality Optimization of X-ray Machines Using Dose Control Mechanisms

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ABSTRACT

Optimization in diagnostic radiology requires evaluation of patient dose and image quality. This study is aimed at using quality control test in assessing Dose Optimization in some hospitals in Makurdi, Benue State.The study adopts the following materials, namely, X-ray machines, grid alignment test tool, film screen contact test tool, tape and focal spot test tool in the quality control examinations in five different hospitals, A, B, C, D and E in Makurdi .Results of this study indicated that in all the selected hospitals, exposure at 50kVP, 10mAs is not possible, hence it is advised that exposures at 50kVp should be made at low mAs (3-4mAs). Additionally, two of the selected hospitals, namely, B and D have aged x-ray machines which resulted in having poor film screen contact, and poor or bad grid alignment. This resulted in poor quality image, encouraged rejection and hence repetition, increased breakdown or increased cost of maintenance as well as unnecessary and undulyexposure of the patients,occupational workers and maybe relation helping to station and hold the patients for the examination. Also, from all the hospitals stated, the study showed that a varying level of adherence to guideline were evident with no hospital demonstrating complete compliance of focal spot within 7-8 lines pair. These results suggest that hospitals that are outside limit should be made to do routine Quality Control on their radio diagnostic equipment as a way of curtailing over exposure to radiation.

Keywords:Diagnostic X-rays, Kvp, Radiographic parameters and Image quality,

NPP033

DETERMINATION OF NEUTRON FLUX OF INNER AND OUTER IRRADIATION CHANNELS OF NIRR-1 LEU CORE

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ABSTRACT

This research work focused on the determination of the effective cross section and thermal neutron flux of the inner (B3) and outer (B4) irradiation channels of the Nigeria Research Reactor-1 (NIRR-1). The effective cross section for the inner (B3) and outer (B4) irradiation channels were found to be 1.85×10-22cm2 and 1.28×10-22cm2respectively. This shows that B3 has higher effective cross section than B4 which means that B3 will have more particle collision and produce more energy than B4. The thermal neutron flux for inner (B3) and outer (B4) irradiation channels were found to be $(4.78 \pm 0.22) \times 10^{11} n/cm^2 s$ and $(6.86 \pm 1.86) \times 10^{11} n/cm^2 s)$ respectively. This shows that outer (B4) channel is more thermalized than inner (B3) irradiation channel because the more the fission the more the thermal neutron flux produce. This signifies that B4 will produce more heat and energy than B3, Meanwhile B3 absorbed or scatter more neutrons by the materials in the reactor than B4 because B3 has lower neutron flux than B4.

Keywords: LEU, NIRR-1, High purity Germanium detector (HPGe), flux monitors, calibration sources.

NPP034

Naturally occurring radionuclide materials assessment and health effect attributable to NORMs exposure from geogenic materials used for dwellings construction in Kano.

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ABSTRACT

All minerals and raw materials contain radionuclides of natural origin. The most important for the purposes of radiation protection are the radionuclides in the U-238 and Th-232 decay series. This study is set to assess Activity concentrations of 226Ra, 232Th, and 40K and health effects attributable to naturally occurring radioactive materials (NORMs) exposure from geogenic materials used for dwelling construction in Kano Nigeria using gamma-ray spectrometry. The materials studied include gravel aggregates (granitic) A1 and A2, sharp

sand B and plaster sand C. The measured activities in Bq kg–1 for 226Ra, 232Th, 40K, ranged from 56 ± 3 to 60±5, 59±4 to 321±9 and 125± to 1249±2 respectively. The radium equivalent activity (Raeq) estimated ranged from 153.50 to 615.83 BqKg-1 with average value of 375.97 BqKg-1, external radiation dose hazard index (Hex) of the samples ranged from 0.42 to 1.66 with a mean value of 1.02, the internal radiation hazard index (Hin) ranged from 0.57 to 1.83. The gamma radiation activity concentration index (Iγ) ranged from 0.54 to 2.22 with a mean value of 1.15. The highest estimated radium equivalent concentration for the samples are 615.83 and 551.06 Bq kg–1 and are slightly greater than the 370 BqKg-1 for safe use these radiation values can contribute to background radiation that should be taken into consideration for its effect on the resident in the building. The values obtained are also within acceptable levels and suggest that the use of these materials does not pose radiological hazard.

Keywords: activity concentration, exposure, gamma-ray, radiological hazard, spectroscopy.

NPP035

Assessment of Health Risk Arising from Hypothetical Release of Sr-89, Sr-90 and Sr-91 from Nigeria Research Reactor-1

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ABSTRACT

The Nigeria Research Reactor-1 (NIRR-1) is one of the low power research reactors operating presently in the world. NIRR-1 belongs to a class of low power research reactors known as the Miniature Neutron Source Reactors (MNSRs) which are sealed core pool-type research reactors designed by the China Institute of Atomic Energy (CIAE) and deployed to several countries for utilization mainly in Neutron Activation Analysis (NAA) and Education and Training. In February 3, 2024, NIRR-1 marked two decades since it first went critical with Highly Enriched Uranium (HEU) fueled core. However, due to proliferation concerns, the reactor core has been converted to a Low Enriched Uranium (LEU) fuel since 2018. Despite nuclear technology's significant contributions to the global economy for over five decades, apprehensions about radiation exposure persist, posing challenges to its widespread acceptance, particularly in countries like Nigeria. This study aims to showcase the level of public safety concerning radiation exposure from nuclear reactor facilities. Radionuclide inventory of some highly radiotoxic isotopes such as Sr-89, Sr-90, and Sr-91, was adapted from Simon et al., 2023. This inventory was then utilized to model the release of the radionuclides, allowing for subsequent estimation of associated health risks based on a worst-case hypothetical scenario. The Hot-Spot computer code was utilized for the calculation of the total effective dose resulting from exposure to these toxic radionuclides. For a release period of one hour, the estimated total effective dose for a co-located worker within the reactor facility was 2.2 μSv. Similarly, for the closest member of the public

situated 100m away, the estimated dose was 1.4 μSv. Notably, these estimated dose values fall below 5% of the prescribed dose limits for both workers and the public, as stipulated by the Nigerian Nuclear Regulatory Authority (NNRA). This underscores the fact that NIRR-1 is unlikely to pose a significant health risk to workers and the public, even in a worst-case scenario involving 100% release of Sr-89, Sr-90, and Sr-91 inventories.

Key Words: NIRR-1, Inventory, Total Effective Dose, Radionuclides

NPP036

Evaluation of Radiation Dose Received by Pediatrics Patients during Routine X– Ray Examinations of the Chest in three selected Hospitals in Yobe State, Nigeria.

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ABSTRACT

The radiation risks associated with children are higher than the risks for adults. Children have growing organs and they have a longer life expectancy than that of adults. Consequently, the effects of damage from radiation could be greater in children than in adults. This study sought to measure the mean Entrance Surface Dose (ESD) and third quartile values for pediatrics chest X–ray examinations, compare these to findings and recommendations from other studies and propose methods of dose reduction in three hospitals (H1–H3) in Gashua. The age groups considered in this study were <1 year, 1–< 5 years, 5–<10 years and 10–15 years. The mean ESD for the chest AP in the age range < 1year in the three hospitals (H1–H3) were respectively 0.10, 0.09, 0.66 mGy; for the age 1-<5years were respectively 0.12, 0.10, 0.48 mGy and for the age range 5-<10 years were respectively 0.13, 0.09, 0.34 mGy.

Key words: Entrance surface dose; Pediatrics; Optimization

NPP037

INVESTIGATION OF RADIOACTIVITY CONCENTRATION IN SOIL SAMPLES FROM SELECTED MINING AREAS IN YUNUSARI YOBE STATE NIGERIA.

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ABSTRACT

Mining is very important but uncontrolled quarry mining activities could cause radiation exposure, and environment pollution which could cause harmful effect to the host communities. In this study, the activity concentrations of 226Ra, 232Th and 40K in soil

samples from five mining locations in Yunusari Yobe State was determined using sodium Iodide (NaI) detector. The systematic sampling techniques was used to collect thirty soil samples from the five mining locations at 50meter apart and a depth 15cm which was analysed for the activity concentration at the Centre for Energy Research and Training (CERT), Ahmadu Bello University Zaria. The Gamma Absorbed Dose Rate, Radium Equivalent Activity, External Hazard Index, Annual Effective Dose Rate and Excess Life Cancer Risk were calculated. Results show that the mean activity concentration of 226Ra, 232Th and 40K in soil samples were 108.27Bq/Kg, 58.99 Bq/Kg and 287.95 Bq/Kg respectively. The Gamma Absorbed Dose Rate (D) was 97.612nGh-1 which is above the world standard of 84nGh-1 while the mean Radium Equivalent Activity was 214.090Bq/Kg which is below the world standard of 370Bq/Kg. The mean values of External Hazard Index, Annual Effective Dose Rate and Excess Life Cancer Risk were 0.3200mSv/y, 0.120mSv/y and 0.300mSv/y respectively which were below the recommended public dose limit of 1mSv/y as recommended by International System of Radiological Protection (ICRP). In conclusion the results show the distribution of natural radionuclides in the soil samples around the study area. The average activity concentrations of 226Ra, 232Th and 40K from this study are higher than the world average values except that of 40K which is lower than world average.

Keywords: Activity Concentrations, Environmental Pollution, Mining, Radiation Exposure.

NPP038

Evaluation of radiation shielding and particle interaction features of ZnO.B2O3 and ZnO.P2O5 glass systems doped with PbO nanoparticle.

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ABSTRACT

Neutron, gamma ray and charged particles attenuation parameters of phosphate and borate glass systems in the form of $PbO.ZnO.B_2O_3$and$PbO.ZnO.P_2O_5$were computed by adjusting the percentage concentration of nanoscalePbO in each of the glass samples with densitiesof samples varied from 3.675 to 6.650 g.cm-3 for borate glasses and 3.177 to 4.845 g.cm-3 for phosphate glasses. The Phy-X/PSD computer program was used in the computation of ten gamma ray shielding parameters while the ranges ofH+, He++, Au+, and C+ ions were calculated with SRIM Monte Carlo code at designated energies between 0.01 to 20 MeV, Total Stopping Power (TSP) and range (R) values for interactions of electrons were computed using ESTAR NIST program at certain electrons energies between 0.01 and 1000 MeV, while Fast Neutron Removal Cross-Section (FNRCS) at 4.5 MeV and Macroscopic effective removal cross-section (MRCs) computed with was calculated with Phy-X/PSD software and MRCsC software respectively. Results obtained showed that shielding properties of these two glass systems are mainly influenced by chemical composition and densities of these samples.

Results indicated that increasing the PbO content to 70% in borate and 50% in phosphate glass systems significantly enhanced gamma radiation, neutron, electron and charged ions shielding properties of these glass systems.

Keywords: Glass shielding; phosphate and borate glasses; lead oxide;Phy-X/PSD.

NPP039

Determination of Radon-222 Concentration in Some Selected Drinking Water Sources at Geidam Town, Geidam Local Government Area of Yobe State, Nigeria

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ABSTRACT

Exposure of human to high doses of Radon-222 through ingestion in water or inhalation as gas can lead to stomach or lung cancer. In this research, the concentrations of Radon-222 (222Rn) were investigated from eleven (11) water samples collected at different locations within Geidam town, Geidam Local Government Area of Yobe state, using liquid vacuum degasification process and RD-35 device. From the results obtained, the minimum value of radon concentration is found in the main borehole of Low-Cost near Friday mosques to be 0.57 pCi/L, while the maximum value measured which was related to a water tank in the general hospital quarters recoded 1.89 pCi/L. The overall average radon concentration for all water samples is found to be (0.99 ± 0.14) pCi/L. According to the achieved results, the radon concentration from all the water samples was lower than the maximum allowable concentration set by EPA and WHO guidelines.

Keywords: Radon-222, Natural Radioactive Sources, Effective Dose, Drinking Water

NPP040

Determination of Radiological Parameters from Topsoil Samples in Geidam, Yobe State, Nigeria

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ABSTRACT

The activity concentrations of elemental occurring radionuclides (226Ra, 232Th and 40K) from the 10 different soil samples in Geidam, Yobe state, Nigeria were measured. The activity concentrations in these samples were determined through gamma spectroscopy with a Thallium activated Sodium Iodide NaI (TI) detector. The activity concentrations in the 10 samples measured, ranged between 49.14 ± 0.8 to 99.27 ± 3.4 Bq kg-1, 68.93 ± 1.3 to 95.11 ± 1.1 Bq kg-1, 115.19 ± 0.6 to 217.50 ± 0.6 Bq kg-1 for 226Ra, 232Th, and 40K radionuclides

respectively. The radium equivalent activity estimated in the soil samples were in the range of 164.00 to 248.43 Bq kg-1 and with mean value of 205.6 Bq kg-1. The mean absorbed dose rate was determined to be 91.56 nGyh-1, while the annual effective dose rate was estimated, varied in the range from 89.04 to 135.96 μSv y-1 with an average value of 112.29 μSv y-1. The internal and external hazard indices estimated for the study area ranged from 0.6 to 0.9 with mean value of 0.8 and from 0.4 to 0.7 with mean value of 0.6 respectively.

Key Words: Radionuclides, Hazard Index, Gamma Spectroscopy, Radioactivity, Geidam.

NPP041

Assessing Radiation Safety Awareness and Practices among Residents Undergoing Medical Imaging Procedures in Tambuwal metropolis

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ABSTRACT

In this research article on the Assessing Radiation Safety Awareness and Practices among Residents Undergoing Medical Imaging Procedures in Tambuwal metropolis with the aimed to assess radiation safety awareness and practices among residents of Tambuwal metropolis undergoing medical imaging procedures. Three primary objectives were pursued: (1) to assess the number of people undergoing imaging exposure, (2) to determine the level of awareness and knowledge regarding radiation safety, and (3) to develop and implement targeted educational initiatives to promote radiation safety practices, particularly among the youth population. The study involved 100 participants within Tambuwal metropolis. Results revealed that an overwhelming 98% of participants reported undergoing at least one medical imaging procedure within the past 12 months, with abdomen Radiography scan being the most common type. However, only 10% of participants were aware of the potential risks associated with ionizing radiation from medical imaging. Of those aware, only 5% could specify risks (e.g., cancer), while 69% were unable to articulate specific risks. Furthermore, the data indicated a lack of access to formal radiation safety education, as only 5% of participants had received information on radiation safety, primarily from friends, family, and relatives. Only 2% reported taking precautions during medical imaging procedures. However, 15% had asked medical personal providers questions about radiation safety before undergoing imaging, highlighting some interest in the topic. These findings underscore a critical need for targeted educational initiatives to enhance radiation safety awareness and practices, especially among the youth population. Community-wide efforts, involving medical personal providers and other stakeholders, are essential to bridge the knowledge gap and promote safer practices during medical imaging procedures in the area.

Improved awareness and education can contribute to reducing potential health risks associated with *ionizing radiation exposure.*

Key Words: Medical Imaging, Radiation Safety, Radiography, Questionnaire and ionization radiation

NPP042

Radioactivity concentration and Associated Radiological Health risk of EFFA Coal mine, Benue state, Nigeria

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ABSTRACT

The radionuclides and the associated health risk of the coal mine at Effeche Effa in Benue state, Nigeria has been identified in this work. Soil samples were collected from the coal mine site and analyzed by using an HPGe detector for 238U, 232Th and 40K. Mean radioactivity concentrations (in Bq/kg) of 238U, 232Th and 40K evaluated are 40.44 ± 12.60, 27.69 ± 6.74, 72.40 ± 14.20 respectively. The average radium equivalent activity (Raeq in Bq/kg), absorbed γ dose rate (D in nGy/h),annual effective dose rate: Indoor and Outdoor (E in mSv/y), external hazard index (Hex), internal hazard index (Hin), Iγ and excess lifetime cancer risk (ELCRin Sv/y) are 85.62 ± 23.07, 38.43 ± 10.37, 0.19 ± 0.05, 0.05 ± 0.01, 0.23 ± 0.06, 0.34 ± 0.10, 0.55 ± 0.15 and 0.16 ± 0.04 respectively. The absorbed dose rate, external hazard index and outdoor annual effective dose are lower than that of the recommended value of 60nGy/h and 1mSv/y. Radium equivalent and excess life cancer risk are within safe limit. The results are lower than the recommended value by United Nations Scientific Committee on effects of atomic radiation (UNSCEAR, 2000). The findings show that the coal mining in the area does not pose any radiation health hazard to the inhabitants, though no radiation dose is completely safe.

Keywords: Radioactivity, radionuclide, absorbed dose rate, gamma rays, coal

NPP043

Exploring the Effects of Electromagnetic Radiation from Earbuds of Different Mobile Phone Brands.

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ABSTRACT

The use of mobile phone earbuds has become widespread, but there are concerns about the possible health effects of the electromagnetic field (EMF) radiation that these devices emit. This project aims to explore the effects of EMF radiation from different earbud brands, including Apple, Oraimo, Sony, Tecno, Itel, JBL, Samsung, New Age, and P-Series. The study analysed the mean E-field, H-field, SAR, and Dosimetry measurements in idle, music, and calling modes. The findings revealed that P-Series earbuds consistently showed higher electromagnetic field emissions compared to other brands across all modes. Specifically, in idle mode, the P-Series earbuds emitted 7V/m of E-field, 1.02μT of H-field, 0.0058W/kg of SAR, and 12.25W/kg of Dosimetry. In music mode, the values were 9.86V/m, 3.48μT, 0.0116W/kg, and 24.29W/kg. In calling mode, the values were 11.86V/m, 4.34μT, 0.0167W/kg, and 33.15W/kg. However, the measured values were within acceptable limits set by safety guidelines. It is important to note that the heating rate of EMF was not determined. Generally, the EMF level was higher in the music and calling modes, which may be due to increased power usage, active communication functionality, amplification of audio signals, proximity to the head, and signal interference. t is advised to follow safety guidelines and conduct further research to assess the long-term effects of EMF radiation.

Keywords: Dosimetry, earbuds, radiation, electromagnetic and idle.

NPP044

Measurement of the Radiation Emission from the commonly used Electric Light Sources (Bulbs)

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ABSTRACT

The measurement of radiation emission levels from common electric light sources was done using a Geiger Muller counter (j2554-2 model). At varying distances from 2cm, 4cm, 6cm, 8cm and 10cm with about four (4) incandescent light bulbs, compact fluorescent lamps (CFL), light emitting diode (LED) and high-intensity discharge lamps were used. The readings were obtained by placing each bulb at 60 seconds under the Geiger Muller tube for a count in μSV/h and the background count was measured and recorded before taking the reading of the samples. The measurements and analyses revealed that there are possible x-ray and ultraviolet emissions from the electric light bulbs at a distance of 2cm. Table 3 shows radiation levels of radiation emission readings obtained for compact fluorescent lamps (CFL). This showed that 23w had the highest reading (2.83μSV/h) at the distance of 2cm and the next to this bulb is 85w with 2.53μSV/h at the same distance. Also, at 4cm away from the light source, 23w has a radiation value of 1.59μSV/h which is the highest for that distance and next to it is 85w with a radiation value of 1.27μSV/h. However, the emission value from the incandescent bulb with values 0.31μSV/h (2cm, 40w) and 0.33μSV/h (10cm, 200w) was

not as high as those of the other bulbs. The values are still within the safety limit by radiation sources and the effects of ionising radiation.

Keywords:incandescent, emitting, ultraviolet, fluorescent and radiation.

NPP045

TRANFER FACTOR OF RADIONUCLIDES FROM SOIL TO FRUITS AND PLANT CROPS IN IPERINDO GOLD MINE SITE, OSUN STATE, SOUTHWESTERN NIGERIA.

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ABSTRACT

Iperindo is a community in Atakumosa Local Government Area in Ijesha, Osun State Southwestern Nigeria. Over decades, the community is predominantly farmers of food and cash crops and at the same time are artisanal miners. The proximity of Agricultural activities is close to the mine site. This study aim to access the transfer factor of naturally occurring radionuclides from soil to fruit and food crops in gold mine site, Iperindo, Osun, Southwestern Nigeria. The transfer factor ofprimodial radionuclides, 40K, 238U and 232Th from soil to fruits and plants for the three consecutive months within the mine sites were estimated to be 0.954, 0.554 and 1.262 respectively for cocoyam. 0.1912, 0.826 and 0.738 for banana, 1.0104, 0.986 and 0.992 for guava, 0.942, 0.941 and 0.766 for pawpaw, 0.933, 1.258 and 1.362 Bqkg-1 respectively. Also it was estimated to be 0.812, 1.024 and 1.137 for cocoyam, 1.083, 0.588 and 0.176 respectively for banana,0.932, 0.801 and 1.177 for guava, 0.772, 0.729 and 0.890 for pawpaw and 0.986, 1.106 and 0.753Bq/kg for cocoa respectively. The estimated transfer factor of these radionuclides were 1.284, 0.848 and 2.012 for cocoyam, 1.149, 1.522 and 1.226 for banana, 1.195, 1.036 and 1.176 for guava, 1.267, 1.083 and 0.970 for pawpaw and 1.199, 0.979 and 1.341 Bq/kg respectively for cocoa. For control location, the transfer factor for the radionuclides from soil to fruits and plants for the three consecutive months were estimated to be 0.961, 0864 and 0.926 respectively for cocoyam, 0.892, 0.853 and 0.926 for banana, 1.032, 0.892 and 0.924 for guava, 1.080, 0.767 and 1.263 for pawpaw, 0.972, 0.812 and 1.069 Bq/kg for cocoa respectively. The estimation was 0.972, 1.012 and 0.021 for cocoyam, 0.875, 1.027 and 0.107 for banana, 1.070, 0.017 and 0.128 for pawpaw and 1.168, 1.021 and 0.381Bq/kg for cocoa respectively. Also, the estimation was 1.088, 1.460 and 1.096 for cocoyam, 1.273, 0.970 and 0.982 for banana, 1.016, 0.939 and 0.778 for guava, 1.317, 1.328 and 1.108 for pawpaw and 1.146, 0.650 and 1.089q/kg for cocoa respectively. The transfer factor obtained from the study showed that 40K has a higher value compared to 238U and 232Th within the period of research study especially in October while 238U and 232Th transfer values were similarly close and varies from one another. However, the transfer values obtained from the research *study is lower than the permissible limit 370Bq/kg for Agricultural use by USEPA.*

KEYWORDS: Transfer factor, Artisanal mining, Iperindo Primodial radionuclides, Gamma spectrometry

NPP046

X-ray Diffraction Techniques for Soil Mineral Identification

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ABSTRACT

X-ray diffraction (XRD) is an effective method that does not cause damage, used to analyze crystalline substances. It offers valuable insights into the properties of materials, including their structures, phases, crystal orientations (texture), and various structural characteristics such as average grain size, crystallinity, strain, and crystal defects. By observing the X-ray diffraction peaks, which result from the constructive interference of a monochromatic X-ray beam scattered at specific angles from each set of lattice planes within a sample, valuable information about the sample's composition and arrangement can be obtained. In this study, the X-ray diffraction technique has been used to identify different phases of minerals present in soil samples in obtained from some locations around the FCT to determine their industrial applicability. The result of sample from Wuna area shows the presence of Quartz (64%), Muscovite (8%), Orthoclase (6%) and Albite (22%). The sample obtained from Checheyi area confirms the presence of Quartz (48%), Muscovite (7%), Orthoclase (16%) and Anorthite (29%). The sample obtained from Dadabiri reveals the presence of Quartz (60%), Muscovite (17%), Orthoclase (15%) and Anorthite (8%).

Keywords: Mineral, XRD, Soil, Technique

NPP047

Assessment of Radiological Impact of Anthas River Water Pocos de Cadas, State Minas Gerais, Brazil

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ABSTRACT

Examination of river water samples from Pocos de Cadas, Brazil State Minas Gerais, Brazil has been carried out using High Pure Germanium Detector (HPGe) in IPEN, Brazil. The radionuclides (RDNs) such: 40K, 226Ra, 228Ra, 232Th and 238U including examination of Annual Effective Dose (AE_{Dose}) and Life Time Cancer Risk (LTCR) were determined. The

mean value of 40K, 226Ra, 228Ra, 232Th and 238U in BqL-1: 51.6±4.26, 3.4±0.44, 5.05±0.96, 2.57±0.76 and 0.017±0.002 respectively. For AE_{Dose}: infant, children and adult, 40K, 226Ra, 228Ra, 232Th and 238U: 2.79, 0.16 and 0.18;0.96, 0.52 and 0.69;7.7, 1.89 and 2.51;8.29, 5.62 and0.87 0.01, 0.011 and 0.0027 in (mSv/y) while LTCR for morbidity and mortality forK-40, Ra-226, Ra-228, Th-232 and U-238 had values of20.3 and 0.84, 1.71 and 1.23, 7.33 and 5.05, 0.27 and 0.182; 0.0011 and 0.0007 respectively. The average value of RDNs were found to be higher than 1 BqL-1, 0.1 BqL-1, 1 BqL-1 and 1 BqL-1 recommended limit according to (WHO) except 238U while AE_{Dose} and LTCR the average value are higher than 0.1mSv/y and 10^{-3} recommended allowable limit according to (WHO) except 238U. It is concluded that the river water is not radiological safe for consumption and construction.

Keywords: Radiological impact, water, high Pure germanium detector, Brazil

NPP048

Determination of the Bioeffects Emanating from the Radiological Exposure of NASENI Headquarters Staff to Background Radiation

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ABSTRACT

Background terrestrial radiation survey of National Agency for Science and Engineering Infrastructure (NASENI) Headquarters located in Idu Industrial Area of Abuja was carried out and twenty-three locations were probed inside the compound of the Agency. An in situ measurement approach was adopted using a Inspector alert nuclear radiation meter (manufactured by S.E international U.S.A SN:35440) with inbuilt Geiger-Muller tube was used for the measurement of 222Rn concentration in the twenty-three (23) investigated points at NASENI Abuja, in order to estimate the bioeffect to the staff resulting from 222Rn and its progeny . The meter was held at the abdominal level (about 1m above the ground surface) and counted for ten minutes for each value measured. The radon concentration (D) range from 130.3 – 217.5 nGy/yr with an average of 176.65 nGy/yr, annual effective dose equivalent (outdoor) (AEDE) values ranges from 0.160 – 0.267 mSv/yr with an average of 0.216 mSv/yr and excess lifetime cancer rate (ELCR) values ranges from (0.480 – 0.801) x 10-3 with an average of 0.649 x 10-3. The recorded values of background radiation exceeded the safety limit of 59.00 nGy/yr, AEDE is lower than the recommended value of 1 mSv/yr while the ELCR recommended value of 0.29 x 10-3 was exceeded significantly. Hence the studied area has a potential of radiological contamination and therefore the necessary precautionary steps be taken urgently.

Keywords – Bioeffect, exposure, NASENI, background radiation and idu

NPP049

The Prospection of U, Th, Bi And Other Elements From Outcrops Indicating Promising Deposits

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ABSTRACT

The motivation for this research work is to mitigate the dwindling foreign of earning of Nigeria. This work interrogated outcrops with potentials deposits of U, Th, Bi and other elements. These elements can boost revenue base of Nigerian economy. Five samples were collected and analyzed using proton induced X-ray emission technique. This technique of analysis was chosen because of its ability of multi-element assay and that it is non-destructive to the samples under interrogations. The results obtained indicated U, Th, Bi, Cu, Zn, Se, Br, Rb, Y, Zr, Ba, Dy, Au; even Ti, V, Cr. Closer look on the result showed that some of these elements are deposited in commercial quantities with a prospect to enlarge the foreign revenue Till. U element can be used to develop the electricity industry which has been comatose for years in Nigeria. Other allied industries could spring up as a result of prospecting some of these elements that will be beneficial to Nigeria and the World as a general. In addition to this is the prospect to engage the restless Youths in search for Jobs.

Keywords: U, Th, Bi, Cu, Zn, Se, Br, Rb, Y, Zr, Ba, Dy, Au, Proton Induced X-ray emission (PIXE).

NPP050

MEASUREMENT OF BACKGROUND RADIATION IN SOME SELECTED AREA AT FEDERAL COLLEGE OF EDUCATION YOLA

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ABSTRACT

Radiation is said to be energy that is in motion and manifests itself everywhere. it look in the form of waves or particles which can be either useful or dangerous. Since radiation has always existed in the environment since the earth's origin, daily exposure to varied levels of ionizing radiation is inevitable for humans. Therefore, environmental radioactivity measurements are crucial for measuring the background radiation level caused by naturally occurring radioactive sources with terrestrial and cosmic origins because of these effects on living beings. The aim of this is paper is to measure and record the background radiation of various locations in Federal College of Education Yolaand use the measured value to produce a reliable and easily accessible background radiation. JLDG Geiger Counter Nuclear Radiation Detector γ-ray Beta Gamma Detector Geiger counter Radioactivity Detector JD-3001 was used for this research to measure background radiation at some selected location at Federal College of Education Yola. The average mean values of the background radiation across the

selected location is 0.19 mSv/yrs which it appear to be lower than the recommends maximum permissible dose for occupational exposure of 20 mSv/yrs according to International Commission on Radiological Protection (ICRP).

NPP051

Natural Radioactivity Distribution in Soils and the Radiological Implications from Pindiga Formation, North-Eastern Nigeria.

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ABSTRACT

Naturally occurring radioactive materials (NORMs) are everywhere in our environment and have accounted for significant level of exposure to human and entire ecosystem. In the present study, forty-two (42) terrestrial gamma radiation dose (TGRD) measurements were performed across the Pindiga geologic formation in Gombe State, North-Eastern Nigeria, using a portable handheld NaI(TI) gamma surveyor. The preliminary results showed TGRD values range between 48-71 nGy/h, the mean Annual Effective dose equivalent (AEDE) of 0.06, while the excess life cancer risk (ELCR) was 123µSv/yr. The results confirmed higher radioactivity level in some measuring points to be attributed to the anthropogenic events in those areas. Hence, precautionary measures be observed in those areas.

Key words: Pindiga formation, Anthropogenic events, NORMs, TGRD, Exposure

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NPP052

DETERMINATION OF ELEMENTAL COMPOSITION OF BITTER COLA (GARCINIA KOLA) USING X-RAY FLUORESCENCE (XRF) METHOD

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ABSTRACT

The elemental content of four varieties of Cola nitida (crushed coated, pink, brown, and white) has been determined using X-ray Fluorescence (XRF) Analysis. The samples were analyzed at the National Geoscience Research Laboratory (NGRL) Kaduna, using high resolution Energy Destructive X-ray Fluorescence (EDXRF) machine (minipal 4,25kv, Dy No. 1055) for a period of 200 seconds for each sample to emit or fluorescence their characteristics. Fourteen (14) different elements ; Ni, As, Cr, Co, Mn, Cu ,Zn, Cd, Pb, Fe, V, Na, K, and Ca were detected. Potassium oxide (K2O) has the highest oxide composition of 33.80% and Arsenic trioxide (As2O3) has the lowest of 0.10%, while Potassium has highest percentage concentration of 28.06% in the elemental composition, Arsenic has the lowest of 0.064% in the elemental composition of the crushed coated sample of cola nitida , Na has the highest percentage composition in both raw and crushed samples of 1.42% and 1.38% respectively. Potassium (K) has the lowest of 0.024% in both crushed and coated samples of cola nitida. It was discovered that potassium has more pronounced in the samples that were crushed with its coat. Some of these elements were detected by many researchers like Cadmium, Lead, Chromium, and Arsenic, though their percentage concentration is higher than those obtained in this research work. Elements like; K,Ca, Na, Cu,etc. performs many functions in human body in controlling blood pressure, heart diseases, metabolism, blood clothing, nerve transmission, infant growth, bone strength, red and white blood cell maturation , cholesterol and glucose control, heart contraction and brain development. Some of these elements are useful for pregnant women for the development of the foetus as well as the mothers heal.

Keywords: Cola nitida, X-ray Fluorescence (XRF), Energy Destructive X-ray Fluorescence (EDXRF), potassium, human body.

NPP053

A REVIEW OF HEALTH IMPLICATIONS ASSOCIATED WITH BACKGROUND RADIONUCLIDES IN SAND MINING AREAS

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ABSTRACT

The assessment of any release of radioactivity into the environment is crucial for safeguarding public health, particularly when this radioactivity has the potential to enter the food chain. This study delved into the environmental risks associated with natural radioactivity and toxic elements in quarry sites, with a focus on the transfer mechanism from soil to plant to human pathways. Soil samples were gathered from various mining sites and control locations, and analyzed for natural radionuclides, specifically 238U, 232Th, and 40K. This article compiles and reviews a number of research studies conducted by scholars in Nigeria, which have been published in both national and international journals. The aim is to provide an integrated and synthesized overview of the present state of knowledge on transfer factors of naturally occurring radioactive materials (NORMs) in Nigeria. The gamma-ray spectrometry method, coupled with either NaI(Tl) or HPGe detector, was used by different research groups to measure the activity concentrations of 40K, 226Ra, 228Ra, 232Th, and 238U. The activity concentrations of natural radioactivity in soil samples were generally higher than those recorded in plant and food crop samples in almost all the research studies considered in the review. Roughly 70% of the values of the soil-to-plant

transfer factor of 40K in all the studies under review exceeded the recommended value, while some studies reported transfer factors for 232Th and 238U that were above or below the recommended level.

KEYWORDS:ACTIVITY CONCENTRATION, EXPOSURE LEVEL, HEALTH IMPLICATIONS,

NPP054

Assessing Soil Fertility with Radionuclide Analysis using a Data Logging Spectrophotometry Approach

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ABSTRACT

Radionuclides, characterized by excess nuclear energy, play a pivotal role in agriculture by indicating soil fertility. This study focuses on identifying key Radionuclides (nitrogen, phosphorus, and potassium) relevant to agriculture, utilizing data logging spectrophotometry to analyze soil samples from various locations within the Bayero University, Kano. The objective is to determine the most suitable land for farming based on nutrient content. Results reveal varying concentrations across sites: staff quarters exhibit 12.46mg/kg of nitrate, 0.821mg/kg of phosphorus, and 19.65mg/kg of potassium, whereas staff primary school and sport complex showcase the highest potassium levels (19.65mg/kg and 13.75mg/kg respectively), and mechanics workshop displays elevated phosphorus (11.362mg/kg) and potassium (12.34mg/kg) content. Consequently, the mechanics workshop soil emerges as optimal for farming due to its high phosphorus and potassium concentrations.

Keywords: Land suitability, Radionuclides, Soil fertility, Spectrophotometer

NPP055

Assessment of Terrestrial Gamma Radiation Dose Rate and Radiological Hazards in Niger State, Nigeria, through In-Situ Measurements and Geological Mapping

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ABSTRACT

This study aimed to investigate the terrestrial gamma radiation dose rate (TGRDR) and assess the radiological risks in Niger State, Nigeria, based on geological formations.

Environmental radiation measurements were conducted at 739 locations across various geological formations using a portable handheld gamma survey meter. The study revealed significant variations in TGRDR mean values, with higher levels observed in the migmatite gneiss complex (68.1±1.6 nGyh-1) compared to metasedimentary (45.1±9.7 nGyh-1) and Enagi formation of Nupe sandstone sedimentary basin (42.4±2.9 nGyh-1). The total TGRDR mean value for the study area was estimated at 63.1 nGyh-1, surpassing the world average recommended by UNSCEAR. Radiological parameters including gamma index (Iγ), alpha index (Iα), external hazard index (Hex), internal hazard index (Hin), and annual effective dose equivalent (AEDE) were evaluated, with values within permissible limits except for Annual gonadal dose equivalent (AGDE) which exceeded the allowable threshold at 323.54 Bqkg-1. Despite this, the excess lifetime cancer risk (ELCR) remained below the permissible limit at 0.2709, indicating potential radiation exposure risks attributed to Naturally Occurring Radioactive Materials (NORMs) in the soil and rocks of Niger State. These findings emphasize the importance of ongoing monitoring and management strategies to mitigate radiological hazards for individuals residing in the region.

KEYWORDS: Environmental Radiation, geological formation, does rate, mapping, radiological parameter.

NPP056

ACTIVITY CONCENTRATION OF NATURAL RADIONUCLIDES IN SELECTED WELLS OF PART OF NORTH CENTRAL REGION OF NIGERIA.

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ABSTRACT

Activity concentrations of Natural Radionuclides of selected Wells have been investigated and reported. This is necessary because ofan outbreak of water borne diseases as reported in clinics around the area. The result obtained from this measurement shows a range of values from 1.01 ± 0.02 to 8.21.33 ± 1.73 with an average value of 3.88 ± 0.609 Bq. l-1 for 238U, 0.97 ± 0.01 to 14.81 ± 2.79 with an average value of 7.02 ± 0.99 Bq. l-1 for 232Th and 4.44 ± 0.12 to 147.33 ± 6.59 Bq. l-1 with an average value of 48.08 ± 2.513 Bq. l-1 for 40K respectively. The average values of these Radionuclides are lower than 32.0, 30.0 and 420.0 Bq. l-1 respectively, all the average values of the estimated radiological parameters are also within the UNSCEAR) recommended allowable permissible limit, although higher values were obtained in some locations within the study area. These results shows that Radionuclides (238U, 232Th and 40K) concentrations and radiological parameters in the Well are low but may still have a Probabilistic effect on the inhabitant in the future. It is recommended that values obtained from this study will serve as a baseline for future work.

Keywords: groundwater, Radionuclides, Radiological parameters, Kwara Polytechnic, NaI (TI) detector.

NPP057

DETERMINATION OF REACTION CROSS-SECTION OF NEUTRON INDUCED REACTIONS ON Ca-40, Fe-56 and Cu-63 TARGETS USING EXIFON CODE

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ABSTRACT

Cross section is among the most important research topics nuclear physics, as it can reveal the interaction mechanism between incident particles and target nuclei. The paper calculated the excitation function of neutron induced reaction of Ca-40, Fe-56 and Cu-63isotopes in the reaction channel (n,α), (n,p) and (n,2n) in the energy range of 1-30MeV, using the computer code EXIFON which is based on the analytical model of statistical multistep direct and multistep compound reaction and the result was compared with the experimental data (EXFOR) from IAEA and nuclear evaluated data ENDF. The excitation functions of the selected reaction channels was obtained where the minimum cross-section is 0.1mb at energy 2.0MeV on the reaction channel Cu-63(n,p)Ni-63 and the maximum cross-section is 746.398mb at 20MeV on the reaction channel Cu-63(n,2n)Cu-62 . The shell effect was observed on the reaction channelFe-56 (n,p)Mn-56 at energy 16MeV, where the cross-section with shell correction is 135.6mb and without shell correction is 131.6mb. This showed that the shell correction has no much effect on the nuclides in this paper.

Keywords: EXIFON code; Cross-section; Excitation function; Statistical Multistep reaction.

NPP058

Adsorbed radiation dose across adult brain computed tomography examination at Rashid Shikoni Teaching Hospital, Dutse, Jigawa State, Nigeria

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ABSTRACT

The study investigated the radiation doses of adult brain Computed Tomography (CT) examination at Rashid Shikoni Teaching Hospital, Dutse, Jigawa State. Dose length product (DLP) and volume-weighted CT dose index (CTDIvol) dose descriptors were retrospectively obtained from 116 adult brain CT examinations performed (from 2017 to 2022). while the effective dose (Deff) was estimated from the product of the DLP and a convention coefficient (k = 0.0023). The facility's 75 th percentile (3 rd quartile) for CTDIvol, DLP, and effective

dose (Deff) were 82.14 mGy, 1705.78 mGy cm, and 3.10 mSv, respectively. The radiation doses associated with this examination were observed to be higher in variation than other established findings, therefore, it is recommended for optimization measures on the protocols for brain CT examination in the hospital. Keywords: Radiation, computed tomography, dose length product, volume-weighted CT dose index

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NPP059

Proton-induced radiation damage on microstructural properties of indium Arsenide using Binary Collision approximation methods.

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ABSTRACT

Prolonged exposure to high-energy particles and photons can cause zero- to three-dimensional defects in the microstructure of most metals and semiconductor materials, leading to changes in their microstructural properties. Indium Arsenide (InAs) is commonly used in producing electronic and optoelectronic devices, such as light-emitting diodes, photodetectors, laser mobility, and infrared imaging systems. Therefore, it is necessary to study the radiation damage to this crystalline material when subjected to protons originating in space, especially in the trapped particle region, and protons in other harsh radiation environments where devices made with this material are used. This study used the Monte Carlo-based Binary Collision Approximation Code - the Stopping and Range of Ions in Matter (SRIM-2013) in both Quick Calculation (QC) and Full Cascade (FC) modes to investigate radiation damage to InAs caused by protons. The Norgett-Robinson-Torrens (NRT) dpa model was utilized to calculate displacement-per-atom rates for energy ranges of 0.1 to 10 MeV..Displacement-Per-Atom (pa) rates of 1.36×10^{-6} to 7.01×10^{-6} dpa.s-1 were obtained for proton flux of order 1014 ion.cm-2.s-1. Furthermore, the displacement damage created with the FC mode was slightly higher than that of the QC mode, with an FC-to-QC ratio of approximately 1. Results obtained in this study suggest that InAs is susceptible to significant levels of damage to the microstructure which could result in significant damage to the material, leading to changes in its electrical and photoluminescent properties.

Keywords: Displacement-Per-Atom (dpa), microstructure, Proton, Radiation damage, SRIM.

NPP060

Nuclear Matter in the Relativistic Mean Field Theory with Non-linear Interaction at Finite Temperature

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ABSTRACT

Nuclear matter properties in the relativistic mean field theory has been investigated with non-linear interaction at finite temperature. In contrast to the usual linear Walecka model, non-linear $\sigma - \omega$ interaction terms have been included in the original Lagrangian density. The effect of temperature on the equation of state (EOS) and effective mass is also discussed. The EOS of the symmetric nuclear matter at finite temperature becomes stiffer and the effective mass increases monotonically as temperature increases due to the formation of baryon and anti-baryon pairs. The relativistic mean field approximation method has been applied to study symmetric nuclear matter at finite temperature using the newly developed force parameters with one of the oldest sets, NL3. The results are found to be consistent with other theories and experimental observations.

Keywords: Non-linear model, relativistic mean field theory, equation of state, symmetric nuclear matter, force parameters

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NPP061

Liquid-Gas Phase Transition for Symmetric Nuclear Matter in the Relativistic Mean Field Theory

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ABSTRACT

Nuclear matter properties have been studied within the framework of the relativistic mean field theory. The FSU Garnet, IOPB-I, G3 and NL3 parameter sets were used to investigate the liquid-gas phase transition in symmetric nuclear matter. At normal nuclear density, there is a strong correlation among the different parameter sets, however the linear Walecka model gives values of nucleon effective mass M_0^* and nuclear incompressibility (K) at variance with the experimental values hence the addition of both quartic and cubic terms to the original Lagrangian density $(\mathcal{L})$ to enhance a better fit. The results of the numerical computations were compared with the empirical analysis of the giant isoscalar monopole resonance data. It was difficult to fit the data at $K \lesssim 200MeV$. However, to fit the data, the equation of state becomes soft even at the finite temperature region due to lower value of the nuclear incompressibility. The results obtained for the calculated critical parameters were in good agreement with other theoretical models and recently published experimental data. In our calculations, the critical temperature T_c for the symmetric nuclear matter ranges from

(13.30-13.60) MeV with the corresponding critical pressure P_c and critical density in the range of $(0.1604 - 0.1912)\ MeV.fm^{-3}$ and $(0.044 - 0.052) fm^{-3}$ respectively. Thus, this paper considers some bulk properties of symmetric nuclear matter at finite temperature for application in the study of astrophysical objects, liquid-gas phase transition at extreme conditions and the critical temperature at which the transitions take place.

Keywords: Nuclear matter, relativistic mean field theory, nuclear models, Walecka models, liquid-gas phase transition

NPP062

NUCLEAR REACTIONS IN STELLAR ENVIRONMENT AS FUNDAMENTAL TO LIFE ON EARTH

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ABSTRACT:

The source of most of the elements heavier than helium in todays' Universe is believed to originate from nuclear processes occurring in massive stars. Massive stars produced most cosmic elements like Oxygen (O), Carbon (C), Iron (Fe), Calcium (Ca) etcetera, as such, the need to know the cosmic origins of all chemical elements, especially those fundamental to life on earth. Different nuclear processes take place simultaneously in stellar plasma and nuclides created by fusion reactions are destroyed by another reaction. Realising the critical importance of these processes, this work investigates the dynamic of nuclear reactions in very-massive stars specifically those with carbon-oxygen cores, within the range of 60 M⊙< MCO < 133 M⊙. Stellar models with rotation in Small Magellanic Cloud (SMC) as well as those with and without rotation in Large Magellanic Cloud (LMC) are considered. The results of this work shows that hydrogen (H) burning releases more energy per unit fuel consumed -about 1019 erg g-1- compared to helium burning -of about 1018 erg g-1- and also of advanced burning stages, - of about 5×10^{17} erg g-1 for carbon and oxygen burnings. The density-temperature range during helium (He) burning; is 102 – 105 g cm-3 and $1 - 4 \times 10^{8}\ K$ respectively. The more massive a star is, the more 16O is produced relative to 12C. The ashes of a consumed burning nuclide become the fuel for next set of nuclear burnings; for example, the most efficient neutron source during C-burning is 22Ne(□□□n)25Mg. This work would help in improving the understanding of the first formation of stars in the Universe and their influence to the environment.

Key words: Nuclear reactions; massive stars; life on earth

NPP063

Committed health risk assessment of natural radioactivity in local rice sold in Enugu urban markets

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ABSTRACT

This study examined the levels of natural radioactivity (232Th, 226Ra and 40K) and committed health risk in local rice sold in Enugu urban markets, a southeastern part of Nigeria. A 76 mm × 76 mm NaI(Tl) detector was used to analyze the activities of the radionuclides in fifteen collected local rice samples. The mean activity concentrations were estimated to be 235.81±12.93, 54.29±8.08 and 63.70±3.93 Bqkg−1 for 40K, 226Ra and 232Th, respectively, and follows this order, 40K > 232Th > 226Ra with 40K contributing about 66.7% to the total radioactivity content. Obtained values were higher than values reported in literature for rice in other locations. The average daily intake was estimated to be 4.60, 3.92 and 17.02 Bq.day−1 for 232Th, 226Ra and 40K, respectively. Also, the calculated average committed effective dose was 0.04, 0.40 and 0.39 mSvy−1. The estimated committed effective doses for 226Ra and 232Th exceeded the global ingestion dose average of 0.12 mSvy−1 whereas that of 40K is below 0.17 global average. Average lifetime cancer risk of 9.6×10−4 and 2.9×10−4 was obtained for 226Ra and 232Th and falls below the global range of~10−3 for radiological risk to the general public. This suggest that radiogenic cancer morbidity incidence through ingestion of 40K, 226Ra and 232Th in local rice found in Enugu urban markets is not feasible. The result of this study is a further enhancement of the radiological database of the nation's food safety and monitoring agencies for the protection of the general public.

Keywords: Natural radionuclides; Local rice; Ingestion exposure; Enugu urban

NPP064

Assessment of natural radionuclides and committed effective dose in cassava tubers cultivated in Ebonyi State, Nigeria

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ABSTRACT

This study presents the assessment of natural radionuclides and committed effective dose (CED) in cassava tuber crops of Ebonyi State origin. Activity concentrations of 40K, 226Ra and 232Th, determined by gamma spectrometric Na(TI) detector, were in the range of

177.71 ± 0.86 to 260.40 ± 0.91 Bq/kg, 66.08 ± 0.52 to 91.12 ± 0.44 Bq/kg and 103.92 ± 0.63 to 136.44 ± 0.39 Bq/kg, with average value of 199.15 ± 23.51 Bq/kg, 77.57 ± 7.98 Bq/kg and 118.20 ± 10.72 Bq/kg, respectively. The CED of 40K, 226Ra and 232Th calculated by assuming the consumption of the tuber crop was averaged at 0.17, 2.41 and 4.47 mSv/y, respectively, with a total average value 7.05 mSv/y. The CED values were in this order, 232Th > 226Ra > 40K. This total average CED value was higher than world average of 0.29 mSv/y given by United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). The data presented in this study contributes to baseline information on radiological characteristics of tuber crops in Ebonyi, which would be valuable to WHO/FAO food safety policy in Nigeria and rest of the world.

Keywords: Natural radionuclides; Activity concentration; Ingestion exposure; Health risk

NPP065

Characterization of actinides (uranium and thorium) in iron ore deposit of Itakpe, Kogi State, Nigeria

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ABSTRACT

Actinide elements (uranium and thorium) are natural constituents of ore minerals. These radio- and chemo-toxic elements are being mobilized and dispersed into the environment through mining activities and constitute commensurate cumulative human and environmental hazards such as cancer and respiratory diseases. This study presents the characterization of uranium and thorium in iron ore deposits obtained from Itakpe, Kogi State. Forty-five (45) iron ore samples were collected from Itakpe mining sites A, B and C (15 per site) at a depth of 45 cm and were characterized using scanning electron microscopy (SEM) coupled with energy dispersive spectroscopy (EDS) and x-ray fluorescence (XRF) to determine the form of occurrence, particle size, morphology, distribution and concentration of uranium and thorium. The iron ore samples were observed to contain uranium and thorium-bearing monazite particles with sizes between 20 μm and 40 μm. The monazite particles with very angular, rounded and spongy surface morphologies show very low surface distribution of U and Th. XRF analysis shows that the concentrations of the uranium and thorium were several times higher than the recommended limits of 2.8 and 7.4 ppm, respectively. This study has shown that uranium and thorium from Itakpe iron ore are associated with monazite particles and can potentially deliver localized radiation doses when inhaled.

Keywords: Ore deposit, Mining, Uranium, Thorium, Environmental hazard

NPP066

THERMOLUMINESCENCE DOSIMETRY MEASUREMENT OF IONIZING RADIATION AT THE RADIO DIAGNOSTIC CENTER, NATIONAL ORTHOPAEDIC HOSPITAL IGBOBI, LAGOS.

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ABSTRACT

Ionizing radiation measurement and monitoring is very important and poses an increasing international concern. In this study, the level of exposure to ionizing radiation by radiation health workers and outdoor patients at the at the radio diagnostic centre of the National Orthopedic Hospital Igbobi, Lagos State was determined. Ten pairs of Thermoluminescence Dosimeters (TLD: LiF) obtained from the Radiation Centre of the Lagos State University Ojo, were placed in holders and mounted at various points in and outside the x-ray rooms of the trauma x-ray unit as well as the x-ray rooms of the main x-ray unit and modular theatres within the hospitals in order to obtain the radiation effective doses. The results obtained in the x-ray rooms show mean annual effective doses (mSv) of 39.52, 2.05, 1.25 and 1.16 at the trauma x-ray unit, main x-ray unit and the modular theatres 1 & 2 respectively. Outside the x-ray rooms, the mean effective doses reduced significantly showing a good containment of the radiation being emitted from the x-ray machines. The radiation health workers as well as the general public are radiologically safe from the harmful effects of *ionizing radiation within the environment.*

Keywords: Radio-diagnosis, Thermoluminescence, Dosimeter, Effective Dose, Ionizing

NPP067

ASSESSMENT OF HEAVY METAL CONCENTRATIONS IN INDIGENOUS AND IMPORTED KOHL PRODUCTS

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ABSTRACT

Kohl is a traditional cosmetic product that has been used for centuries in many cultures, including Nigeria. However, recent studies have shown that kohl products may contain high levels of toxic metals, such as lead and iron, which can pose a risk to human health. This study assesses the levels of heavy metals in indigenous and imported kohl products using atomic absorption spectrophotometer analysis (AAS). A total of 20 kohl samples, comprising of 10 indigenous mined products and 10 imported products are analyzed for general elemental composition but with particular interest in those reported to be relevant in cosmetics. The results showed that the mean concentrations of lead, iron, zinc, aluminum, cobalt, cadmium, arsenic, antimony, chromium, and nickel were considerably higher than the tolerance limits in both the indigenous and imported products. The study highlights the need for harmonization of regulations of kohl among countries in order to safeguard public health.

Keywords: KOHL, AAS, Mean Concentration, Cosmetics, Heavy metals, Tolerance limit.

NPP068

Radiation Exposure of Cell Phones & Its Impact on Human Health – A Case Study in Kano-Nigeria

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ABSTRACT

This study delves into an in-depth exploration of the ramifications of cell phone radiation on human health, with a specific focus on the context of Kano, Nigeria. The escalating prevalence of mobile phone usage in our society has raised significant concerns regarding potential risks associated with exposure to radio frequency electromagnetic fields. The consequential biological effects of such exposure have become a subject of paramount importance. This paper employs a comprehensive approach to assess the impact of mobile phone radiation on human health, particularly emphasizing its effects on the brain and the resultant disruptions to daily functioning and overall well-being. Through rigorous statistical analysis of the data collected using the conducted survey across diverse segments of mobile phone users in Kano, a substantive correlation is established between radiation exposure and associated health hazards. This research underscores the urgency of addressing the health implications of cell phone radiation and provides valuable insights for policymakers and healthcare practitioners in devising strategies to mitigate risks and safeguard public health in the digital age.

Keywords: Cell phone radiation, Human health, Radio frequency, Electromagnetic fields, Mobile phone usage, Brain health, Health hazards, Public health concerns

NPP069

Assessment of Natural Radioactivity Concentration and Radiological Exposure Risk of Soil Ohia in Umuahia South Abia State Nigeria, Using High Purity Germanium (HPGe) Gamma Ray Spectrometry

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ABSTRACT

Evaluation of natural radioactivity concentration and radiological exposure are important. The main goal of this work was to determine the natural radioactivity level and radiological exposure risk in Umuahia, using High Purity Germanium Gamma Ray Spectrometry at IPEN, Brazil. The radionuclides (RDNs) such as: 40K, 210Pb, 226Ra, 228Ra, 232Th and 238U radiological parametric indices (RPIs) such as: absorbed dose rate (AD), $AEDE_{out}(mSvy1)$, $AEDE_{in}$(mSvy1), REA(BqKg-1), excess life time risk (ELTCR), Internal hazard index (IHI), external hazard Index (EHI), AGED(μSvy1), and exposure risk(ERμR/h) were determined. The mean value of 40K, 210Pb, 226Ra, 228Ra, 232Th and 238U in Bqkg-1 were: 146.99±11.14, 63.54±8.37, 27.62±2.17, 33.7±4.66, 30.74±5.17 and 22.49±3.59 while the RPIs for AD, AGED, ELTCR, AEDE, IHI EHI and RAE were: 47.74±4.58, 0.06±0.01, 0.23±0.02, 105.71±10.42, 0.75±0.07, 0.39±0.03, 0.29±0.03, 332.11±31.8, 0.19±0.01 and 372276.39±119.02 respectively. Mean value of RDNs were found to be lower than 420, 2325. 35, 131, 30 and 35 (BqKg-1) recommended limit according to (UNSCEAR) while RPIs were lower than 59nGyh-1, 0.08, 370(BqKg-1), 0.00029, 1, 1, 1, 300μSvy^{-1} and 134±4.7(ERμR/h) respectively except ELTRC and AGED that were higher than recommended limit according to (UNSCEAR). It is concluded that the soil is not radiological safe for agriculture, building and construction.

KEYWORDS: Soil, Natural Radioactivity, Radiological Exposure Risk, Umuahia, High Purity Germanium (HPGe)

NPP070

ELEMENTAL ANALYSES OF FREEZE-DRIED HOME-MADE DRINKS USING NIGERIA RESEARCH REACTOR (NIRR-1) AFTER CONVERSION TO LEU

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ABSTRACT

Due to Health concerns and the economy, imported carbonated drinks, are being substituted with unwholesome home-made drinks in the country. Consequently, there is a need to assess the safety of these drinks. with regards to their elemental composition. The work is part of Strategic utilization of NIIR_1 after conversion to LEU with regards to Nutrition and Health for the Socio-economic development of Nigeria. In this regard, the elemental compositions of freeze-dried cow milk, soy milk, kunun dawa and kunun aya were carried using NIRR-1. The samples were processed into granules at a vacuum pressure range of (1- 0.5 mbar) and temperature of (- 40 to -79 oC) using a freeze dryer facility (Lylo Alpha 6-80) supplied by the I.A.E.A. The freeze-dried samples were then irradiated with thermal neutrons of 5 x 1011 ncm-2s-1. Results from the elemental analysis indicated the presence of K, Mg, Fe, Ca, and Na in cow milk and soymilk while traces of minor and major elements were seen in the kunun aya and kunun dawa, respectively. The health and nutritional implications of consumption of these home-made drinks are discussed in details.

Keywords: Freeze-drying, NIRR-1, home-made drinks, NAA, Nutritional & Toxic elements.

NPP071

ESTIMATION OF RADIATION DOSE TO ADULT PATIENTS UNDERGOING FLUOROSCOPY EXAMINATIONS IN SOKOTO MEDICAL DIAGNOSTIC CENTRE

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ABSTRACT

This study investigates the radiation dose levels experienced by adult patients undergoing fluoroscopy examinations at Sokoto Medical Diagnostic Centre, aiming to compare these levels with international standards. Data collection, including demographic information and exposure factors, was conducted prospectively for 20 patients. The mean Dose-Area Product (DAP) was calculated, revealing a wide range of radiation doses among patients. The overall mean DAP was found to be 5664 mGy.cm^2, indicating potentially elevated radiation exposure levels compared to international studies. These findings underscore the critical need for ongoing efforts to optimize imaging protocols and minimize unnecessary radiation exposure for patient safety. Recommendations include optimizing procedures, implementing quality control measures, and providing continuous education and training for radiographers to ensure adherence to best practices. Establishing baseline data for dose optimization and radiation protection measures is essential to ensure patient safety and comply with national and international radiation safety standards in fluoroscopy examinations.

NPP072

GENDER DISPARITIES IN RADIATION EXPOSURE: ANALYZING DOSE DISCREPANCIES IN X-RAY EXAMINATIONS FOR MALE AND FEMALE PATIENTS IN SOKOTO METROPOLIS

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ABSTRACT

This research project investigates gender disparities in radiation exposure during X-ray examinations, aiming to analyze dose discrepancies between male and female patients. Recognizing the importance of equitable healthcare practices, the study delves into factors contributing to these disparities, including anatomical differences, clinical indications, and imaging equipment settings. The objectives encompass quantifying gender-based radiation dose levels, identifying influencing factors, assessing potential health implications, and developing recommendations for optimizing radiation exposure. By conducting a thorough literature review, the study contextualizes its goals within historical developments in medical imaging, radiation exposure, and existing research on gender-related observations. Methodologically, the research involves data collection from two medical centers in Sokoto metropolis, encompassing patient records, and clinical information. Ethical considerations prioritize participant well-being, privacy, and informed consent. The study area covers a range of medical care settings, ensuring a comprehensive analysis of gender disparities in radiation exposure. Results has provided insights into the extent of gender-based variations in radiation exposure, contributing factors, and potential health consequences. The study's significance lies in informing healthcare policies, optimizing practices, and advocating for equitable and safe medical imaging for all patients, irrespective of gender.

In conclusion, this research contributes to the evolving landscape of medical imaging by addressing gender disparities in radiation exposure. By fostering awareness and offering practical recommendations, the study aims to enhance patient safety and guide future developments in the field.

Keywords: X-ray examination, gender disparities, kV, mAs, FFD and FSD

NPP073

INVESTIGATION OF DOSE AND CANCER RISK TO PATIENTS UNDERGOING DIGITAL X-RAY EXAMINATION AT SACRED HEART CATHOLIC HOSPITAL (SHCH) OBUDU L.G.A OF CROSS RIVER STATE

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ABSTRACT

Radiation protection of patients forms a relevant part for the regulation of health practices in Nigeria. An assessment of the dose received by patients undergoing routine medical examination at Sacred Heart Catholic Hospital Obudu, Cross River State has been investigated through a series of quality control tests using a Philip OPTIMUS 980620611102 digital x-ray machine. The study was able to determine patient doses due to three common x-ray examinations; Chest, Abdomen and Pelvis using the newly acquired digital x-ray machine at the Hospital. The results from the study shows that the doses to patient are within recommended diagnostic reference levels as published by the NRPA,UK, 2000. The average risk of cancer induced death was found to be 5.68 x 10-5 %, 1.58 x 10-4 % and 6.9 x 10-2 % for Chest, abdomen and Pelvis examinations respectively. The risks of exposure induced death due to the three examinations are generally low.

Keywords: Cancer risk, patient, Digital X-ray, and dose

NPP074

INVESTIGATING VARIATIONS IN ENTRANCE SKIN DOSE (ESD) AND PATIENT EFFECTIVE DOSE (ED) ACROSS DIFFERENT DIAGNOSTIC FACILITIES IN KADUNA STATE

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ABSTRACT

The extensive use of radiation in medical practices has raised concerns about the necessity for robust radiation protection regulations. This is especially critical in ensuring a careful equilibrium between the advancements in human health facilitated by radiation technology and the potential risks associated with exposure to ionizing radiation. Understanding the radiation dose administered to patients during radiological examinations is crucial for mitigating potential exposure risks. This work examines the Entrance Skin Dose (ESD) and Effective Dose (ED) in patients incurred during multiple types of radiographic examinations across different diagnostic facilities in Kaduna State. Exposure parameters and data of 60 patients were collected during a period of three (3) months. Entrance surface dose (ESD) was measured based on the exposure parameters used for the actual examination and effective dose (ED) was calculated by use of conversion coefficients calculated by addition of the weighing factor multiplied by the equivalent dose. In this study, the mean ESD estimated was lower than the diagnostic reference levels (DRLs) recommended by the National Radiological Protection Board (NRPB), the World Health Organization (WHO), and

International Atomic Energy Agency (IAEA) as such the study is in good agreement with ALARA concepts.

Keywords: Entrance Surface Dose, Effective Dose, Radiographic Examinations, Exposure

NPP075

Determination of Gross Alpha and Beta Radioactivity in Some Agricultural crops from Ushongo L.G.A of Benue State, Nigeria.

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ABSTRACT

The Alpha and Beta activity concentration of some selected tuber crops in Ushongo L.G.A of Benue State has been determined using the portable single channel, gas free MPC2000B-DP detector. With particular focus on the concentration gradient of these activities from the tuber crops samples, which serve as bio-data of the environment. The activity concentration of alpha particles ranged from 0.0012±0.0059 to 0.0113±0.0070 Bq/g, the mean value of alpha activity concentration is 0.0847±0.0943 Bq/g, similarly, the beta activities concentration ranged from 0.0043±0.0083 to 0.0277±0.0097Bq/g, the mean value of beta activity is 0.2447±0.1434 Bq/g. The alpha and beta activities measured in farm one, two and three are lower than the maximum allowed limit set by WHO. The recommended dose set by International Board (WHO, 2003) for alpha is 0.5 Bq/L per year and for beta is 1.0Bq/L per year. The activity concentrations of alpha beta investigated in the study area are lower than the recommended values; hence tubers produced in the study area are safe for consumption.

Keywords: Activity concentration, tuber, detector, Alpha and Beta

NPP076

CYCLOTRON PRODUCTION OF 167TM AND 168TM RADIONUCLIDES VIA (A,X) NUCLEAR REACTIONS FOR APPLICATION IN NUCLEAR MEDICINE

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ABSTRACT

One of the most important peaceful applications of nuclear reactions is seen every day in nuclear medicine, in which partly, radionuclides are produced for diagnosis and therapy of tumour cells. In this study, we measured the cross sections of 167Tm and 168Tm radionuclides through alpha particle-beam bombardment of natural metallic holmium stack in the energy range of 50 MeV down to the threshold of production of the production. The stacked-foil activation technique was used for the irradiation of target whereas the gamma-ray spectrometry was perfumed using a Ge detector. The measured excitation functions for the radionuclides are compared with previous measurements as well as the results from Talys nuclear reactions code. We also calculated the thick target yield for the radionuclides. The present results could be useful for medical applications, astrophysical studies, and for the improvements of the nuclear reaction models codes. Specifically, the 67Tm was proposed as an important radioisotope for studying bone and tumor and as skeletal imaging agent.

Keywords: Cross sections, 167Tm, 168Tm cyclotron, alpha particles, nuclear medicine.

NPP077

EXPLORING THE BIOACTIVE CONSTITUENTS IN FINGER MILLET SEEDS USING FTIR AND UV-VIS SPECTROSCOPIC TECHNIQUES

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ABSTRACT

This study characterized the bioactive compounds present in whole-grain finger millet and aqueous extract of finger millet seeds using Ultraviolet Visible (UV-Vis) and Fourier-Transform Infrared Spectroscopy (FTIR) techniques. The UV-Vis analysis of the aqueous extract of finger millet seeds revealed peaks in the ultraviolet region (200-380 nm) at 310 nm, 315 nm, and 319 nm, indicating the presence of inorganic, hipsochromic compounds, with functional groups such as O, N, S, flavonoids, nitroso, unsaturated, and carbonyl groups, and excitation from $n \rightarrow \pi^*$ while that of whole-grain finger millet seeds showed a peak in the visible region (380-800 nm) at 734 nm, indicating the presence of bathochromic compounds, with functional groups such as chlorophyll, carotenoids, and anthocyanins. The FTIR analysis compliments that of the UV-Vis, where the aqueous extract of finger millet seeds showed peaks corresponding to alkene, halo compound, sulfoxide, secondary alcohol, alkyl aryl ether, phenol, sulphate, cyclic alkene, and alcohol; while the FTIR analysis of whole-grain finger millet seeds revealed peaks corresponding to alkane, alkene, alkyne, primary and tertiary alcohol, amine, aromatic compounds, aliphatic ether, phenol, and nitro compound. The study provides valuable insights into the chemical composition of finger millet seeds, highlighting their potential health benefits and applications.

Keywords: Finger millet seeds, UV-Vis spectroscopy, FTIR spectroscopy, Bioactive compounds

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NPP078

APPLICATION OF RESIDUAL RADIOACTIVITY CODES IN THE VALORIZATION OF NORMS WASTE.

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ABSTRACT

Naturally Occurring Radioactive Materials (NORMs) waste presents significant challenges for waste management and environmental protection due to its radioactive properties. Residual radioactivity (RESRAD) codes developed at Argonne national laboratory are used to calculate the site-specific radiation dose and/or risk to an individual residing or working in the contaminated or a supposedly contaminated site. The codes allow users to specify their site specific data, exposure data as well as exposure routes and pathways in order to predict the dose received by an individual at any time over the next 100,000 years. The codes can perform: calculation of doses to persons inside radioactively contaminated building, environmental transport and risk analyses of hazardous chemicals, dose and risk calculations from radionuclide and chemical concentrations, calculation of doses to persons located beyond the boundary of the site, calculations of doses to workers and members of the general public from the recycle of materials containing traces of radioactive materials as well as calculations on risks to ecological receptors from exposure to hazardous chemicals. This paper discusses the framework of methodology to be followed in the recycling and reuse (valorization) of NORMs waste in line with circular economy principles and the pillars of sustainability

Keywords: Radioactivity, NORMs, Valorization, RESRAD codes

NPP079

COMPUTATIONAL ANALYSIS OF NUCLEAR REACTION CROSS-SECTIONS INVOLVING ALPHA PARTICLES: ISOTOPIC PRODUCTION OF BARIUM, LANTHANUM, AND CESIUM USING THE EXIFON CODE

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ABSTRACT

This study aims to evaluate reaction cross-sections and excitation functions for nuclear reactions involving alpha particles to enhance our understanding of isotopic production. The methodology involved the utilization of the EXIFON code for analyzing cross-sections and excitation functions. Key findings reveal the observed production of specific isotopes $^{126,125,124}La$, $^{125,124}Ba, and$ $^{122,121,}Cs$, while notably, the absence of $^{122}Cs(a,3n)^{123}La$ production within the considered energy range is noted. These results contribute

significantly to our comprehension of nuclear processes involving alpha particles and the production of specific isotopes.

Keywords: nuclear reactions, cross-sections, alpha particles, Statistical multistep reactions, EXIFON.

NPP080

DETERMINATION OF RADIOACTIVITY LEVELS AND HEAVY METALS CONCENTRATION IN HARVESTED WATER WITHIN EKPOMA, EDO STATE, NIGERIA.

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ABSTRACT

Radioactivity and heavy metal levels were assessed in water samples from communities in Ekpoma, Nigeria using Atomic Absorption Spectrometry and grows alpha and beta counting techniques.. In general, measurements of the heavy metal concentrations in the harvested water revealed that Zn>Fe>Cr>Cu, while Pb and Se fall below the detection limit. The highest value was found to be 1.54 ppm for Zn, while Fe, Cr, and Cu recorded values of 0.798 ppm, 0.034 ppm, and 0.55 ppm, respectively, but all of these values were found to be within their respective permissible levels. The radioactivity concentrations of gross alpha and beta values ranged from 0.0027 ± 0.01 Bq/L to 0.369 ± 0.02 Bq/L and from 0.003 ± 0.001 Bq/L to 0.735 ± 0.03 Bq/L, respectively. The results showed that there was generally no significant radiological pollution in the drinking water used in this area, with the gross alpha and beta activity values within the permissible limits of 0.5 and 1.0 Bq. The study found that trace element concentrations in water were within World Health Organization (W.H.O.) and Global Safety Organization (G.S.O.) limits of 0.5 Bq/L and 0.55 Bq/L. Harvested water poses no detectable radiological health risks for the environment or public.

Keywords: soil radioactivity, radiation indices, gamma spectrometer, heavy metals

NPP081

RADIOLOGICAL CHARACTERIZATION OF SOIL AND PLANT SAMPLES OF KUDAN LOCAL GOVERNMENT AREA, KADUNA STATE, NIGERIA

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ABSTRACT

Soil and plant samples from Kudan, Kaduna State, were analyzed for radioactivity using a NaI (Tl) gamma spectrometer at Ahmadu Bello University, Zaria. A mean TGRD value of 115 nGy/h was found in the studied area. In soil, the average specific activities of 238U, 232Th, and 40K were 81.101, 39.281, and 179.952 Bq/kg, and in plants, the values were 75.770, 29.942, and 116.56 Bq/kg, respectively. For soil and plants, the average values of the radiological parameters absorbed dose, annual effective dose, and radium equivalent were 68.342 nGy/h, 0.014 mSv/y, and 151.061 Bq/kg for soil, and 57.961 nGy/h, 0.081 mSv/y, and 127.577 Bq/kg for plants, respectively. In soil, the average values of the radiological hazard indices Hex and Hin were 0.407 and 0.625, whereas in plants, they were 0.345 and 0.549. The results were below the unity limit that UNSCEAR recommended. The overall cancer risk resulting from NORMs in plants and soil was 1.121E-4 and 2.241E-5, respectively. The calculated values are within the 1E-6 to 1E-4 tolerable range set by the USEPA. However, there is no contamination in the area because all of the indices were found to be within the globally recommended acceptable levels.

Keywords: soil radioactivity, radiation indices, gamma spectrometer

NPP082

ASSESSMENT OF RADON CONCENTRATION IN UNDERGROUND WATER WITH ASSOCIATED HUMAN-HEALTH IMPLICATIONS AROUND BAGWAI AND SHANONO ARTISAN GOLD MINING SITE KANO STATE, NORTHWESTERN NIGERIA.

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ABSTRACT

Radon, a colorless, odorless, and tasteless gas, is the second most serious cause of lung cancer after smoking cigarettes. This study was carried out to assess the activity concentration of radon in underground water around Bagwai and Shanono artisan gold mining site Kano State, Northwestern Nigeria. A total of (38) underground water samples, including (16) from boreholes and (22) from hand-dug wells, were randomly collected. The activity concentration of radon was analyzed using a portable radon detector from DURRIDGE COMPANY, RAD7. The results show that the radon concentration in all the water samples ranges from 4.13 to 45.24 Bq/L, with an average value of 20.13 Bq/L. The calculated total annual effective dose due to both ingestion and inhalation for different age groups ranges from 41.15, 33.41, and 18.21 (μSv/y) to 444.21, 361.61, and 196.51 (μSv/y), with an average value of 197.62, 160.94, and 87.47 (μSv/y) for adults, children, and infants respectively. The total excess lifetime cancer risk for different age groups varies from 0.00012, 0.00081, and 2.67E-05 to 0.0012, 0.0087, and 0.00030, with mean values of 0.00051, 0.0038, and 0.00013 for adults, children, and infants. However, from a radiological point of view, all the values

obtained are within the internationally recommended limits set by WHO, EU, UNSCEAR, ICRP. The water in the study area is good for drinking and other domestic purposes.

Keywords: Radon, Gold Mining, ingestion, inhalation, Rad7 detector.

NPP083

SCALABILITY AND DEPLOYMENT FLEXIBILITY OF SMALL MODULAR NUCLEAR REACTORS (SMRS) IN TRANSITIONING TO A NET ZERO CARBON EMISSIONS

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ABSTRACT

This paper explores the potential of Small Modular Reactors (SMRs) in driving the transition to a net-zero carbon emissions future. Employing the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), we assess the viability of SMRs alongside other energy alternatives. Key issues include the ease with which SMRs can be scaled to meet changing energy demands, their adaptability to varied geographical, regulatory sittings, and their alignment with net-zero carbon emission targets. The analysis incorporates criteria such as construction time, cost, environmental impact, and energy reliability. Sensitivity analysis explores the robustness of the rankings to changes in criteria weights, while risk assessment evaluates safety, proliferation, and waste management concerns. SMRs' diverse deployment options, including off-grid applications, extend their reach to remote areas and industrial sites, reducing reliance on fossil fuels. By displacing fossil fuel-based generation, SMRs contribute significantly to mitigating climate change and advancing towards a sustainable energy future.

Keywords: Small Modular Reactors, Net-Zero Carbon, Sustainable Energy, Climate Change

NPP084

Radioactivity Analysis of Plantain Food Crops Contamination in Kolo Town in Ogbia Local Government Area of Bayelsa State, Nigeria Due to Radium-226, Thorium-232 and Potassium-40 Concentrations in the Environment

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ABSTRACT

One of the three goals of the United Nations for sustainable food security is to ensure that all people have access to sufficient food that is nutritionally adequate and safe. Kolo town of Ogbia local Government Area of Bayelsa State is a home to some crude oil and other important minerals deposits. As a result of the mineral occurrence, some parts of the town have become associated with significant levels of natural radioactivity. The exploration and exploitation of these minerals are known to have enormous consequences on the Kolo and its environs. The present study therefore examines the levels of natural radionuclides, 40K, 226Ra and 232Th in some samples of plantain food crops harvested in a farm in Kolo town in Ogbia Local Government Area of Bayelsa State. The activity concentrations of 40K, 226Ra and 232Th were determined in the plantain food samples using γ- ray spectrometry at the Centre for Energy Research and Development, Obafemi Awolowo University, Ile-Ife. Results of measured activity concentration in Bq/kg of the radionuclides indicated a result of a mean decreasing order of 40K > 226Ra > 232Th, with 40K contributing the highest percentage to the total radioactivity content in the plantain food stuffs. The high concentration observed in 40K in the plantain foodstuffs may be due to its essential nature to crops and natural abundance of potassium radionuclide in the earth crust as well as the possible use of enriched potassium fertilizers and agrochemicals by farmers during cultivation for greater crop yields. Also, The mean concentration of 232Th are lower than the 40 Bq/kg limit, 226Ra recorded values lower than the 370 Bq/kg world limit in samples. The low rate of absorption from the soil to crop as well as atmospheric deposition might have affected the low values recorded in the plantain samples recorded.

Keywords: Environment, Contamination, Minerals, Radioactivity, Plantain.

NPP085

TERRESTRIAL GAMMA RADIATION DOSE (TGRD) LEVELS IN NORTHERN ZONE OF BAUCHI, NIGERIA: MAPPING AND STATISTICAL RELATIONSHIP BETWEEN GAMMA DOSE RATES AND GEOLOGICAL FORMATIONS

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ABSTRACT

This present study aims to obtain baseline data of environmental terrestrial radiation and to assess the corresponding health risk in the ambient environment in Bauchi north. The Terrestrial gamma radiation dose rates (TGRD) of study area were measured on-site using a portable Radiation alert milli-Roentgen (mR) survey meter, with a total of 280 measured points which covered all geological formations of the study area. The TGRD ranged from 60.90nGyh-1 to 313.20nGyh-1 with a mean value of 165.48nGyh-1, which is about two times higher than the world average value of 59.00nGyh-1 Geological formation (Granites) was found to have the highest mean TGRD value of 194.88nGyh-1. Likewise, Geological formation

(Quatenary sedimentary) appeared to have the lowest mean TGRD value of 151.82nGyh-1. The map for the distribution and exposure rate due to TGRD for the study area was also plotted using Golden surfer 12 software. One-way ANOVA was used to investigate the variation of the significant difference between the geological formations with TGRD, which shows the influence of geological formation on the measured TGRD values of the study area. Measured data could further be used to evaluate the public radiation exposure and in formulating safety standards and radiological guidelines.

Keywords: Gamma dose rates; Annual effective dose, Geological formations, Lifetime cancer risk, Contour map, Alpha particles, Beta particles, Health hazard, Ionizing radiations

NPP086

ESTIMATION OF RADON CONCENTRATION IN COMMONLY CONSUMED COMMERCIAL BOTTLED WATER IN NIGERIA

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ABSTRACT

Radon (222Rn) concentration in water is one of the major problems of radiation protection in recent years. In this study, a total of thirty (30) samples of commonly consumed commercial bottled water were randomly purchased from some major bottled water distributors in Nigeria and analyzed using Liquid Scintillation Counter (Tri-Carbon-LSA-1000). The overall mean radon concentration of the water sample was found to be 0.0334 Bq/l, which is lower than the parametric reference level of 11.1 Bq/l set by USEPA and lower than the permissible limit of 100 Bq/l set by WHO and UNSCEAR. The overall Annual Effective Dose (AED) due to inhalation of 222Rn is 0.081 mSvy-1, which is less the permissible limit of 1 mSvy-1 set by WHO. Also the overall AED, due to ingestion of 222Rn from the sample water are 0.272, 0.318. and 0.298 mSvy-1 for adult, child and infant respectively. These values are lower than the safety limit of 1 mSvy-1 recommended by WHO and UNSCEAR. The computed Life Cancer Risk (LCR) with a mean value of 13.64 x 10-7 and 3.667 x 10-7 mSvy-1 for adult and child respectively. These values are below the 1 mSvy-1 safety limit set by WHO for radionuclides in water. Hence, the likelihood of any radiological health effect among the public due to consumption of commonly consumed commercial bottled water in Nigeria could be negligible.

Keywords: Radon, Effective Dose, Bottled Water, Liquid Scintillation Counter

NPP087

RADIOLOGICAL ANALYSIS OF KAOLIN IN KANKARA, KATSINA STATE, NIGERIA

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ABSTRACT

This study assesses the concentration of 238U, 232Th and 40K, in-site background radiation, radiological implications of Kaolin mined from Kankara Katsina State. Ten (10) samples were collected randomly from the Kankara kaolin mining sites and the background radiation dose was measured using a portable radiation survey meter. The samples for gamma spectrometry analysis were prepared and analyzed using NaI(TI) detector at Centre for Energy Research and Training, Ahmadu Bello University. The range of activity concentrations of 238U, 232Th and 40K in Kaolin samples from the study area varies from 12.11 – 76.96 Bq/kg, 24.02 – 96.72 Bq/kg and 126.13 – 1038.93 Bq/kg with mean values of 31.63 Bq/kg, 58.06 Bq/kg and 388.64 Bq/kg respectively. The mean value of gamma radiation dose rate measured in Kankara is 66.97 nGy/h which is 7.97 nGy/h more than the world average, 59 nGy/h as stated by UNSCEAR. The average annual dose from such gamma radiation dose rate is 110.07μSv/y; the excess lifetime cancer risk was determined to be 0.39 × 10-3 which is more than the world average value of 0.29 × 10-3. In view of these, it is concluded that the workers (miners) at the samples mining sites are not safe.

Keywords: Radioactivity, radiation indices, gamma spectrometer

NPP088

SCALABILITY AND DEPLOYMENT FLEXIBILITY OF SMALL MODULAR NUCLEAR REACTORS (SMRS) IN TRANSITIONING TO A NET ZERO CARBON EMISSIONS

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2Department of Physics, Bayero University Kano, Nigeria
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ABSTRACT

This paper explores the potential of Small Modular Reactors (SMRs) in driving the transition to a net-zero carbon emissions future. Employing the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), we assess the viability of SMRs alongside other energy alternatives. Key issues include the ease with which SMRs can be scaled to meet changing energy demands, their adaptability to varied geographical, regulatory sittings, and their alignment with net-zero carbon emission targets. The analysis incorporates criteria such as construction time, cost, environmental impact, and energy reliability. Sensitivity analysis explores the robustness of the rankings to changes in criteria weights, while risk assessment

evaluates safety, proliferation, and waste management concerns. SMRs' diverse deployment options, including off-grid applications, extend their reach to remote areas and industrial sites, reducing reliance on fossil fuels. By displacing fossil fuel-based generation, SMRs contribute significantly to mitigating climate change and advancing towards a sustainable energy future.

Keywords: Small Modular Reactors, Net-Zero Carbon, Sustainable Energy, Climate Change

NPP089

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1Osu, A. D.; 2Ononugbo, C. P., 3Oliver, G. & 1Debia, V. O.

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Abstract

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Keywords: Environment, Contamination, Minerals, Radioactivity, Plantain.

NPP090

Terrestrial Gamma Radiation Dose (TGRD) Levels in Northern Zone of Bauchi, Nigeria: Mapping and Statistical Relationship Between Gamma Dose Rates and Geological Formations

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Abstract

This present study aims to obtain baseline data of environmental terrestrial radiation and to assess the corresponding health risk in the ambient environment in Bauchi north. The Terrestrial gamma radiation dose rates (TGRD) of study area were measured on-site using a portable Radiation alert milli-Roentgen (mR) survey meter, with a total of 280 measured points which covered all geological formations of the study area. The TGRD ranged from 60.90nGyh-1 to 313.20nGyh-1 with a mean value of 165.48nGyh-1, which is about two times higher than the world average value of 59.00nGyh-1 Geological formation (Granites) was found to have the highest mean TGRD value of 194.88nGyh-1. Likewise, Geological formation (Quatenary sedimentary) appeared to have the lowest mean TGRD value of 151.82nGyh-1. The map for the distribution and exposure rate due to TGRD for the study area was also plotted using Golden surfer 12 software. One-way ANOVA was used to investigate the variation of the significant difference between the geological formations with TGRD, which shows the influence of geological formation on the measured TGRD values of the study area. Measured data could further be used to evaluate the public radiation exposure and in formulating safety standards and radiological guidelines.

Keywords: Gamma dose rates; Annual effective dose, Geological formations, Lifetime cancer risk, Contour map, Alpha particles, Beta particles, Health hazard, Ionizing radiations

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NPP091

ESTIMATION OF RADON CONCENTRATION IN COMMONLY CONSUMED COMMERCIAL BOTTLED WATER IN NIGERIA

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ABSTRACT

Radon (222Rn) concentration in water is one of the major problems of radiation protection in recent years. In this study, a total of thirty (30) samples of commonly consumed commercial bottled water were randomly purchased from some major bottled water distributors in Nigeria and analyzed using Liquid Scintillation Counter (Tri-Carbon-LSA-1000). The overall mean radon concentration of the water sample was found to be 0.0334 Bq/l, which is lower than the parametric reference level of 11.1 Bq/l set by USEPA and lower than the permissible limit of 100 Bq/l set by WHO and UNSCEAR. The overall Annual Effective Dose (AED) due to inhalation of 222Rn is 0.081 mSvy-1, which is less the permissible limit of 1 mSvy-1 set by WHO. Also the overall AED, due to ingestion of 222Rn from the sample water are 0.272, 0.318. and 0.298 mSvy-1 for adult, child and infant respectively. These values are lower than the safety limit of 1 mSvy-1 recommended by WHO and UNSCEAR. The computed Life Cancer Risk (LCR) with a mean value of 13.64 x 10-7 and 3.667 x 10-7 mSvy-1 for adult and child respectively. These values are below the 1 mSvy-1 safety limit set by WHO for radionuclides in water. Hence, the likelihood of any radiological health effect among the public due to consumption of commonly consumed commercial bottled water in Nigeria could be negligible.

Keyword: Radon, Effective Dose, Bottled Water, Liquid Scintillation Counter.

NPP092

RADIOLOGICAL ANALYSIS OF KAOLIN IN KANKARA, KATSINA STATE, NIGERIA

Abdullahi M. Vatsa1*, Pius E. Johnson[1], Nuraddeen N. Garba1, Rabiu Nasiru1, Anas M. Salisu1, Musa Jibril1, Usman M. Kankara1, Usman Adamu2, Mahammad Aliyu1, Aminu Ismaila1

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ABSTRACT

This study assesses the concentration of 238U, 232Th and 40K, in-site background radiation, radiological implications of Kaolin mined from Kankara Katsina State. Ten (10) samples were collected randomly from the Kankara kaolin mining sites and the background radiation dose was measured using a portable radiation survey meter. The samples for gamma spectrometry analysis were prepared and analyzed using NaI(TI) detector at Centre for Energy Research and Training, Ahmadu Bello University. The range of activity concentrations of 238U, 232Th and 40K in Kaolin samples from the study area varies from 12.11 – 76.96 Bq/kg, 24.02 – 96.72 Bq/kg and 126.13 – 1038.93 Bq/kg with mean values of 31.63 Bq/kg, 58.06 Bq/kg and 388.64 Bq/kg respectively. The mean value of gamma radiation dose rate measured in Kankara is 66.97 nGy/h which is 7.97 nGy/h more than the world average, 59 nGy/h as stated by UNSCEAR. The average annual dose from such gamma radiation dose rate is 110.07μSv/y; the excess lifetime cancer risk was determined to be 0.39 × 10-3 which is more than the world average value of 0.29 × 10-3. In view of these, it is concluded that the workers (miners) at the samples mining sites are not safe.

Keywords: Radioactivity, radiation indices, gamma spectrometer

NPP093

Assessment of Natural Occurring Radioactive Materials and Radiological Hazards Exposure in Soil of Ohia in Umuahia South Abia State Nigeria, Using High Purity Germanium

(HPGe) Gamma Ray Spectrometry

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ABSTRACT

Evaluation of natural radioactivity concentration and radiological exposure are important. The main goal of this work was to determine the natural radioactivity level and radiological exposure risk in Umuahia, using High Purity Germanium Gamma Ray Spectrometry at IPEN, Brazil. The radionuclides (RDNs) such as: 40K, 210Pb, 226Ra, 228Ra, 232Th and 238U radiological parametric indices (RPIs) such as: absorbed dose rate (AD), $AEDE_{out}(mSvy1)$, $AEDE_{in}$(mSvy1), REA(BqKg-1), excess life time risk (ELTCR), Internal hazard index (IHI), external hazard Index (EHI), AGED(μSvy1), and exposure risk(ERμR/h) were determined. The mean value of 40K, 210Pb, 226Ra, 228Ra, 232Th and 238U in Bqkg-1 were: 146.99±11.14, 63.54±8.37, 27.62±2.17, 33.7±4.66, 30.74±5.17 and 22.49±3.59 while the RPIs for AD, AGED, ELTCR, AEDE, IHI EHI and RAE were: 47.74±4.58, 0.06±0.01, 0.23±0.02, 105.71±10.42, 0.75±0.07, 0.39±0.03, 0.29±0.03, 332.11±31.8, 0.19±0.01 and 372276.39±119.02 respectively. Mean value of RDNs were found to be lower than 420, 2325. 35, 131, 30 and 35 (BqKg-1) recommended limit according to (UNSCEAR) while RPIs were lower than 59nGyh-1, 0.08, 370(BqKg-1), 0.00029, 1, 1, 1, 300μSvy^{-1} and 134±4.7(ERμR/h) respectively except ELTRC and AGED that were higher than recommended limit according to (UNSCEAR). It is concluded that the soil is not radiological safe for agriculture, building and construction.

KEYWORDS

Soil, Natural Radioactivity, Radiological Exposure Risk, Umuahia, High Purity Germanium (HPGe).

STC: Solid State, Theoretical & Computational Physics

STC001

DEPOSITION AND CHARACTERIZATION OF CZTS THIN FILMS FOR PHOTOVOLTAIC APPLICATIONS.

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ABSTRACT

Thin films of copper zinc tin sulphide (CZTS) were grown onto fluorine-doped thin oxide (FTO) substrates using a sol-gel spin coating technique. Copper nitrate, zinc nitrate, tin chloride and thiourea served as sources of copper, zinc, tin and sulphur, respectively. The films were annealed at different temperatures between 200 and 400oC and the influence of annealing was examined on the optical, structural and surface morphology of the films using UV visible spectrophotometry, Xray diffraction (XRD) and scanning electron microscopy (SEM) techniques, respectively. The films had a low average transmittance between 20.07 % and 38.93%, the reflectance was very low, and high absorbance in the UV visible range of electromagnetic radiation was observed. The energy gap was between 1.42 and 1.56 eV. The size of the crystallite of the films was calculated from the XRD results according to Debye Scherrer equation and it was found to be between 34.94 and 58.62 nm. The films were dense, and rough and covered the substrates when viewed with the SEM.

Keywords: Annealing, Band gap, Electromagnetic, Sol-gel, Thin film.

STC002

UNVEILING THE STRUCTURAL AND ELASTIC PROPERTIES OF SILVER OXIDE INCORPORATED ZINC TELLURITE GLASS SYSTEM DOPED WITH SAMARIUM NANOPARTICLES

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ABSTRACT

Zinc tellurite glasses in the form of [{(TeO2)0.7 (ZnO)0.3}0.99 (Sm2O3 NPs)0.01]1-y (Ag2O) y, y = 0.005, 0.01, 0.015, 0.02 and 0.025 M fraction is prepared by the method of melt quenching. The molar volume increases while the density of the glasses decreases with an increase in dopant content. The XRD analysis of the synthesized samples showed that the glasses are amorphous. At room temperature, the longitudinal and shear velocities of glass samples are determined using a 5 MHz frequency. To examine the quantitative study of the structure of synthesized glasses, the Poisson ratio (σ), elastic moduli, Debye temperature (θD) and softening temperature (TS) are computed and in-depth descriptions are given. Sm2O3NPs with a 72.43 nm particle size were discovered using high-resolution electron microscopy transmission (HR-TEM). The obtained data showed that silver oxide influences the host material by enhancing its properties and solidifying the glass network.

Keywords:

STC003

RELATIVE STRUCTURAL STABILITY OF RUTILE AND ANATASE POLYMORPHS OF TiO2: AN AB INITIO STUDY

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ABSTRACT

This paper present a theoretical study on the relative structural stability of rutile and anatase phases of titanium dioxide (TiO2) within the framework of density functional theory (DFT) and local density approximation (LDA) as the exchange-correlation scheme. The optimized lattice parameters of the two phases are in good agreement with the experimental data. However, based on the values of the calculated enthalpies of formation of the two different polymorphs, the anatase phase is found to be the most stable polymorph of TiO2 at zero temperature.

Keywords: Relative, Stability, Structural properties, Titanium dioxide,

STC004

EFFECT OF SUCCESSIVE IONIC LAYER ADSORPTION AND REACTION (SILAR) ON STRUCTURAL CHARACTERIZATION OF COPPER-ZINC SULPHIDE (CuZnS) THIN FILMS

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ABSTRACT

Successive Ionic Layer Adsorption and Reaction (SILAR) is a versatile and simple procedure for the fabrication of high-quality thin films of Copper Zinc Sulphide (CuZnS). CuZnS are non-toxic, earth-abundant and inexpensive constituent elements with suitable optical and electrical properties for usage in solar cell fabrication. This study investigated the effect of the SILAR method on the structural characterization of fabricated thin films of CuZnS. The thin films of CuZnS were synthesized by SILAR technique with varying numbers of cycles (10, 20 and 30 cycles). The X-ray diffraction (XRD) analysis revealed the polycrystalline nature of the films confirming the formation of the Cu-Zn-S phase. XRD pattern of the thin films deposited at 10 SILAR cycles exhibited peaks, observed at around 2θ = 5.340, 23.1740 and 27.270 corresponding to orientation around (100), (420) and (511). Improvement in the crystallinity was observed as a result of an increase in film thickness at SILAR 20 cycles. XRD pattern at 20 SILAR cycle showed a crystal grown at 2θ = 8.048660 indexed at (110). SILAR deposition cycles peak shifted to 2θ = 8.2060 indexed at (111) at SILAR 30 cycle. An increase in the number of SILAR cycles leads to thicker films which in turn affect structural properties of crystallinity, grain size, and porosity. The material electrical, optical, and catalytic properties will therefore improve its suitability for various applications like solar cells, sensors, and photocatalysis.

Keywords:

STC005

A QUANTUM ESPRESSO STUDY OF NITROGEN DOPED GRAPHENE USING DENSITY FUNCTIONAL THEORY

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ABSTRACT

Nitrogen-doped graphene has attracted attention because of the abundance of nitrogen and the high performance of graphene. Graphene is an allotrope of carbon that takes the shape of a plane of sp2-bonded atoms with a molecular bond length of 0.142 nm. Despite the material's unusual characteristics, such as being the thinnest known material but the strongest, and a brilliant conductor of both heat and electricity, it lacks a band gap. Quantum Espresso was used to investigate the structural and electronic properties of graphene nanosheets. It was observed that pure graphene produces zero energy gap while 0.32 when the hydrogen atom was doped. Different patterns were observed in Total Density of State (TDOS) and Projected Density of State (PDOS) due to the doping effect.

Keywords: Graphene, Band Structure, Density of State, Projected Density of State

STC006

DENSITY FUNCTIONAL THEORY STUDY FOR STRUCTURE AND ELECTRONIC PROPERTIES OF GRAPHENE AND BORON-DOPED GRAPHENE

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ABSTRACT

To meet the world's energy demand in the future, engineers and scientists must work on developing methods and materials for storing and producing power. Graphene Sheets (GSs) have piqued the interest of researchers due to their low cost, reduced weight, unique nano-surface patterns, electrical capabilities, and a wide variety of industrial applications. The density functional theory method was used to calculate the electronic and structural properties of graphene sheet nano material. Energy band and formation energy were found to be zero and 0.25 eV for both pure and doped boron graphene sheets. Also, it was observed that due to the effect of doping, the energy state of the graphene changes and hence semiconductive properties were observed.

Keywords: Graphene, Doping, Formation energy. Energy gap, TDOS and PDOS

STC007

AN OVERVIEW OF TWO LAYER GRAPHEME SUPER CAPACITOR AND ITS APPLICATION

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ABSTRACT

A two-layer graphene can conduct electrons, showing superconductivity if the two hexagonal nets are twisted at a 1.1-degree angle. This finding could lead to room-temperate superconductors, a hypothetical material, exhibiting superconductivity at temperatures above 0 degrees. Most superconductors are working in reality at -140 0C. A material that displays this property at room temperature eliminates the need for extensive cooling and could revolutionize energy transmission, medical scanners and energy transport.

Keywords: Graphene, Super Capacitor, Super Conductors, and Transmission

STC008

ENHANCING SUPERCAPACITOR PERFORMANCE WITH ZIF-7 ELECTRODE THROUGH ION BEAM TECHNOLOGY IN ELECTROCHEMICAL ENGINEERING

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ABSTRACT

ZIF-7 material was exposed to 500 keV copper (Cu++) ions at dosages of 1 × 1014, 1 × 1015, and 5 × 1014 ions/cm2 in this study. An intense peak at 16.231o with a crystal plane of (012) characterizes the polycrystalline ZIF-7 unirradiated. As the radiation of copper ions increases, the peak intensity in the XRD pattern becomes broader The diffraction peak at 16.231o and crystal plane at (021) on ZIF-7 irradiated with copper ions created a defect and enhanced energy storage. The benzene ring's C=C stretching vibration is visible in the ZIF-7 unirradiated FTIR at 1469 cm-1, while the hydroxy phenyl benzimidazole (bIm) ligand's C-H bending vibration is visible at 740 cm-1. Irradiated ZIF-7 reveals C-H bending at 758, 759, and 754 cm-1 from the bIm ligand and C=C stretching at 1456, 1460, and 1457 cm-1. The CV plots showed redox peaks, demonstrating faradaic processes. At scan rates of 50, 40, 30, 20, and 10 mV/s, the ZIF-7's unirradiated estimated specific capacitances are 156, 195, 260, 390, and 781 F/g. The irradiated ZIF-7 material with copper ions of 1x1014 ions/cm2 has an estimated specific capacitance of 185, 308, 462, and 925 F/g. The ZIF-7 with copper ions of 1x1015 and 5x1014 ions/cm2 with an estimated specific capacitance of 187, 234, 468, 937, and 1200 F/g, 300, 375, 500, 750, and 1200 F/g respectively. The unirradiated (ZIF-7) shows a bandgap energy of 3.53 eV which is suitable for photovoltaic applications. The irradiated sample with 1x1014 ions/cm2, 1x1015 ions/cm2 and 5x1014 ions/cm2 revealed a bandgap energy of 2.52 to 2.87 eV which is a suitable energy storage application.

Keyword: Copper (Cu^{++}) ions; ZIF-7, XPS, EIS, Energy density.

STC009

OPTIMIZATION OF TITANIUM OXIDE THIN FILM THICKNESS DEPOSITED ON BLACK SILICON FOR HETEROJUNCTION SOLAR CELLS

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ABSTRACT

This work investigates the surface morphological and optical properties of sputtered titanium oxide (TiO2) thin films on black silicon (b-Si) fabricated by silver (Ag)-based metal-assisted chemical etching (MACE) for potential application in heterojunction solar cells. After depositing 30 nm, 60 nm, and 90 nm of TiO2, electron dispersive X-ray (EDX) confirms the presence of Ti, and O elements in weight percentage (wt.%) on b-Si. With TiO2 on b-Si, weighted average reflection (WAR) decreases compared to TiO2 on planar c-Si within 300-1100 nm wavelength region. This is due to the refractive index grading effect, which improves light-trapping into the b-Si. In the solar cells, the TiO2/c-Si/Al reference solar cell demonstrates a short-circuit current density (Jsc(max)) of 2.1 mA/cm2. In comparison, the TiO2/b-Si/Al solar cell achieves an enhanced Jsc(max) of ~6.5 mA/cm2 at a slightly higher open-circuit voltage (Voc) of 390 mV. This represents ~208% of Jsc(max) enhancement when compared to the reference solar cell. The achieved Jsc(max) enhancement of the b-Si solar cell is due to the increased light absorption owing to enhanced light-trapping in the b-Si absorber within the 300-1100 nm wavelength region.

Keywords: Titanium oxide, film thickness, black silicon, heterojunction solar cells

STC010

EFFECT OF COMPLEXING AGENTS ON CADMIUM SULFIDE DEPOSITION FOR BUFFER LAYER APPLICATION IN SOLAR CELLS

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ABSTRACT

This work explores the possible effect of complexing agents on cadmium sulfide (CdS) deposition for buffer layer application in solar cells. First, CdS films were deposited with different complexing agents (ammonia and acetylacetone) using the facile and economical chemical bath deposition (CBD) technique. The deposited films' structural, morphological, and topological properties using different complexing agents were characterized by x-ray diffraction, scanning electron microscopy, and AFM spectroscopy. X-ray diffractogram explored structural characteristics, showing a preferred (002) orientation in some cases and (110) preferred orientation in others, depending on the choice and ratio of complexing used. Further studies will optimize and study the interface properties of the CdS layer with the copper-indium-(gallium)-selenide p-type absorber layer, employing it as the n-type semiconducting layer in thin film solar cells.

Keywords Solar cells, Complexing agent, Cadmium sulphide, Thin films

STC011

THERMAL CONDUCTIVITY AND DIELECTRIC PROPERTIES OF COMPOSITE METAL OXIDE PARTICLES FROM EGGSHELL AND COWBONE FOR POWER INSULATION APPLICATION

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ABSTRACT

In the pursuit of optimizing materials for industrial applications, and rather than relying on chemical procedures to produce metal oxides for use as additives in polymer composites, there is potential for a more cost-effective and environmentally friendly alternative by utilizing metal oxides derived from readily available natural sources. This study focuses on evaluating finely processed powder obtained from thoroughly cleaned eggshells and cow bones and compares it to conventional calcium oxide powder. The objective is to determine its suitability as a filler in polymer composites designed for high-voltage applications. The powder was characterized using scanning electron microscopy (SEM), X-ray fluorescence spectrometry, Fourier transform infrared spectroscopy, thermal conductivity measurements, and a programmable LCR Bridge. The SEM images of the eggshell and cow bone powder revealed a range of particle sizes ranging from 2 to 34 µm. Chemical analysis indicates that CaO is the dominant metal oxide in the eggshell powder, constituting 91.148 wt%, and in the cow bone powder, it comprises 82.563 wt%. The dielectric constant and electrical conductivity of the eggshell powder were found to be 11.08 and 1.5876×10^{-8} S m^{-1}, respectively, while for cow bone powder, these values were 10.58 and 1.567x10-8 S m-1 at a frequency of 200 Hz. The electrical conductivity of the powders is lower than that of pure CaO, while the thermal conductivity is slightly higher than that of pure CaO. This variation may be attributed to the presence of other constituent metal oxides. These findings suggest that periwinkle shell powder if properly processed into micro- and even nano-sized particles, could be a promising candidate as a filler in polymer composites, capable of producing polymeric insulation with favourable insulating and thermal conducting properties.

Keywords:

STC012

DIELECTRIC AND THERMAL REINFORCING EFFECTS OF RECYCLED BOROSILICATE GLASS ON POLYTETRAFLUOROETHYLENE MATRIX AT A MICROWAVE FREQUENCY

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ABSTRACT

This work fabricated polytetrafluoroethylene (PTFE) composites filled with recycled borosilicate (rBRS) glass for microwave printed circuit board (PCB) substrate application. The rBRS powder was prepared via a ball milling technique and dispersed in the PTFE matrix in different volume fractions (5%–25%) to develop the PTFE/rBRS composites through a dry powder mixing technique. The impact of filler content on the composites' structural, dielectric, and thermal properties was examined using X-ray diffraction (XRD), Rectangular waveguide (RWG) connected to an Agilent E5063A vector network analyser, and L75 Platinum dilatometer. Scanning electron microscopy showed that rBRS filler was more dispersed in the composites at lower filler contents. The composites showed excellent microwave properties with a relative permittivity of 2.31 and a loss tangent of 0.0018 at the highest filler content of 25% at 10 GHz. The composites also exhibited a good thermal property with a mean coefficient of thermal expansion (CTE) of 60.54 ppm/◦C at 25% filler content.

Keywords: PTFE, CTE, RWG, relative permittivity, loss tangent

STC013

DETERMINATION OF THERMOMECHANICAL PROPERTIES OF REFRACTORY BRICKS (DENSE AND INSULATING BRICKS)

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ABSTRACT

The purpose of this research work is to achieve further and new innovation on these refractory bricks locally produced. The Thermal properties of two selected refractory bricks were evaluated. This research has aimed to evaluate and determine the properties that we're not previously determined such as the thermal expansion test, thermal conductivity and refractoriness of selected bricks. The firing of the refractory bricks was heated at a temperature of 1350°C and they came out successfully. Thermal expansion measurement was carried out using an Orton 2012 STD dilatometer apparatus with a temperature measurement of 1250 °C. The thermal conductivity test was also carried out using Einstein's Thermal Conduction Equipment and refractoriness was estimated using Sheun's formula. The results showed that the dense brick composition showed an overall negative expansion of 0.25 while that of the insulating brick was 0.15. The thermal conductivity measurement showed a thermal conductivity measurement of 2.56w.m-1.k-1 for dense and insulating bricks. This shows that the bricks fall within the standard.

Key word: Refractory bricks, Thermal conductivity and expansion

STC014

SYNTHESIS AND CHARACTERIZATION OF DILUTED MAGNETIC SEMICONDUCTOR NixZn1-xS NANOSTRUCTURE THIN FILMS FOR OPTOELECTRONIC DEVICE APPLICATIONS

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ABSTRACT

Diluted Magnetic Semiconductor (DMS) materials like Nickel (Ni) doped ZnS have a wide range of optoelectronic device applications. This study investigated the effects of Ni doping concentration on the properties of synthesized DMS NixZn1-xS nanostructured thin films prepared by the Chemical Spray Pyrolysis (CSP) technique. DMS NixZn1-xS with different mole ratios (x = 0.00, 0.02, 0.04, 0.06 and 0.08) were grown on hot glass substrates at a temperature of 300oC by CSP technique. The influence of Ni doping concentration on the optical, electrical, and magnetic properties of NixZn1-xS was studied by Ultraviolet-visible spectroscopy (UV-Vis), Direct current two-point probe technology, and vibrating sample magnetometer, respectively. The UV analysis showed that transmittance is moderately high and proportional to the Ni content while average transmittance was 61.3, 62.8, 63.9, 67.6, and 69.6 % for x = 0.00, 0.02, 0.04, 0.06, and 0.08, respectively. Electrical analysis revealed that conductivity increased with concentration of dopant, while the Magnetic analysis showed strong ferromagnetic characteristics. Hence making the materials suitable for optoelectronic device applications.

Keywords:

STC015

INCREASING THE EXTINCTION COEFFICIENT OF PLASMONIC TITANIUM DIOXIDE

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ABSTRACT

In this work, natural Alpirin was extracted and its opto-structural properties on plasmon-enhanced titanium (iv) oxide nanoparticles were investigated through a comparative study with eosin red synthetic dye. The films were characterized by Ultraviolet-Visible light Spectroscopy (UV-Vis Spec) X-ray Diffraction (XRD) and Energy Dispersive Spectroscopy (EDS). The average crystalline size of titanium dioxide, when doped with Alpirin, was found to be 21.39 nm with a band gap of 2.52 eV. When the film was doped with Alpirin +AgNPs, the average crystalline size reduced to 18.26 nm with a band gap of 2.00 eV, while Eosine+AgNPs showed an average crystalline size of 20.23 nm with a band gap of 2.10 eV as against the undoped TiO2 with average crystalline size of 20.37 nm and band gap of 3.65 eV.

Studies show that optical absorbance and extinction coefficient were reasonably increased The synergy between Alpirin + AgNPs and Eosine+AgNPs shows that the incorporation of metal nanoparticles increased the extinction coefficient of the samples which is beneficial for enhanced photoactivity. Energy Dispersive x-ray Spectrometry (EDS) confirmed the presence of silver and some other substances in the sample.

Keywords- *Alpirin*, eosine red, synergy, titanium dioxide.

STC016

THE EFFECT OF SYNTHESIS TIME ON OPTO-ELECTRONIC AND STRUCTURAL PROPERTIES OF HYDROTHERMALLY GROWN ZnO NANOWIRES FOR POTENTIAL APPLICATION AS ELECTRON TRANSPORT LAYERS IN ORGANIC SOLAR CELLS

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ABSTRACT

Zinc oxide (ZnO) nanowires (NWs) have been widely studied owing to their unique material properties and remarkable performance in optics, electronics, photonics and solar cells. Vertically aligned ZnO NWs grown on a ZnO seed layer and used as electron transport layers (ETL) in photovoltaics (PVs) have proven to significantly improve the performance of the cells. In this study, a facile hydrothermal deposition process is used to synthesize ZnO NWs on fluorine-doped tin oxide (FTO) coated glass substrates, pre-coated with a 150 nm thick ZnO seed layer. Parameters such as optimal solution concentration, growth temperature, and varying time of 2, 4, 8 and 22 hours respectively, are systematically investigated. Grazing incidence X-ray diffraction (GXRD), field emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM), UV-visible (UV-Vis) spectroscopy and X-ray photoelectron spectroscopy (XPS) were applied to investigate the characteristics of the samples. The results show highly dense ZnO nanowire arrays with a hexagonal Wurtzite crystal structure, distributed vertically and uniformly. The nanowire diameters and lengths of the varying times of 2, 4, 8 and 22 hours ZnO structures are 34.69 ± 4.81 nm and 524 ± 0.24 nm, 35.86 ± 4.89 nm and 631 ± 5.89 nm, 36.1 ± 3.89 nm and 745 nm ± 2.87, 37.01 ± 2.12 nm and 1.02 ± 1.1 µm, respectively. UV-Vis spectroscopy shows that the ZnO NWs arrays exhibit an average transmittance of 90% at 755 nm, with an indirect band gap of 3.30 eV. GXRD shows that the lattice constants of all four samples, calculated from the four most dominating crystalline orientations, i.e. (200) (111), (110), (102) and (100) are approximately a = 0.325 and c = 0.519 nm, yielding a c/a ratio of 1.596, which closely resembles the theoretical value of 1.633. XPS reveals no reshaping of the conduction band minimum, as oxygen atoms exclusively fill vacancies, with no substitutional replacement of lattice oxygen, ultimately leading to O-Zn-O bond formation. Thus, variation of the hydrothermal synthesis time is an effective method of altering the morphological, optical, and structural features of the nanowire arrays, allowing for suitable application of these structures as electron transport media in different solar cell architectures.

Keywords: Nanowires; Hydrothermal Synthesis; Photovoltaics; Electron Microscopy; X-ray Photoelectron Spectroscopy

STC017

ELECTRICAL CHARACTERIZATION OF SPRAY PYROLYSIS-BASED ZINC OXIDE THIN FILMS

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ABSTRACT

This paper explains how a structured zinc oxide thin film was prepared by spray pyrolysis technique and analyses the electrical properties of the deposited film. A nanostructured zinc oxide thin film was deposited on a soda lime substrate by an electrical low-cost spray pyrolysis machine equipped with a deposition controller at a substrate temperature of 300k. structural characterization of a deposited thin film was studied using the X-ray diffraction technique, which reveals zinc oxide thin films are polycrystalline with typical hexagonal wurtzite structure with preferentially oriented along (1 0 1) direction and has a band gap of 3.34eV. the electrical resistivity of Zinc oxide thin films is of the order of 102Ωcm. the thermos-emf measurement confirms the n-type conductivity of the zinc oxide thin film. There is a possibility of commercial production of the most suitable solar cells using zinc oxide as it possesses promising electrical properties and in addition, zinc oxide contains neither rare metals nor toxic materials.

KEYWORDS: Thin film, Nanostructured, Electrical properties, N-type conductivity.

STC018

ELECTRICAL PROPERTIES OF A SYNTHESIZED COPPER IRON SULPHIDE NANO-CRYSTALLINE THIN FILM

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ABSTRACT

In this work, the electrical properties of a synthesized Copper Iron Sulphide (CuFeS) thin film were successfully measured using a four-point probe technique. Preliminary results obtained for the current and voltage measurements of the film indicated that electrical conductivity, sheet resistance as well as sheet resistivity recorded a range value of 13.84 (Ωm)-1 to 38.56 (Ωm)-1, 51.71Ω to 328.65Ω, as well as $4.1 \times 10^{-1}\Omega\text{m}$ to $1.0 \times 10^{-2}\Omega\text{m}$ respectively; leading to the deposition of FeCuS thin films of sizes ranging between 31.34×10^{-9}m and 46.47×10^{-9}m, confirming the films to be nanocrystals (Cu3Fe3)3S16.

Keywords: Electrical Properties, Synthesis, Film, Conductivity.

STC019

AUGMENTING ELECTROCHEMICAL PERFORMANCE OF CoS2 USING CITRUS LIMON PEEL EXTRACT

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ABSTRACT

CoS2 electrodes were synthesized using aqueous citrus lemon peel extract as a mediating agent using the co-precipitation method. X-ray diffraction studies revealed crystallites of various nanoparticles (NPs) sizes valued from the Debye-Scherer's equation to be 21.80, 23.77 and 24.50 nm for CS C, CS H and CS W respectively corresponding to CoS2 mediated with citrus peel extract, hydrazine and water. The electrochemical analysis shows that the estimated specific capacitance acquired using cyclic voltammetry (CV) employing 5.0 mV/s scan rates are 986, 598 and 513 F/g for CS C, CS H and CS W respectively in 1.0 M of KOH. The obtained results show that specific capacitance of CoS2 mediated citrus limon peel extract, an organic and natural material is better when compared with CoS2 mediated with synthetic inorganic material or CoS2 alone. Citrus limon peel extract increased the synergistic effect among constituent ions by reducing electrode resistance, increasing electrode conductivity and enriching electrode performance.

Keywords: Cobalt sulfide, Co-precipitation, citrus lemon, Supercapacitor

STC020

APPLICATION OF COHERENCE ATTRIBUTE FOR PROSPECT IDENTIFICATION

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ABSTRACT

Structural features, such as faults, act as traps and a conduit for the migration of hydrocarbon, while stratigraphic features, such as channels and point bars act as reservoirs for the accumulation of hydrocarbon. These geological features have significant importance in the discovery of commercial quantities of hydrocarbon. Geological features not delineated along time slices on conventional seismic data have been successfully delineated. The

identification of subtle structures poses great challenges when using time slices on conventional data. Along the time slice, these subtle geological features are difficult to view, but by the application of seismic attributes such as coherence attributes, along the time slice, the features are seen clearly. This research focuses on the application of coherence attribute in delineating geological features (such as channels, point bars, sand distribution, faults, and sub-seismic faults) that can lead to the delineation of commercial quantity of hydrocarbon-bearing reservoirs in the study areas from two data set in the Niger Delta. The identification of fault channels and point bars, in the study areas could lead to the drilling of a commercial quantity of hydrocarbon.

KEY WORDS: Coherence Attribute, Fault, Channels and Time slice.

STC021

OPTIMIZATION OF FRESH CASSAVA PEELS AND COW DUNG BIOGAS PRODUCTION USING NaOH

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ABSTRACT

This study focused on the optimization of biogas from fresh cassava peels and fresh cow dung using sodium hydroxide (NaOH) as the pretreatment chemical. The possibility of producing biogas from fresh cassava peels and fresh cow dung waste was investigated. Fresh cassava peel and fresh cow dung were used in the study. The feedstocks of fresh cassava peels, fresh cow dung and fresh cassava peel mixed with fresh cow dung were charged into the bio-digester and used to investigate the anaerobic digestion in generating biogas for 20 20-day retention period. The digesters were charged separately with these wastes in the ratio of 1:2, 1:3 and 1:3 of waste to water respectively. NaOH solution was used in pre-treating the fresh cassava peel and fresh cow dung slurry. The volume of biogas produced was monitored and recorded daily. The result obtained from the biogas production showed that fresh cow dung produced the highest methane content of 67.9 %, followed by the mixture of fresh cassava peel and fresh cow dung with 59.7 % methane content and fresh cassava peels had the least methane content of 51.4 %. The results also showed that the cow dung had the highest cumulative biogas yield of 93.3 litres (L), followed by the mixture of cassava peel and cow dung with a cumulative volume of 73.8 L and the least was cassava peels with a cumulative volume of 61.3 L within the same retention period of 20 days. Overall results indicate that these wastes which are always available could be a source of renewable natural gas if properly treated.
Keywords: Biogas, fresh cassava peels, fresh cow dung, sodium hydroxide.

STC022

INFLUENCE OF GROWTH VOLTAGE ON Electrodeposited ZnS FILM PROPERTIES INVESTIGATED BY UV SPECTROSCOPY

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ABSTRACT

Zinc sulfide (ZnS) thin films have attracted considerable attention due to their broad applications in optoelectronic devices. This study explores the impact of growth voltage on the properties of electrodeposited ZnS films using UV spectroscopy. ZnS thin films were deposited on fluorene-doped tin oxide (FTO) coated glass substrates at various growth voltages ranging from 1 V to 5 V. The structural, optical, and morphological characteristics of the films were examined using X-ray diffraction (XRD), UV-visible spectroscopy, and scanning electron microscopy (SEM), respectively. The XRD analysis indicated that all deposited films exhibited a cubic zinc blende structure with a preferred orientation along the (111) plane. The size of crystallites increased with rising growth voltage, indicating enhanced crystallinity at higher voltages. UV-visible spectroscopy measurements demonstrated that the optical bandgap of the films decreased from 3.89 eV to 3.61 eV as the growth voltage increased, suggesting a transition towards the visible region with improved light absorption.

Keywords: Growth voltage, UV spectroscopy, Optical, X-ray diffraction (XRD), Zinc sulfide (ZnS), thin films.

STC023

IMPACT OF GROWTH VOLTAGE ON ELECTRODEPOSITED CdS THIN FILMS: XRD CHARACTERIZATION ANALYSIS

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ABSTRACT

This study investigates the influence of growth voltage (Vg) on the structural properties of cadmium sulfide (CdS) thin films electrodeposited onto suitable substrates. Utilizing X-ray diffraction (XRD) characterization techniques, the structural characteristics such as crystallinity, grain size, and preferred orientation of CdS thin films grown at different growth voltages are examined. By varying the growth voltage during the electrodeposition process, insights into the structural evolution of CdS thin films are elucidated. The results reveal significant variations in the crystalline structure of the deposited films with changing growth voltages. Higher growth voltages are observed to facilitate improved crystallinity and larger grain size in the CdS thin films. Additionally, alterations in preferred crystal orientations are identified, offering valuable insights for optimizing the growth conditions of CdS thin films for diverse applications. This study underscores the importance of growth voltage manipulation in tailoring the structural properties of electrodeposited CdS thin films, thereby contributing to the advancement of thin-film technology and its potential applications.

Keywords: CdS, Electrodeposition, V_g, Structural properties, Thin films, XRD, Structural evolution

STC024

ADVANCES IN DEPOSITION TECHNIQUES OF ZnS AS BUFFER LAYER FOR SOLAR CELLS: A COMPREHENSIVE REVIEW

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ABSTRACT

This review paper explores the various deposition techniques employed for the fabrication of ZnS buffer layers in solar cell applications. The significance of ZnS as a buffer layer in enhancing the performance and stability of solar cells is discussed, along with an in-depth analysis of the deposition methods, including chemical bath deposition (CBD), sputtering, atomic layer deposition (ALD), and chemical vapour deposition (CVD). The review highlights the key parameters, advantages, challenges, and recent advancements associated with each deposition technique. Additionally, the influence of ZnS buffer layers on solar cell efficiency, device structure optimization, and future research directions are also addressed. The synthesized information aims to provide valuable insights for researchers and industry professionals working in the field of photovoltaics.

Keywords: ZnS, Buffer layer, Solar cells, Deposition techniques, Photovoltaics.

STC025

PREPARATION AND CHARACTERISATION OF A 2.18V, 6AH UNICELL FROM RECYCLED LEAD ACID BATTERY MATERIALS

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ABSTRACT

Despite the abundance of supposed technical information on the world-wide internet, real and valuable products cannot be effectively developed from the information alone. Some technological secrets still do exist. The work presented here details knowledge acquired directly in the laboratory from efforts at preparing workable battery cells from materials obtained from unusable lead acid batteries. The preparation processes include Thermal lead extraction, Grid casting, Pasting, Curing and careful Polarity formation charging. Cell characterisation involved Internal Resistance, Discharge Capacity and Charge discharge lifetime evaluations. The prepared 6 Ah theoretical capacity cell gave 4.8Ah available initial capacity which declined to 2.7Ah after 340 Charge / Discharge runs. The result suggests that the processes can be upgraded to the preparation of full-size batteries.

Keywords: Batteries, Grids, Curing Charge / Discharge.

STC026

TOPO-MORPHOLOGICAL STUDY OF ITO/Al-Ag/ITO FILMS FOR PHOTOVOLTAIC APPLICATION

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ABSTRACT

Transparent conducting oxide materials such as indium tin oxide (ITO), zinc oxide, or fluorine tin oxide are recently attracting intense attention for application as transparent conducting electrodes or anti-reflective coating in different optoelectronics devices including solar cells, electrochromic, liquid crystal displays and organic light-emitting diodes. This is attributed to their high optical transmittance in the visible region and good electrical conductivity. ITO layer properties such as topological, morphological and optoelectronic have revealed an immense dependence on the types of deposition techniques used during preparation. The ITO films in the ITO/Si structure either serve as an anti-reflecting coating, an ohmic contact or a rectifying contact. In this work, surface topological-morphological (topo-morphological) properties of ITO/Al-Ag/ITO multilayer films studied by atomic force microscopic (AFM) and field emission scanning electron microscopy (FESEM) are investigated. The multilayer films are deposited by direct current (DC) and radio frequency (RF) magnetron sputtering on p-type Si. Multilayer film root means square roughness, smoothness, grain size and boundaries, as well as general morphology, are studied after post-annealing treatment at 300-500oC. The results showed that the surface topology parameters of the multilayer films increased with an increase in post-annealing temperature. Sharp crystallite peaks were obtained by all the films with smaller peaks diffusing and recombining to form larger films with increasing post-annealing temperatures. The RMS of the multilayer films increased as the temperature increased with even the as-deposited film showing a good microstructure while the film annealed at 500oC showed a superior and enhanced microstructure due to improvement in the film structural property after post-annealing treatment at high temperature. Compared to as-deposited film, careful observation shows that surface smoothness increased with an increase in temperature with films annealed at 400oC and 500oC showing an increasing surface smoothness feature. Similarly, higher grain sizes were observed especially by films annealed at 400oC and 500oC due to the heat absorption which causes the particles to expand thereby narrowing the grain boundaries and subsequently improving the surface smoothness. These results are consistent with AFM measurements confirming the high surface property and grain size with increasing post-annealing temperature. These highly enhanced topo-morphological multilayer films with Al–Ag interlayer can be a promising contact for low-resistance optoelectronics devices.

Keywords: ITO, Topology, Morphology, Radio frequency, Magnetron sputtering.

STC027

STRUCTURAL, DIELECTRIC AND RAMAN SPECTROSCOPY OF La3+ Ni2+ Zn2+ SUBSTITUTED M-TYPE STRONTIUM HEXAFERRITES

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ABSTRACT

In this work, M-type strontium nano-hexaferrites with chemical composition Ba0.8−xSr0.2LaxFe12−x−yNixZnyO19 (x = 0.00, 0.05, 0.10; y = 0.00, 0.08, 0.16) are prepared using sol-gel auto-combustion technique. The formation of single-phase hexagonal ferrites is confirmed by XRD analysis. It also reveals the presence of magnetite and the crystallite sizes are in the range of 21.31–29.91nm. The lattice constants are found to decrease with an increase in cation substitution. The FTIR spectra of the sample show three dominant peaks in the range of 400–600 cm−1 which indicate the formation of the desired hexaferrite structure. The field emission scanning electron microscope images reveal large crystallites with shapes close to the hexagonal platelet-like whose sizes are non-uniformly distributed. Also, agglomeration is observed due to magnetic interactions between the crystallites. The dielectric constant, dielectric loss, conductivity, and dielectric modulus are analyzed using the Maxwell–Wagner model. The dielectric constant is enhanced at high frequency in the entire sample and reduction of dielectric loss is also observed with further cations substitutions.

Keywords: **Nano-hexaferrites, Magnetite, Dielectric, M-type hexaferrites.**

STC028

HARNESSING SOLAR ENERGY FOR SUSTAINABLE WATER TREATMENT: PHOTOCATALYTIC ACTIVITIES OF TiO2 and ZnO

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ABSTRACT

Access to clean and safe water is a critical global challenge that affects human health, environmental sustainability, and economic development. Traditional water purification methods often rely on energy-intensive processes or chemicals that can have adverse effects on the environment and human health. Photocatalysis, a promising and innovative technology, offers a sustainable solution for water purification by utilizing solar energy to degrade pollutants and pathogens. In this work, we explore titanium dioxide (TiO2), and zinc oxide (ZnO) as our photocatalytic materials for solar-driven water treatment. Water samples containing pollutants and pathogens were collected from wastewater treatment plants and natural water bodies. The photocatalytic process was performed under varying solar intensity and reaction durations. Water quality parameters like turbidity, chemical oxygen demand (COD), total organic carbon (TOC), and pathogen count were monitored.

Keywords: **Photocatalysis, Titanium dioxide, Zinc Oxide, Pollutants, Wastewater.**

STC029

PHASE TRANSITION OF FexZn1-xO NANOPARTICLES SYNTHESIZED BY MICROWAVE ASSISTED SYNTHESIS METHOD

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ABSTRACT

Significant research interest has been devoted to dilute magnetic semiconductors due to their promising potential for spintronic applications. Attention was given to ZnO-based dilute magnetic semiconductor material owing to its ferromagnetic behaviour at room temperature when doped with transition metals. FexZn1-xO nanoparticles were synthesized via a microwave-assisted method and calcined at 600°C. The structural, optical and magnetic properties of these nanoparticles were studied using X-ray diffraction (XRD) and field Emission Scanning Electron Microscopy (FESEM). UV-Visible and Photoluminescence Spectroscopy and Vibrating Sample Magnetometer (VSM) respectively. A single-phase wurtzite hexagonal crystal structure with no agglomeration was observed. The optical property shows a blue shift in the band gap of the nanoparticles with three emissions observed from the PL. The magnetic measurement reveals a magnetic phase transition from diamagnetic to ferromagnetic behaviour as a result of the Fe dopant, the magnetic saturation increases with an increase in the Fe concentration thereby making the material a good candidate for spintronic-based applications.

Keywords: ZnO, Fe doped ZnO, Structural, Optical magnetic properties.

STC030

FIRST PRINCIPLE EXPLORATION OF ELECTRONIC AND PHONONIC BAND STRUCTURES OF CHLORINE DOPED TWO-DIMENSIONAL TRANSITION METAL DICHALCOGENIDE MSe2 (M = W, Pt)

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ABSTRACT

Due to their exotic and outstanding physical properties for optoelectronics applications transition metal dichalcogenides (TMDCs) monolayers have shown a potential candidacy to replace the traditional silicon in silicon-based technology. Hence the exploration of the most important features of these crystal compounds is indispensable. In this paper, we provide a

theoretical elucidation of the electronic and Phononic characteristics of Chlorine doped of two materials namely PtSe2 and WSe2 monolayers. This investigation was carried out within the frame work of the density functional theory (DFT) technique using first principle calculations. The generalized gradient approximation (GGA) as proposed by Pardew Burke Ernzerhof (PBE) scheme as performed in the Quantum ESPRESSO package is used. Electronic band structures of the considered materials show that PtSe2 is indirect while WSe2 is a direct band gap semiconductor. The obtained result of phonon calculation reveals excellent dynamical stability of the three samples (PtSe2, WSe2 pristine and chlorine-doped PtSe2 monolayer compounds), while the doped WSe2 material is metastable. These results obtained hold promise for structural and electronic properties and therefore could be considered for potential uses in electronic and optoelectronic devices

Keywords: DFT, Chlorine doped $PtSe_2$ monolayer, Chlorine doped WSe_2 monolayer, Electronic Band structure.

STC031

RECENT ADVANCEMENT ON ZNIN2S4 BASED MATERIALS FOR PHOTOCATALYTIC WATER SPLITTING TO GENERATE HYDROGEN ENERGY

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ABSTRACT

In past years, the overdependence on fossil fuels, and the ever-increasing demand for sustainable, clean and environmentally friendly energy sources for industrial and domestic applications have been a major issue of concern. As a ternary metal sulfide (chalcogenides), ZnIn2S4 photocatalyst has attracted widespread attention in the field of photocatalysis due to its unique properties such as; easy synthesis, high stability, low cost, non-toxicity, high chemical durability, suitable band gap and superior absorption of visible light. However, despite all these novel properties, ZnIn2S4 has some distinct drawbacks that hinder photocatalytic H2 generation via photocatalytic water splitting such as high charge recombination, low utilization of solar energy as well as inferior redox capacity. Many review articles have been published on ZnIn2S4 for photocatalytic *H2 generation.* However, most of the reviews focus on the application of ZnIn2S4 and heterojunction. Herein, recent advancements in ZnIn2S4-based material for photocatalytic water splitting to generate H2 are discussed in detail. Furthermore, the study widely identified and discussed the challenges related to ZnIn2S4-based photocatalysts towards the generation of *H2,* recent synthesis methods, properties and morphology, modifications strategies of ZnIn2S4 such as heterojunction, elemental doping etc. *Thus, this study would guide future researchers to*

broaden the modifications of $ZnIn_2S_4$ *-based materials for* H_2 *generation via photocatalytic water splitting.*

Keywords: Zinc Indium Sulfide; Solar Fuel; Photocatalysis; Water-Splitting; Hydrogen.

STC032

IMPACT OF TEMPERATURE VARIATION ON THE PHYSICAL PROPERTIES OF ZIRCONIUM DOPED PbSe NANOSTRUCTURE MATERIAL FOR PHOTOVOLTAIC APPLICATION

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ABSTRACT

Nanostructure films of Zirconium (Zr) doped lead selenide (PbSe) were successfully synthesized with different deposition temperatures on fluorine-doped tin oxide (FTO) glass substrates using the electrodeposition technique. The synthesized Zr-doped PbSe nanostructure films were investigated for optical, structural, electrical and morphological properties using different analyses. The absorption spectrum analysis revealed a decrease in the optical band gap from 1.6 eV to 1.3 eV as the deposition temperature increased from 40°C to 55°C. The absorption spectra decrease with an increase in deposition temperature across the UV-VIS-NIR region of the spectrum. The SEM micrographs showed a change in the morphologies of the films as the increase in deposition temperature yielded a surface less tightly packed with short chains of large granules of grain. The x-ray diffraction pattern confirmed the cubic structure and revealed an increase in diffraction peaks as the deposition temperature increased. The lattice constants were found to decrease from 5.30104 Å to 3.47501 Å as the deposition temperature increased. The crystallite sizes were observed to increase with an increase in deposition temperature.

Keywords: Nanostructure, Zirconium, Doping, PbSe films.

STC033

JUDD-OFELT ANALYSIS OF SM3+ ACTIVATED TELLURO-BORATE GLASS SYSTEM FOR ADVANCED OPTICAL APPLICATIONS

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ABSTRACT

The search for optimized glasses doped with lanthanides for advanced applications persists. Lanthanides are characterized by complex spectral attributes due to their electronic

structure; thus, understanding these properties is crucial for diverse optical applications. Based upon the principles of quantum mechanics and the interaction of the lanthanides with their local environment, Judd-Ofelt analysis provides a quantitative framework to describe these interactions making it easier to understand and predict the light interaction processes. Driven by this, we explored the Judd-Ofelt analysis of a novel Sm3+ doped telluroborate glass fabricated using the melt-quenching method. The revealed Judd-Ofelt intensity parameters Ω2, Ω4, and Ω6 were obtained in the range of 1.48 to 4.20 (×10-20 cm2), 2.31–4.31 (×10-20 cm2) and 1.15–1.99 (×10-20 cm2), accordingly. Furthermore, the small values of Ω2 point to the fragility of the covalency nature of network coordination in the surroundings of Sm3+ sites. A branching ratio of 68.8%, emission cross-section of 75.90 × 10-23 cm2, gain bandwidth of 167.69×10-29 cm3, and optical gain of 172.01×10-26 cm2 s-1 were realized. Thus, Judd-Ofelt analysis disclosed that the developed glass system could be an excellent lanthanide ions host for visible tunable solid-state laser development.

Keywords: Sm^{3+}; Telluro-borate glasses; Judd-Ofelt; Optical properties.

STC034

ELECTRONIC AND MAGNETIC PROPERTIES OF COS: A SYSTEMATIC STUDY OF THE EFFECTS OF THE ON-SITE COULOMB INTERACTION AND COMPARISON WITH HYBRID FUNCTIONAL CALCULATIONS

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ABSTRACT

The electronic and magnetic properties of wurtzite cobalt sulphide (CoS) have been studied using the density functional theory approach. Since strong hybridization between the 3d orbital of cobalt (Co) and 2p orbital of sulphur (S) has been observed earlier, the effects of the on-site Coulomb interaction term, U on Co and S atoms have been extensively investigated. Comparison with the result from the hybrid functional shows that application of the on-site Coulomb interaction term on the S atom in addition to Co gives an acceptable electronic structure. The obtained electronic structure shows that wurtzite CoS is an indirect band gap semiconductor appropriate for absorption layers in solar cell applications. The obtained result is comparable with the experimental data and explains the apparent disagreements among various experimental results. Magnetic properties show that CoS is anti-ferromagnetic with the bulk of the magnetic moment residing on the Co atoms.

Keywords: CoS; Antiferromagnet; Band gap; Solar cell, Density functional theory

STC035

INVESTIGATING THE INFLUENCE OF EXCHANGE-CORRELATION EFFECTS AND THE HUBBARD TERM ON THE ELECTRONIC BANDS OF DEFECTED Cu2O: A DFT STUDY

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ABSTRACT

The study utilized the Quantum Espresso package, employing plane wave and pseudopotential methods. Three approximations for the exchange-correlation functional were considered: Perdew-Burke-Ernzerhof (PBE), Perdew-Burke-Ernzerhof revised for solids (PBEsol), and local density approximation (LDA). The effects of spin polarization and the inclusion of a Hubbard term (U=8.5 eV for Cu and O) were also examined for each approximation. The findings revealed interesting insights into the structural properties of defected Cu2O. The PBE and PBEsol approximations tended to underestimate the experimental values of the lattice constant 'b', while the PZ-LDA approximation yielded a value close to the experimental one. In terms of bond distances, all three exchange-correlations tended to overestimate the Cu-O and O-O bond distances, with PBE yielding the highest values, followed by PBEsol and PZ-LDA. The Cu-Cu bond distances exhibited a unique pattern with modulated lengths at different atomic distances, and the LDA-PZ parameterization tended to underestimate these values. The inclusion of the Hubbard term had a significant impact on the electronic band structure of defected Cu2O. It improved the band gap for all approximations, reducing errors associated with lattice parameter values for PBE and PBEsol, except for LDA+U. Additionally, the bond lengths and bond angles generally increased when the Hubbard term was included, except for the bond length at the Cu-Cu region of the oxygen vacant site, which demonstrated a distortion effect known as the Jahn-Teller effect. The study also highlighted the importance of hybridization between Cu3dxz, 3dyz orbitals and O 2s orbitals in the formation of the defective spin-polarized Cu2O bandgap. Overall, the research emphasized the significance of considering exchange-correlation effects and the Hubbard term in understanding the electronic properties of defected Cu2O using DFT. The findings contribute to the evolving understanding of the electronic behaviour of this material and pave the way for further investigations on the doping process of this material.

Keywords: Cu_2O, DFT, exchange-correlation function, PBE, PBEsol, LDA, Hubbard term, spin polarization, Jahn Teller effect.

STC036

RECENT ADVANCEMENTS IN NANOSTRUCTURED FE3O4 COMPOSITE ABSORBER MATERIALS FOR EFFICIENT ABSORPTION OF MICROWAVES

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ABSTRACT

The occurrence of unwanted radiation such as microwaves in the atmosphere has resulted in the malfunctioning of electronic devices in the form of electromagnetic interference (EMI). Additionally, human DNA could be altered and potentially cause radiation-related diseases such as cancer by these unwanted microwaves. Magnetite (Fe3O4) possess extraordinary magnetic properties (especially saturation magnetization) which makes it show excellent magnetic losses and consequently high absorption of microwaves. However, Fe3O4 exhibit poor dielectric losses which result in poor absorption of microwaves. Therefore, there is a need to add additional dielectric and conducting nanomaterial to Fe3O4 to form a composite thereby improving its capability and performance for absorption of microwaves. Furthermore, other nanomaterials could be used to create synergistic effects thereby enhancing the microwave absorption performance of Fe3O4 and its composites. In this review, the structure, properties and synthesis route of Fe3O4 were discussed in detail. Detailed discussions on the microwave absorption performance of Fe3O4 and its composites were presented. Finally, prospects as well as guidance into designing and synthesizing Fe3O4-based composites with high and efficient microwave absorption performance were critically analyzed and discussed.

Keywords: Fe_3O_4 absorber; Reflection loss; Impedance matching; Attenuation constant.

STC037

DENSITY FUNCTIONAL THEORY STUDY OF THE EFFECT OF MONO-HALOGEN SUBSTITUTION ON ELECTRONIC AND NON-LINEAR OPTICAL PROPERTIES OF PORPHYRIN

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ABSTRACT

Porphyrin is an organic macrocycle compound with a chemical formula ($C_{20}H_{14}N_4$). In this work, DFT and TD-DFT were used to calculate the molecular geometry, and electronic and nonlinear optical properties of parent and substituted porphyrin molecules using Gaussian

03 package. The results for the bond lengths indicate that the strongest bond was found in the chloroporphyrin molecule with a value of 1.0771(Å). The calculated value of the HOMO-LUMO energy gap shows that porphyrin will be more stable by the substitution of a fluoride atom with a HOMO-LUMO energy gap of 5.59eV. The value of the energy gap for the parent porphyrin molecule (2.89) eV was found to be closer to the reported value of (2.92) eV. It was found that the zero-point vibrational energy reduces, while the entropy and specific heat capacity of the molecules rise, due to the effect of the substitutions. The non-linear optical properties calculations show that, the first-order hyperpolarizability (β_{tot}) values turn out to be ten times that of the prototype area ($0.3728\ x10^{-24}$ esu) molecule, which is commonly used for the comparison of NLO properties with other materials. The values for the open circuit voltage are within the acceptable limit for organic solar cells. The UV-VIS spectrum shows that due to the solvent effect, there was an increase in the excitation energy and a slight increase in oscillator strength. Our findings show that the hybrid halogenated compound may be used for solar cell applications.

Keywords: Porphyrin, TD-DFT, NLO, and HOMO-LUMO

STC038

FIRST PRINCIPLE INVESTIGATION OF STRUCTURAL, ELECTRONIC, AND OPTICAL PROPERTIES OF STANENE AND STANENE DOPED NON-METALS (SULFUR AND PHOSPHORUS) FOR OPTOELECTRONICS APPLICATIONS

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ABSTRACT

In this paper, the structural, electronic, and optical properties of stanene, stanene-doped sulfur, and stanene-doped phosphorus were investigated using the method of projected augmented wave (PAW) within the framework of density functional theory (DFT). pristine stanene exhibits a zero-band gap nature as compared to pristine stanene when doped with sulfur and phosphorus atoms. However, stanene doped with a sulfur concentration of 25% and phosphorus of 25% concentration were observed to retain their direct band gap property and also have wider band gap openings of 0.77eV and 0.47eV respectively as compared to other doping concentrations. A close observation of the optical properties of stanene-doped phosphorus and that of sulfur at various doping concentrations infers that the material exhibits anisotropic behaviour. The refractive index of stanene-doped phosphorus and that of sulfur at SnP12.5% and SnS12.5% are higher than that of pristine stanene. Thus, SnP12.5%, SnP25%, SnS12.5%, and SnS25% could be a promising candidate for optoelectronic applications.

Keywords: Stanene, DFT, Optoelectronics, 2D material.

STC039

SYNTHESIS AND CHARACTERIZATION OF CU-DOPED H3PO4 ACTIVATED GROUNDNUT HUSK CARBON-BASED COMPOSITE ANODE MATERIAL FOR SUPERCAPACITOR APPLICATION

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ABSTRACT

This study utilised the remarkable qualities of groundnut carbon husk that has been activated with H3PO4 and doped with Cu using the hydrothermal method and the drop-casting synthesis technique. The main goals are to obtain high energy storage capacity and quick charge-discharge cycles, to enhance the performance of supercapacitors. The charge transfer and ion transport kinetics throughout the composite electrodes were improved by the addition of Cu2+ into the H3PO4C network. The charge stored in the anode material during charging represents a linear decrease of the charge capacity with an intensity of charging current. The observed decrease in the charge and discharge capacities at the current density of 5 A/g was caused by ionic polarization. The composites Cu0.1:(H3PO4C)0.9 at a scan rate of 3 mV/s gave a higher specific capacitance and energy density, thereby making it a more suitable anode material when used in electrochemical applications. The sample Cu0.1:(H3PO4C)0.9 at a scan rate of 5 mV/s has a relatively higher power density, this is mainly attributed to its lower equivalent series resistance.

Keywords: Groundnut Carbon Husk, Power Density, Energy Density, Anode Electrode

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STC040

ELECTRICAL AND DIELECTRIC PROPERTIES OF DISC-SHAPED COMPACTS FABRICATED USING COW BONE NANOPOWDERS

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ABSTRACT

This work explores the utilization of nanopowder derived from cow bone. The cow bone was milled to Nano and the powder was characterized using scanning electron microscopy (SEM), XRF, and Fourier transform infrared spectroscopy (FTIR). The nanopowder was then fabricated into disc-shaped compacts in triplicates. A thermal conductivity setup and a programmable LCR Bridge were used for further characterization. The result of the chemical analysis shows that CaO is the dominant metal oxide in the powder, accounting for 69.077 wt%. The mean dielectric constant and electrical conductivity of the discs are 10.71

and$1.467 \times 10^{-8}\ S/m$, respectively, in the frequency range of 20 Hz to 3000 kHz. Their electrical resistance, capacitance, dielectric loss (tan δ or loss tangent), and dielectric constant (relative permittivity) values were determined within a frequency range of 20 Hz to 3000 kHz. The capacitance and loss tangent of the compacts were evaluated over the frequency range from 20 Hz to 3000 kHz. Results indicate that the capacitance of the compacts decreased with increasing frequency, exhibiting characteristic frequency-dependent behaviour, and the dielectric constant of the studied samples decreased exponentially with an increase in frequency. The sample could serve as a suitable alternative to conventional dielectrics such as paper, mica, aluminium oxide, and plastic films commonly used in capacitor manufacturing companies.

Keywords: Capacitance, Cow bone, Dielectric properties, Electric conductivity, Thermal conductivity.

STC041

CHARACTERIZATION AND MODELLING OF BIOGAS PRODUCED FROM ANAEROBIC DIGESTION AND CO-DIGESTION OF POTATOES AND ONION WASTES IN A MESOPHILIC ANAEROBIC DIGESTER USING ARTIFICIAL NEURAL NETWORK (ANN)

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ABSTRACT

Biogas is an alternative, renewable and clean energy source produced through anaerobic digestion of organic matter. This study aims to determine the biogas produced from the anaerobic digestion and co-digestion of Potato and Onion wastes and to model the biogas yield using Artificial Neural Networks (ANNs). The experiment was operated under mesophilic conditions (27 - 38ºC) and daily biogas yield from the plant was monitored for 60 days. The parameters studied were Total solids (TS), Volatile solids (VS), Volatile fatty acids (VFA), Carbon contents (CC), Organic carbon, Temperature, pH and Moisture content (MC). The temperature of the slurry remains at the range of 29°C-31°C which is within the mesophilic range. The pH varies from 8.5 before digestion and decreases to an approximate value of 8.2 during the digestion process and becomes slightly acidic at a range of 7.7 to 7.0 when digestion stops. The study also utilizes the Artificial Neural Network (ANN) as a tool for simulating of biogas production process from the digesters. A multi-layer ANN model with ten hidden layers was trained to simulate the digester operation and to predict biogas production. The performance of the ANN model was verified and demonstrated the effectiveness of the model to predict the biogas production accurately with correlation coefficients of 0.85, 0.86, and 0.81. The high-value R2 demonstrates the appropriateness of the artificial neural networks model for accurate estimation of anaerobic digestion and co-digestion of potato and onion wastes.

Keywords: Anaerobic, Artificial Neural Network, Biogas, Modelling, Renewable Energy.

STC042

THE COMPARATIVE STUDY OF THE OUTPUT OF AMORPHOUS SILICON PHOTOVOLTAIC SOLAR CELLS WHEN RECEIVING DIRECT AND DIFFUSED RADIATIONS

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ABSTRACT
A tracking mechanism is adopted here for diffused radiation while a fixed position was used for directing radiation. Four amorphous silicon photovoltaic solar cells were subjected to solar Radiation reception to analyze different configurations. Two of the solar cells were at fixed positions corrected together to observe Diffuse solar Radiation while the other two were subjected to direct solar Radiation from the Sin track. The LDR cell was constituted to control the tracking system. It was connected with LED which indicates the action of reception intensity at any time of receiving Direct Solar Radiation. Measurements were taken with digital mutitrelin at 10-minute intervals for the two configurations separately. The data obtained was subjected to further treatment to determine the trend by plotting graphs of solar Radiation against ambit temperature. For the two configurations, trend line equations were obtained and a consistency test was carried out to test the validity of each data obtained and the raw measurement, which shows that the equation is constant with the data obtained.

Keywords: ***Tracking, Photovoltaic, Radiation, LED, LDR***

STC043

UNVEILING THE INFLUENCE OF ANNEALING TEMPERATURE ON PROPERTIES OF CZTSE NANOCRYSTALS

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ABSTRACT
The burgeoning interest in kesterite materials stems from their promising applications in both charge-selective materials and photocathodes for photoelectrochemical water splitting. Kesterites, a complex class of semiconductors, typically contain copper, zinc, tin, and either sulfur or selenium atoms. Despite their prevalent use as photocathodes, a comprehensive understanding of their optoelectronic properties remains elusive. This study delves into the synthesis and characterization of Copper Zinc Tin Sulfide Selenium (CZTSe) nanopowders, aiming to elucidate the impact of annealing temperature on their properties. Solution-based synthesis utilizing copper chloride, zinc acetate, tin(II) chloride, and thiourea/selenium precursors yielded CZTSe nanopowders. Annealing in distilled water at varying temperatures (100°C to 350°C) offered a platform to explore the effects on elemental and phase compositions, morphology, and optical behaviour. X-ray diffraction analysis provided insights into crystal structure and size, while microscopy techniques revealed morphology and particle size distribution. Optical analysis evaluated the light-responsive properties, shedding light on the potential of these materials for optoelectronic applications. This research contributes to a deeper understanding of CZTSe nanopowders and their suitability

for photoelectrochemical water splitting, paving the way for further advancements in sustainable energy technologies.

Keywords: Kesterites, CZTSe, Semiconductors, Thiourea/Selenium, Nanopowders

STC044

OPTIMAL CONDITIONS FOR PREPARATION OF PEROVSKITE CRYSTALS AND THIN FILM FOR OPTOELECTRONIC APPLICATIONS

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ABSTRACT

Lots of data on the preparation of perovskite crystals has been obtained because samples were prepared using films of different qualities. Identifying optimal conditions for perovskite material synthesis and thin film preparation as well as optimizing the properties will help in reducing the disparities in the data obtained. The optimal composition management of various elements of perovskite remains an outstanding research. A little alteration in the elemental composition can have a notable influence on the properties of the materials and the device output. This study examined the experimental investigations for preparing and optimizing the microstructure of halide perovskites through solution processing. We optimized the properties of the materials before fabrication to identify optimal conditions for chemical and material synthesis. This was done properly in powder form without substrate since it was not possible to analyze a material property once the cell had been manufactured. Elemental characterization and measurements carried out revealed the ties between powder crystals and thin film specifying the fitness landscape for the target objective. The findings paved the way for the optimum design of the synthesis process of perovskite-based devices for better performance. Results also provide a basis for explaining the effective optimizations of synthesis conditions and material properties.

Keywords: Optimal conditions, perovskite material, thin film, properties, Characterization.

STC045

EVALUATION OF VISCOSITY-TEMPERATURE COEFFICIENTS OF SOME LUBRICANTS

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ABSTRACT

We evaluated the viscosity-temperature coefficients of some four commonly used lubrication oils. We employed Poiseuille's equation while raising the temperature from 24°C to 40°C of the lubricants at a regular interval of 2°C in a laboratory. The viscosity-temperature coefficients of the four samples of lubricants A, B, C and D were obtained to be: −0.1747, −0.2228, −0.1082, and −0.1657 respectively. and their temperature change that renders viscosity value to be zero for the four samples were found to be 23, 20, 24 and 26

degrees Celsius for samples A to D respectively. Based on this finding sample C is found to be more effective as a lubricant due to its smallest temperature coefficient with appreciable temperature change before it loses its viscosity.

Keywords: Lubricant, Poiseuille's equation, Temperature coefficient, Viscosity.

STC046

PRODUCTION OF METHANE GAS BY ULTRASONIC MEMBRANE SYSTEM (UMAS) USING PALM OIL MILL EFFLUENT (POME) AS A SUBSTRATE

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ABSTRACT

This study focuses on methane production from palm oil mill effluent (POME) using the Ultrasonic Membrane Anaerobic System (UMAS). A 100 mL volume digester was designed as part of the experimental setup for the UMAS. Six kinetic parameters, including COD, BOD, pH, and TSS, were investigated. The reactor operated at ambient temperatures ranging from approximately 30 to 35 ˚C. POME was continuously fed into the anaerobic reactor from the side flow, and effluent samples were collected after 5 hours for parameter analysis at each hydraulic retention time (HRT) batch. The start-up of the UMAS reactor involved stepwise increases in influent organic volumetric loading rates, ranging from higher to lower retention times of 392.16, 128.21, 119.05, 111.11, and 98.04 days. Acclimatization of microorganisms in the mixed liquor took place throughout 4 to 9 days to ensure adaptation to the new environment. Methane and carbon dioxide gases produced were collected using a syringe, with NaOH or KOH added to adsorb the carbon dioxide from the methane gas. The developed UMAS is expected to be an effective process for methane production, potentially reducing membrane fouling and decreasing retention time. Additionally, complete treatment may lead to an 86% reduction in COD content and improvement in performance.

Keywords*:* Methane production, palm oil mill effluent, kinetic parameters, anaerobic reactor, membrane fouling, carbon dioxide adsorption, wastewater treatment.

STC047

Constancy of the Half Value Layer of Cobalt-doped borate glasses with Lanthanum Oxide Additive at Extremely High Radiation Energy

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ABSTRACT

Radiation shielding is essential for protecting workers, patients, and the environment from the harmful effects of radiation. To achieve effective and non-toxic shielding, scientists are interested in developing lead-free materials with low thickness that can still attenuate radiation. This is where the concept of Half Value Layer (HVL) comes in. This study aims to investigate the nature of the HVL of Cobalt-doped borate glasses with five different concentrations of Lanthanum oxide (La2O3) additive at various energy levels. Phy-X/PSD software was used to simulate radiation exposure and determined the HVL values for energies within the order of 0-10 keV, 10 – 100 keV, 100 keV – 1 MeV, 1 – 10, 10 – 100, 100 – 1,000, 1,000 – 10,000, and 10,000 - 100,000 MeV. The results showed that the HVL values fluctuated depending on the energy range of the incident radiation, but they remained constant within a mean value at extremely high energies. These findings can help manufacturers determine the appropriate thicknesses and the amounts of (La2O3) additive for different applications of this glass system.

Keywords: Glass system, Half value layer, Low thickness, Radiation shielding.

STC048

SYNTHESIS AND CHARACTERIZATION OF ZINC OXIDE (ZNO) THIN FILMS FOR SOLAR CELL APPLICATIONS USING SOL-GEL AUTO COMBUSTION TECHNIQUE

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ABSTRACT

Zinc oxide (ZnO) nanoparticles were prepared using the sol-gel auto-combustion method from Zinc acetate dehydrate and sodium hydroxide. Their structural, morphological, optical and electrical properties were studied. X-ray diffraction (XRD) analysis revealed the film's hexagonal wurtzite phase with preferred (101) grain orientation. The mean crystallite size calculated using the Debye-Scherrer model was 23nm with lattice parameters a=0.3255nm and c=0.5185nm (CF. JCPDS 361451) and small dislocation density of 1.8 x 10-3nm-2, which shows the presence of few lattice defects and very good crystallinity. Scanning electron microscope (SEM) micrographs revealed the film's granular porous structure composed of collections of hexagonal columnar grains in a direction normal to the substrate surface and an average grain size of around 198.86nm. The UV-Vis room temperature optical absorption coefficient was analysed using the transmission spectra data and the optical band gap energy was estimated to be around 3.3eV. A low electrical resistivity value of 2.35x10-4Ωm was obtained and a high value of carrier charge mobility was found to be 185cmV-1S-1. The results of this work are important for applications in semiconductor devices, particularly solar cells, optical sources and detectors.

Keywords: Zinc oxide, Sol-gel, ZnO, XRD, SEM.

STC049

Cs3+- Ni2+ SUBSTITUTED ZINC SPINEL FERRITES NANOPARTICLES: INFRARED AND MORPHOLOGICAL PROPERTIES

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ABSTRACT

In this research, the sol-gel auto-combustion method was employed to synthesise caesium - nickel (Cs^{3+}– Ni^{2+}) substituted zinc spinel ferrite with chemical composition $Zn_{1-x}Cs_xFe_{2-x}Ni_xO_4$ (x=0.0, 0.1, 0.2) and calcinated at 700oC for 5hrs. The FTIR spectrum revealed the absorption band of tetrahedral and octahedral sites at 533.51cm-1 and 413.84cm-1 (two characteristic peaks) which indicate the presence of iron oxide. The presence of CO_2 in the prepared samples was also observed at 2359.19cm-1. Morphological study revealed the evidence of agglomeration which occurs as a result of magnetic interaction between the grains. The EDX analysis revealed the presence of various stoichiometry ratios in the prepared samples. The existence of host and doped elements was also revealed by the elemental mapping analysis. The presence of two characteristic peaks at 533.51cm-1 and 413.84cm-1 justified the fact that the prepared sample belongs to the spinel ferrites family.

Keywords: EDX Analysis, Elemental Mapping, Rare-earth Elements, Spinel Ferrite, Vibrational Constant.

STC050

Influence of annealing temperature on the optical and morphological characteristics of black silicon for solar cell applications.

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ABSTRACT

A promising absorber material for photovoltaic (PV) applications is black silicon, or b-Si. This work examines how the annealing temperature affects the optical and surface morphological characteristics of b-Si that are produced using the aluminium-assisted chemical etching (AACE) method. The aluminium (Al) thin film with a thickness of 40 nm is deposited on crystalline silicon (c-Si) wafers using direct current (DC) sputtering in this study, and the wafers are then annealed at 250–450oC in an environment of nitrogen (N_2). The wafers are then etched for 30 minutes at room temperature in a wet chemical solution that contains hydrofluoric acid (HF), hydrogen peroxide (H_2O_2), and deionized (DI) water. The results show that the creation of b-Si nanopores with the deepest nanopores and the maximum

surface coverage occurs when the sample is annealed at 400. This temperature also leads to the lowest broadband reflection within the 300–1100 nm wavelength region. As a result, the least weighted average reflection (Ravg) of 9.8 % is achieved when the substrate of the b-Si annealed at 400 is normalized to the reflection of the planar c-Si reference.

Keywords: Aluminum-assisted chemical etching, DC sputtering, black silicon, weighted average reflection.

STC051

Growth rate of AL2O3 thin film BY LIQUID Phase Deposition as an Anti-reflection coating layer on crystalline silicon for solar cell applications

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ABSTRACT

In this work, an aluminium oxide thin film by liquid phase deposition (LPD-Al2O 3) is synthesized from a combined solution of aluminium sulfate octa decahydrate (Al2(SO4)3· 18H2 O) and sodium carbonate (NaHCO3) with pH of 3.1. Some samples of p-type (100) crystalline silicon (c-Si) wafers of resistivity 1 – 10 mΩ were immersed inside the growth liquid of LPD-Al2O 3 thin film for 1hr – 2.5 hrs. This is followed by annealing the samples at a temperature of 450oC, the deposition rate is faster in the range 1 – 1.5 hrs about 35nm/hr. As the growth time increases, the growth rate of the film decreases and remains nearly constant at about 10nm/hr for 1 – 2 hrs. When the growth time exceeds 2 hrs, the film thickness remains unchanged showing that the liquid has lost in growth ability. The weighted average reflection (R_{avg} %) of planar c-Si is reduced from 44.9% to 29.6% after deposition of the LPD-Al2O 3 for 2.5 hrs growth time, indicating a 34.1% reduction in the reflection within the wavelength region of 300–1100 nm. While the root means square (RMS) surface roughness of 36.5nm was also recorded at the highest growth time of 2.5 hrs. This shows the effect of a thicker LPD-Al2O 3 thin film layer increases the anti-reflecting coating property of the material.

Keywords: Aluminum oxide thin film, weighted average reflection, RMS surface roughness, anti-reflecting coating.

STC052

EXPLORING THE PHYSICAL PROPERTIES OF A LEAD-FREE HALIDE PEROVSKITE RbSnI3: A DFT STUDY

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ABSTRACT

Herein, a detailed study of the structural, electronic and elastic properties of lead-free halide perovskite (RbSnI3) is reported. The integrated quantum ESPRESSO code was used for material modeling, and structural, electronic and elastic properties calculation. The calculation of the properties of this material was carried out within the framework of the density functional theory (DFT). The thermo_pw code was employed for the elastic property. The Perdew-Burke-Ernzerh (PBE) variant of the generalized gradient approximation (GGA) was employed as the exchange-correlation potential. The simulations were done by determination of the optimized lattice constants through relaxation. The lattice constant was found to be a = 10.4066 Å, and γ = 900. The structural property calculation shows that the material is stable within the temperature-dependent phase. The electronic properties result reveals that the material is a semiconductor with an energy gap of 2.02 eV. This value is consistent with the corresponding lead base perovskite. The density of state (DOS) and the partial density of state (PDOS) also confirm the semiconducting behaviour of the material. The elastic constants of the material meet the requirements for mechanical stability by agreeing to the Born stability condition. The results of the study place the material as a potential candidate for solar cell application.

Keywords: Perovskite material, Lead-free halide, Density functional theory, Solar cell

STC053

MEASUREMENT OF PMMA FILM THICKNESS ON SILICON WAFER USING FILMETRICS F20

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ABSTRACT

Abstract: In this paper, we study the effects of PMMA film thickness on the optical properties of crystalline Silicon using FTIR and FESEM. The FTIR spectral analysis shows high absorption and low reflection of light on the sample coated with PMMA and low absorption and high reflection are observed on an uncoated Sample. On the other hand, the FESEM analysis shows the present of PMMA compositions on the coated sample compared to uncoated one.

Keywords: Filmetrics F20, PMMA, FTIR, FESEM, Crystalline Silicon.

STC054

Biodiesel Production from Neem Seeds Oil using Solid Base Heterogeneous Catalyst (CaO/Al2O3)

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ABSTRACT

A comparative study of yield and physicochemical properties of the oil and biodiesel from the neem seed oil was carried out. A matured fruit neem seed was collected and oil extracted using n- hexane via soxhlet, steam and cold extraction method, heterogeneous base-catalysed (CaO/Al2O3) was synthesized and methanol was used in the transesterification for the production of biodiesel, the percentage oil yield (%) of the plant seed are 58.15%, 33.75% and 58.77% while its corresponding methyl esters yield (%) are 79 %, 58 %, 65 % for soxhlet, steam and cold extraction respectively. Some fuel parameters of the methyl esters include Acid value (4.34, 3.4,3.63), Viscosity (4.97, 5.85, 4.48), cloud point (8.0, 7.0, 11.20), pour point (4.30, 4.16, 4.0), free fatty acid (3.12, 1.10, 1.22) and iodine value (47.98, 67.5, 50.49) which were found to confirm with the ASTM standard. The catalyst was prepared using impregnation and calcination method and then characterized by FT-IR spectroscopy, while the Fatty acid methyl esters (biodiesel) profile investigated was determined and presented via GC-MS analysis, the result revealed the presence of Palmitic, Oleic and Linoleic acids as dominant which confirmed the occurrence of the transesterification of the oil to biodiesel. It was confirmed that neem seed (Azadirachta indica) oil can serve as a good feedstock for biodiesel production.

Keywords:

STC055

PERFORMANCE EVALUATION OF CYLIDRICAL POT-LIKE RECIEVER FOR COOKING APPLICATION USING PARABOLIC SOLAR CONCENTRATING SYSTEM

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ABSTRACT

Solar energy has been identified as the largest renewable source of energy, and advocated as the substitute for depleting fossil fuels for thermal applications and electricity generation. The research paper was aimed at determining the performance evaluation of the cylindrical receiver for domestic cooking application using parabolic solar concentrating system. The concentrating solar parabolic dish (CSPD) with a titled angle of 60O, the focal length of 8.15m, and aperture area of 5.8m2 were designed and constructed for the determination of the variables. The (CSPD) and cylindrical pot like receiver were made of stainless-steel reflector sheet and aluminium sheet material painted black respectively. A finite element stress analysis was conducted to determine the thermal efficiency and quantity of thermal

energy of the system under various weather conditions. A simple solar tracking mechanism was employed when it was oriented in a direction of solar radiation. The performance evaluation of the system was also obtained, and thermal energy generated by system with cylindrical pot like receiver (CPR) was used to cooked rice of 0.15 kg, and temperature value of 99 OC was recorded. The thermal efficiency and quantity of thermal energy of the system were determined as 48.6 % and 62370J respectively.

Keywords: Solar radiation, Parabolic collector, Cylindrical receiver and Thermal efficiency

STC056

HIGHLY EFFICIENT AND STABLE ALL-INORGANIC CSPBBR3 PEROVSKITE SOLAR CELLS WITH TIO2 AND QUARTERNARY CHALCOGENIDE CU2FESNS4 AS CHARGE TRANSPORT CHANNELS: A SCAPS-1D SIMULATION STUDY

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ABSTRACT

The efficiency of cesium lead bromide-based perovskite solar cells (PSCs) is still plagued with the limitation of poor performance as compared to well-known organic-inorganic halide counterpart. A proper device modeling on the cesium lead halide (CsPbX3, X = l, Br, and Cl) that can explore its full potential is needed. In this research work, we utilized a one-dimensional solar cell capacitance simulator (SCAPS-1D) tool to investigate the photovoltaic (PV) performance of CsPbBr3-based solar cell in a configuration with different hole transport layers (HTLs) which include CuSCN, CuI, Mg-CuCrO2, CuO, CuSbS2, CFTS, CBTS. During the simulation, the best device configuration was ITO/TiO2/CsPbBr3/CFTS/Au which displayed a power conversion efficiency (PCE) of 12.985%, fill factor (FF) of 79.263%, current density (Jsc) of 18.463 mA/cm2 and open circuit voltage (Voc) of 0.887 V. Further study was carried out on the optimized configuration by varying the thickness of ETL, doping concentration of ETL, doping concentration of absorber, defect density of absorber and thickness of absorber to obtain 0.01 µm, 1020 cm-3, 1012 cm-3, 1014 cm-2 and 0.5 µm as optimized values. The optimized PCE of 14.034% was reported with TiO2 and CFTS as ETL and HTL transport channels. Additionally, the influence of temperature, metal work function, series resistance and shunt resistance were also systematically investigated. This simulation alongside with validated results displayed the real potential of CsPbBr3 absorber with suitable ETL and HTL, creating a major research pathway for the photovoltaic industry to develop cost-effective and high-efficiency.

Keywords: perovskite solar cells, SCAPS-1D, charge transport channels, Cu2FeSnS4, CsPbBr3

STC057

CONSTRUCTION AND PERFORMANCE EVALUATION OF SOLAR WATER HEATER

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ABSTRACT

Solar water heater consisting of a storage tank and a plate flat collector was constructed using locally available material. The construction consists of rectangular solar collector (45 cm by 70 cm), insulated storage tank (25 liters), insulated connection pipes (half inch), and a vent (air escape pipe). Fluid in the collector obeys the thermosyphone system and stored in the tank until when it's needed. Results obtained in the month of November for the period of about a week define the performance of the system. Average values of ambient temperature (Ta), input temperature (Ti), output temperature (To) collector surface temperature (Ts), and the wind speed (V) were calculated to be 33.74 0C, 30.17 0C, 41.50 0C, 53.25 0C and 1.6 m/s respectively. These values allow us to calculate the passive solar gain, and the energy losses in other to compute for the energy balance of the system. The efficiency of the system were computed using the output and the input temperature of the fluid and is found to be 27.3 %. Performance of the system can be higher with increase collector surface area and the storage tank.

Keywords: Solar collector, temperature, fluid, thermosyphone

STC058

VIABILITY STUDY FOR IMPLEMENTING A SOLAR BASED MICROGRID SYSTEM IN GEIDAM TOWN OF YOBE STATE NIGERIA

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ABSTRACT

Renewable energy sources such as photovoltaic (PV) system and wind energy system are among the preferred renewable energy technology in many countries. Photovoltaic systems in particular have greater potential for geographical locations that receive abundance sunlight throughout the year. Geidam, one of the major rural centers in Yobe state Nigeria is one such locations. It is located in the north eastern part of Yobe State with latitude12 degrees 37.54 minutes N and longitude of 11 degrees 58.83 minutes E and has a population of more than 157thousand people (according to 2006 census), a feasibility study was carried out to investigate the possibility of supplying electricity from a renewable energy-supplemented system based on PV solar system to the town. The data obtain was then used

to design a micro grid system using HOMER Pro version software considering the load demand of the study area.

Keywords: photovoltaic, renewable energy, solar radiation, Microgrid, hybrid system

STC059

OVERVIEW OF THE IMPORTANCE AND DRAWBACKS ON RENEWABLE ENERGY IN NIGERIA

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ABSTRACT

As a rapidly developing country with a growing energy demand, due to the factors which include; an increase in national population, increase in industrial activities and worldwide climate changes. Therefore, Nigeria is increasingly in needs of exploring renewable energy options to diversify its energy mix and reduce its dependence on fossil fuels. This article aims to provide an overview of the importance and drawbacks associated with the adoption of renewable energy sources in Nigeria, also to enumerate its benefits and make recommendations on how to use it in a more effectively and appropriate manner. These will give an insight to address these challenges through strategic planning, innovative policies, and collaboration between the government, private sector, and international partners to fully unlock the benefits of renewable energy while mitigating its drawbacks.

Keywords: Renewable energy; importance; drawbacks; effective use.

STC060

In-plane heat distribution measurement for Ti and AlN stack coating for solar thermal application

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Abstract

The photothermal conversion efficiency of solar absorber coating depends not only on the use of high thermal conductivity materials, but also on the ability of the coating materials to distribute the absorbed heat to the working fluids. In this paper, we synthesized titanium (Ti) and aluminium nitride (AlN) composite coating on stainless steel (SS) substrate via Direct Current (DC)/Radio Frequency (RF) magnetron sputtering system at room

temperature using different stack configuration. The structural, optical, surface and topological features of the coating was studied using X-ray diffractometer (XRD), UV-Vis-NIR spectrophotometer, Field Emission Scanning Electron Microscope (FESEM) and Atomic Force Microscope (AFM) respectively. The in-plane heat distribution measurement was carried out using thermal infrared camera. High power light emitting diode (LED) was used as a heat source. The LED was operated at an optimum deriving current of 300 mA, 400 mA and 500 mA and 9 V with 30 minutes heating period. it was observed that the stack configuration with Ti layer at the bottom displayed high heat distribution of ~93 oC compared to that with AlN bottom layer. This result shows that the stack configuration with Ti bottom layer has the potential application in high temperature solar photothermal conversion.

Keywords: Imaging camera, In-plane heat distribution, Photothermal, Conversion efficiency

STC061

Caffeine Doped Perovskite Solar Cells with Enhanced Stability

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ABSTRACT

The effect of caffeine in the absorber structure of the PSCs was studied systematically in this study. Caffeine was added at different concentration ratio of 0.3 ml (S1), 0.6 ml (S2), 0.9 ml (S3) and 1.2 ml (S4) while the PSCs without caffeine content is denoted as C. The as-prepared PSCS were characterized via SEM, UV-vis, and J-V analysis techniques. The SEM results shows a nucleated orientation with average diameter of 185.16±0.2 µm. The optical analysis shows a red shift within the visible light spectrum, indicated a more visible lights are being absorbed, thus, a potential photoanode for perovskite solar cells applications. The electrical performance of PSCs, shows that the caffeine NPs reduced the degradation level of the fabricated PSCs as observed in device S3 with degradation level of 0.26 as compared with the device without caffeine with degradation level of 0.54. The optimized caffeine content for better reduction in the rate of degradation was observed in device S3 with 0.9 ml of caffeine. Furthermore, caffeine NPs was observed to have enhanced the PSCs by improving Jsc, Voc, FF and PCE of the fabricated devices. The highest performing PSCs was observed in device S1 with PCE of 9.57%, Jsc of 15.71 mAcm-2, Voc 0.94 and FF 0.65, which shows ~1.57 times improvement in PCE over the control device (C). Thus, in this study, device S3 showed an enhanced stabilized PSCs with degradation level of 0.26.

Keywords: Degradation Level, Stability, Perovskite, Caffeine and Solar Cells

STC062

Recent Trends in Photocatalytic Water Splitting using Titanium Dioxide Based Photocatalysts for Solar Fuel (Hydrogen) Production

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ABSTRACT

The hydrogen has been utilized in different applications like, production industries, transportations and so on, as a source of energy, over the years. Its mode of productions mostly is through fossil fuel, particularly, natural gas. However, when the production is engineer via photocatalytic processes using renewable energy with net zero carbon emission, the resulting hydrogen is known as solar fuel (H2). Also, photocatalytic H2 generation through water splitting with titanium dioxide (TiO2) based photocatalyst is one of the efficient method. The most widely explored semiconductor material in photocatalysis with unique features is TiO2. Despite it wide band gap of (3-3.2) eV with narrow light absorption, it turn to be the most suitable candidate of photocatalytic hydrogen production. Herein, the strategic modification of polymorph, morphology and crystal structures, metal doped and nonmetal doped of TiO2photocatalyst were discussed. Additionally, the processes of enhancing the photocatalytic hydrogen evolution such as; water splitting, photoreforming and oxidation of organic substrate, development of sensitive TiO2-based photocatalysts,separation of photogenerated charges in TiO2-basedphotocatalysts and many more modifications of such kinds were reviewed. Lastly, future research needs and challenges of TiO2-basedphotocatalysts that must be overcome, to fully utilize it in photocatalytic hydrogen production through water splitting were discussed.

Keywords: Hydrogen; Titanium dioxide; Photoreforming; Bandgap; Water splitting.

STC063

Novel Approaches to Enhanced Photocatalytic Water Splitting for the Production of Solar Fuel (Hydrogen) Using Materials Based on Cerium Oxide (CeO2)

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ABSTRACT

Cerium oxide (CeO2) nanoparticle material exhibits exceptional performance in H2 evolution when used as a catalyst for photocatalytic water splitting. It has numerous nanostructures, including nanorods, nanowires, nanosheets, nanotubes, and nanoflowers, are home to CeO2 nanoparticles. On the other hand, because of its ~2.8–3.2 eV band gap, has the disadvantage of photocorrosion and a response to the visible light area in the UV and

visible light. Unresolved characteristics of CeO2 include its high cost and rarity in nature. However, it has the advantages of radiation, chemical stability, thermal stability, and nontoxicity. Currently, a number of methods for synthesizing CeO2 nanoparticles have been modified; adding metal oxide, sulfide, or other materials to CeO2 nanoparticles enhances their functionality. Mechanism of S-scheme, Z-scheme, and direct S-scheme nano composite heterojunction based on CeO2. Additionally, p-n junction band alignment engineering was clearly covered. Due to the current global energy and climate crises, as well as environmental issues, H2 energy will continue to exist as an auxiliary energy vector. However, an evaluation of the future prospects of CeO2-based photocatalytic H2 generation via water splitting was conducted. It was observed that CeO2 nanoparticles may couple with metal oxide, 2D material, and metal sulfide for photocatalysis.

Keywords: Heterojunction; H_2; Water-splitting; CeO_2

STC064

A review on recent prospect and progress of Cadmium sulfide (CdS) photocatalysts for solar fuel (Hydrogen) production via photocatalytic water splitting

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ABSTRACT

Hydrogen (H2) energy production technology, via Photocatalytic water splitting (wsp) has recently been under extensive investigation to solve the global energy crisis. However, the inefficiency of the process is still the state of the art. This is due to many downsides associated to the semiconductor photocatalysts (Pcs). To address this problem, many strategies have to be adopted to enhance the process. Cadmium Sulfide (CdS) is one of the promising Pcs that has attracted widespread attention for its excellent optical, electrical/electronic properties and suitable band gap size. By the way, CdS is still limited by instability, photocorrosion, rapid charge carrier recombination, and low quantum efficiency. This review discusses the properties of CdS, various synthesis methods, structural properties, effect of solvent on its morphology, modification strategies; which is achieved by surface modification, doping, morphology engineering, heterojunction, composite making, etc. Largely, making a composite of CdS with metal-oxides, metal-chalcogenides, conducting polymers, carbon nanomaterials and other Pcs for higher H2 evolution yield is rigorously reported.

Keywords: Solar fuel; Nanoparticles; photocatalysis; water splitting; Cadmium sulfide (CdS); Hydrogen (H_2) evolution.

STC065

Study and Comparison of Thermal Energy Storage Systems: A review

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ABSTRACT

Thermal Energy Storage (TES) is a technology that stocks thermal energy by heating or cooling a storage medium so that the stored energy can be used at a later time for heating and cooling applications and power generation. One of the main problems in the energy supply especially in the case of the renewable energy technologies is the temporary gap between the availability of the resources and the demand. This paper studied and compared the various types of thermal energy storage systems, their cost, potentials, and barriers associated with them were discussed; research gaps in literature review has been identified and future research directions were suggested. The costs for PCM and TCS systems are in general higher, TES technologies face some barriers to market entry in most cases, and cost is a major issue. The storage of thermal energy can replace heat and cold production from fossil fuels, reduce CO2 emissions and lower the need for costly peak power and heat production capacity. Storage systems based on TCS and PCM also need improvements in the stability of storage performance, which is associated with material properties. For an efficient implementation of TES extensive research and analysis is required.

Keywords: Thermal energy storage, Sensible heat storage, Latent heat storage, Thermo-Chemical storage

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STC066

Numerical investigation on Power Conversion Efficiency of Halide Perovskite Solar Cells Using Different 2D Transition Metal Dichalcogenides as Electron Transport Material

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Abstract

Perovskite solar cell have archived great development especially in terms of power conversion efficiency (PCE). However, due to the intricacy in the stability and synthesis of TiO2 utilized as electron transport layer (ETL), have affected its viability for commercialization. Doped Transition metal dichalcogenides (TMDCs) such as PtSe2, MoTe2 and WSe2 monolayer semiconductors are promising electron transport materials for perovskite solar cell applications due their good optical and electronic properties. The

electronic properties, such as band structure and bandgap, and optical properties of these crystals were obtained from Density Functional Theory (DFT) calculations. Using these properties, we designed and simulated halide perovskite solar cells in planar structure; FTO/TMDCs/MAPbI3/Cu2O/Au. To study the impact of various transparent TMDCs on PCE of the devices, solar capacitance (SCAP) simulating software was used. To obtain an optimum efficiency, the influence of thicknesses of ETL, hole transport material, absorber material and ETL-Absorber interface defect density have been thoroughly investigated. The optimized PCE is achieved using FTO/Br-WSe2/MAPbI3/Cu2O/Au architecture with PCE of 25.743% and Voc, Jsc, and FF of 1.238 V, 24.444 mA/cm2 and 85.040% respectively. The results show the potential of replacing the most commonly used TiO2 in perovskite solar cells with Br-WSe2 as a promising electron transport layer.

Key words: Electron transport layer, Perovskite solar cell, SCAP-1D, Transition metal dichalcogenides

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STC067

ZnTiO THIN FILMS PREPARED BY ELECTRODEPOSITION TECHNIQUE.

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Abstract

ZnTiO has been successfully deposited on fluorine doped tin oxide (FTO) conductive glass substrate using electrodeposition method. Zinc acetate and titanium powder digested with hydrogen fluoride were the starting materials used for Zn, Ti and O ions sources. Volume concentration of Ti ions source was varied with very slight change in the source of Zn and O ions. The deposited thin films of Ti-ZnO were characterized for their optical and structural properties using Uv-Vis spectrometry and X-ray diffraction technique respectively. The transmittance (%) was found to decrease for the film (10 ml Ti/ZnO) deposited at highest Ti concentration in the VIS region but increased to the highest value in the NIR region. The bandgap energy of the deposited thin films was found to decrease with an increase in the volume concentration of Ti doping and the obtained values were (2.73 – 3.20 eV) for un-doped ZnO sample, (2.73 – 3.18 eV) for 4 ml Ti/ZnO, 3.0 eV for 6 ml Ti/ZnO, 2.81 eV for 8 ml Ti/ZnO and 2.76 eV for the film 10 ml Ti/ZnO. The crystallite size of the films was found to increase while micro-strain decreased as doping concentration increased. The obtained thin film is good for wide range of electronic and opto-electronic device applications.

KEYWORDS: Zinc Oxide ZnO, Titanium, Electrodeposition, Opto-electronics.

STC068

Temperature Effect on the Performance of Monocrystalline Photovoltaic Module in Yaba Lagos

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ABSTRACT

Solar energy has emerged as one of the most powerful and sustainable energy sources. However, photovoltaic (PV) module performance decreases with increasing temperature in natural outdoor environment. Temperature can have significant impacts on the amount of power harnessed by a photovoltaic module. This study is a case study that is held at Yaba College of Technology, Yaba, Nigeria to investigate the effect of photovoltaic module temperature on the PV performance in natural outdoor conditions with the aim of maintaining the PV operating temperature within a favourable limit. The electrical performance of the solar panels is represented by measuring short circuit current, open circuit voltage, output current and output voltage of non-cooled and non-cooled PV panels. Results collected show that the PV surface temperature has a significant effect on the efficiency of the PV panels. The water-cooling method maintains the surface temperature of the PV panel between 28.7°C and 33.5°C. The experimental findings indicate open-circuit voltage, efficiency, and maximum power reduce with increase in surface temperature while there is slight increase in short circuit current. The PV panel under water cooling condition shows a percentage increase of 12.6% and 11.05% of the open circuit voltage and the maximum power respectively. This leads to increase in the efficiency of the PV panel by 11.05%. The understanding of effect of temperature on the performance of a PV panel is essential for the development of viable cooling methods to maximize the efficiency and longevity of the PV panel

Keywords: Photovoltaic module, temperature, efficiency, maximum power.

STC069

A SWOT Analysis Approach for the Development of Photovoltaic Energy in Northern Nigeria

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Abstract

Despite receiving an average of 6.5 hours of sunlight each day, northern Nigeria is still not able to fully capitalise on its potential for PV energy due to various factors. This study identifies and analyses the strengths, weaknesses, opportunities, and threats (SWOTs) associated with the development of Photovoltaic (PV) energy in the region. Strengths include the geographical advantage with high solar irradiation, significant technical potential for PV energy generation, opportunities for low carbon transition, increased energy security, economic development, and job creation. However, these are accompanied by notable weaknesses such as limited public awareness, inadequate regulatory frameworks, restricted access to financing, weak institutional capacity, infrastructure deficits, and socio-cultural constraints. Similarly, the paper outlines opportunities presented by the global shift towards renewable energy, reduced costs of PV technologies, increasing energy demand, and removing fossil fuel subsidies in Nigeria. These opportunities exist alongside threats like skill and capacity-building gap, economic instability, environmental and security challenges inherent to the region's geography impacting the logistics and operations of off-grid projects. Additionally, a way forward is proposed that include joint efforts to raise public awareness and disseminate information on the advantages, applications of PV technology, consistent regulatory frameworks and policies. Northern Nigeria could effectively utilise the SWOT analysis presented in this paper to establish a resilient PV energy sector for sustainable development of the region. This paper provides a comprehensive analysis, critical insights and a practical roadmap for stakeholders aiming to tap into Northern Nigeria's promising PV energy landscape, contributing substantially to sustainable development efforts in the region.

Keywords: Photovoltaic, SWOT analysis, Northern Nigeria, Renewable energy

STE: Science & Technical Education

STE001

Effect of Physics-Education-and-Technology Interactive Simulations with guided-discovery instruction on secondary school students' Physics achievement for economic and technological development of Enugu State, Nigeria.

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ABSTRACT

Human capacity building is fundamental to economic and technological development of any nation. Using the instrumentality of Physics Education as a force to enhance human capacity building, the study sought to measure the effect of Physics Education and technology (Phet) interactive simulations with guided-discovery instruction in addressing the problem of poor achievement is secondary school Physics in Enugu state, Nigeria occasioned by inadequate provision of laboratory facilities. Non-equivalent control group research design was used. 243 senior secondary II students were drawn from 8 secondary schools in Enugu State. Physics Achievement Test (PAT) was used for data collection. PAT had a reliability of .82 and .80. Four research questions and three hypotheses guided the study. Mean, standard deviation and analysis of covariance were used in data analyses. The result showed that students taught photoelectric effect with Phet through guided-discovery achieved higher than their counterparts taught same contents using lecture. The female students' achievement better than their male counterparts in Physics. There was a significant interaction effect of method and gender on achievement in Physics. It was recommended that Physics teachers should adopt Phet interactive simulations with guided-discovery instruction for increased students' achievement in Physics.

KEYWORDS: Phet-simulation, Physics, achievement, gender and development.

STE002

Effect of learning Physics through Instructional Videos and Traditional System on Senior School Students

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ABSTRACT

This study compared the academics performance of a students that learned Physics using Instructional videos called experimental group and others using traditional approach called control group. The first term Physics scheme of work for students of SS 1, SS 2 and SS 3 in Sabatu Memorial Academy Zuru, Kebbi State, Nigeria were considered. The population of the study comprised of 45 students as experimental group and another 45 as control group in all the 3 selected classes. Data were collected using 25 items essay test questions with reliability coefficients of 0.74 and analysed with SPSS-V21 using independent sample t-test after 8 weeks of continuous treatment. The study were guided by 1 research question and 1 null research hypotheses (Ho) at significance alpha value .05. The groups were exposed to pretest before the actual commencements of the treatments. The result of the posttest revealed that, there were no significant differences between the experimental and control group students of SS 2 and SS 3 performance with p-val = .119 and p-val = .112 respectively but a significant difference in the performance of SS 1 students with p-val = .001. The researchers concluded that there is no significant difference between the experimental and control group students that learned Physics using Instructional videos and others using traditional (classroom) method in the secondary school system of learning.

Keywords: Physics, Instructional Videos, Traditional Learning System, Senior School Students.

STE003

NURTURING YOUNG MINDS IN SCIENTIFIC AND INNOVATIVE DISCOVERY THROUGH ACTIVITY-BASED TEACHING IN PHYSICS AT SECONDARY SCHOOL LEVEL

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ABSTRACT

The aim of this study was to investigate the impact of activity- based teaching on the students' achievement in Physics at secondary school level. Thirty (30) lessons were selected from SSS Two Physics class for this study. All the science students of secondary schools of Gombe Metropolis studying Physics constituted the population. A sample of 50 students was randomly selected from Government Science Secondary School Gombe and Government Day Science Secondary School II. Six null hypotheses were formulated and tested using t-test. Pretest-Posttest Control Group Design of experimental research was selected for this research study. Two Multiple Choice Questionnaires (MCQs) type achievement tests were used as research tools for the data collection. Experimental group was taught with the help of activities whereas the control group was taught the same lessons through traditional method of teaching for the period of six (6) weeks. Mean and t-test were used to analyze the data. The results showed that the activity- based teaching is more effective for the development of higher order skills in the students.

Keywords: Activity based learning, Academic achievements, cognitive skills

STE004

THE EFFECT OF MINDS-ON ACTIVITY LEARNING METHOD ON ACHIEVEMENT IN PHYSICS AMONG VARIED ABILITY SENIOR SECONDARY STUDENTS: A PATHWAY TO ECONOMIC AND TECHNOLOGICAL DEVELOPMENT

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ABSTRACT

This study investigated the Effect of Minds-on Activity Teaching/Learning Method on Achievement in Physics among varied ability Senior Secondary Students in Billiri L.G.A. of Gombe State: A Pathway to Economic and Technological Development. The study was guided by two research objectives, questions and hypotheses. The quasi experimental research design was used on a population comprised of 231 SS II Science Students (149 males and 82 females) from five (5) public senior secondary schools in Billiri Local Government Area of Gombe State. 91 Physics students selected using the SRSM participated in the research. Two instruments tagged: Physics Achievement Test (PAT) and Physics Students Attitude Questionnaire (PSAQ) were used to collect data for the study. The research questions were answered using the descriptive statistics (mean and standard deviation) while the hypotheses were tested using the t-test statistics at 0.05 level of significance. The results revealed a significant difference between the performance of the experimental and control groups in favour of the former. In addition, there was no significant difference between the male and female students taught using minds-on activity method. The study concludes that the Mind-on activity method was more effective than the conventional method at improving the performance of students taught physics. Moreover, the Minds-on activity method was found to be gender friendly. Based on the results, the following recommendations were made: Physics teachers should use the minds-on activity based method in teaching students for improved performance in the subject. Also, seminars and workshops should be organized by the government for physics teachers on the use of Minds-on activity method.

Keywords: Minds-on activity, Achievement, Advancement, Technological Development

STE005

ADDRESSING THE CHALLENES OF EFFECTS OF PHYSICS-PHOBIA ON SECONDARY SCHOOL STUDENT BY NURTURING YOUNG MINDS IN SCIENTIFIC AND INNOVATIVE DISCOVERY IN GOMBE STATE, NIGERIA

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ABSTRACT

This study examined the effects of phobia on secondary school student's performance in physics, in Billiri Local Government Area of Gombe State, Nigeria. The study was guided by three objectives and three research questions intended to provide possible answers. The research is survey based on SS2 students within the target population of interest of the researchers. 60 students were selected using the simple random method. Two instruments tagged: Secondary School Student's Physics Phobia Questionnaire (SSSPPQ) and Physics Student Performance Test (PSPT) were used to collect data for the study. The research questions were analyzed using the mean ranks, sum of mean rank, mean and standard deviation scores. The hypotheses were analyzed using the Spearman's' rank correlation and Mann-Whitney U-test at 0.05 level of significance. The results revealed that phobia has no effect on student's performance in physics as a subject. In addition, there is no significant difference between the phobia level of male and female students. Also, the study revealed that male student offers physics (science) than female students. Based on the finding, it was recommended that teachers should help students overcome phobia since it affects them in their further studies. Also, Education Boards should encourage students to study physics which contribute greatly to national development and technological advancement.

Keywords: Physics-Phobia, Performance, Young min

STE006

Acquisition of Innovative, Entrepreneurial Skills and Youth Empowerment in Physics Education for Job Creation in Nigeria.

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ABSTRACT

The paper focuses on the innovative, entrepreneurial skills acquisition and youth empowerment in Nigeria. Nigeria in recent times has been plagued with cases of youth restiveness and vices that has defied several approaches by successive governments to curb also entails focuses on what should be done to bridge the gap between the school and labour market, where the learner/student will work after graduation, so as to be self-reliant in the community. Specifically, this paper discussed: The innovative, entrepreneurial skills and youth empowerment needed in physics education for job creation and the teaching approaches required, the philosophy of education in Nigeria to highlight the roles of science education in the inculcation of right values, knowledge and entrepreneurial skills in youth to enable them contribute effectively to national development. The findings revealed that there are many skills were needed in physics education for job creation, the teachers were required to use practically oriented methods in teaching the students, and a lot of factors posed challenges to the acquisition of entrepreneurial skills and youth empowerment in physics education. Consequently, the paper concluded with some recommendations for the effective entrepreneurial skills acquisition and youth empowerment in physics education for job creation in Nigeria.

Key words: Physics Education, Entrepreneurial Skills, Scientific Literacy, Youth empowerment

STE007

RELATIONSHIP BETWEEN THE PERFORMANCE OF STUDENTS IN PHYSICS AT THE SSCE LEVEL AND THEIR PERFORMANCE IN PHYSICS (PHYSICS/MATHEMATICS) AT THE NCE LEVEL: A PATHWAY TO ECONOMIC AND TECHNOLOGICAL DEVELOPMENT

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ABSTRACT

This study compared the relationship between the performance of students in physics at the SSCE level and their performance in Physics (Physics/mathematics) at the NCE level in Federal College of Education (Technical), Gombe. The specific objectives are to: determine the relationship between the performance of students in Physics at the SSCE level and their performance in Physics (Physics/Mathematics) at the NCE level and secondly, to see whether the success in Physics at the SSCE level can be used to predict success in Physics (Physics/Mathematics) at the NCE level. The study adopted a descriptive survey design that employed a Simple Pearson Correlation Analysis and t-test analysis to test the null hypothesis. The r values of +0.374, +0.444, +0.423 and +0.497 for 2015/16 to 2018/19 respectively indicated weak to moderate correlation. Analysis of Variance (ANOVA) revealed that there was a very strong relationship ($r = 0.903$) at $P \geq 0.05$. The result of the study therefore showed a weak to moderate statistical relationship between the students'

performance at the SSCE level and their performance in Physics (Physics/Mathematics) at the NCE level.

KEYWORDS: Performance, Physics/Mathematics, Economy, Technological Development

STE008

Equitable and Quality Basic Science Education: A Springboard for Integrated Science Education in Tertiary Schools

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ABSTRACT

The crux of this paper is to investigate the role of equitable and quality basic science education at Primary and secondary school levels in promoting integrated Science education at the tertiary level. In order to accomplish this purpose, a survey research design with a sample of 25 basic science teachers and 200 junior secondary school two students drawn from public and private schools in Lagos State Education District V through simple random sampling technique. A 20-item self-constructed questionnaire, validated by experts in science education and with a reliability coefficient of 0.87 was adopted to generate data. The data collected were analysed using Analysis of Variance (ANOVA) and t-test at 0.05 level of significant using SPSS.24 Package. The study revealed that primary and secondary schools often do not have enough resources to provide students with quality basic science education. More so, female students usually do not develop interest and motivation to study integrated science as a discipline at tertiary institutions. It then concluded that there is a lack of equitable access to basic science education across different social groups, which further impacts on students' capacity to study integrated science at tertiary level. Among other recommendations, it proposed that increased resources be allocated to the study of basic science education at the primary and secondary schools. Again, a framework for implementing equitable access and quality basic science education should be established in order to ensure that all students have access to adequate resources and instruction.

Keywords: Basic Science Education, Equitable, Quality, Integrated Science Education, Parity

STE009

THE ACTIVE LEARNING MODEL: AN EFFECTIVE APPROACH TO TEACHING AND LEARNING SIMPLE HARMONIC MOTION

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ABSTRACT

This work aims to offer practical insights into the effective teaching and learning of Simple Harmonic Motion (SHM) through the application of the Active Learning Model (ALM). Active learning (AL) is investigated as a teaching approach that offers a special path for the student to follow throughout the process. This paper provides an illustration of an AL model with a focus on the idea of SHM. By using the AL approach, it will be ensured that students take independent notes reflecting their ideas and feelings about the lesson's subject rather than relying solely on the teacher's notes for effective teaching and learning of SHM. In the paper, specifics of these activities are illustrated. Thus, the study comes to the conclusion that AL improves learning by helping students become more adept at thinking. In addition, the paper recommends that, in order to achieve the success of the AL approach, school authorities or management should provide laboratory materials to avoid any strain on students and teachers.

Keywords: Active Learning, Strategy, Simple Harmonic Motion

STE010

PERFORMANCE OF CHATGPT ON TASKS CREATION IN PHYSICS: A REVIEW

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ABSTRACT

The lack of assistance in creating fresh and relevant tasks by teachers has resulted in the recycling of old tasks, which students can easily access online and copy the solutions without engaging their mental capabilities. Therefore, teachers' ability to craft effective tasks that enhance analytical thinking, particularly in the context of formative and summative assessments, will benefit students and positively impact the quality of teaching. While Artificial Intelligence (AI) and Generative Pre-Trained Transformer (GPT) models are already widely employed in various industrial applications, little attention has been given to the integration of ChatGPT, a tool of Natural Language Processing (NLP), into the classroom, especially in the creation of test items for both formative and summative evaluations. This paper systematically reviews existing studies with the intention of identifying theoretical, methodological, empirical, and geographical gaps. The paper adopts a trend analysis approach, selecting relevant articles published between 2021 and 2023. The analysis reveals that most existing studies have been conducted in the Global North, including Germany, Sweden, and some parts of the Global South, such as Brazil. Notably, there is a lack of research in countries in Africa, such as Nigeria. Furthermore, we found that most previous studies did not employ theoretical frameworks; instead, they used analytical frameworks such as EASE guidelines and text characteristics. The research questions that guided these studies were primarily addressed using exploratory case studies and surveys. The dominant focus of these studies was on teachers and experts as subjects, with outcomes mostly revealing the (in) effectiveness of ChatGPT in generating test items for physics and other disciplines. Based on these results, the paper suggests areas for further research.Top of Form

Keywords: ChatGPT, Task, Artificial Intelligence (AI), Creation, Natural Language Processing (NLP)

TQP: Theoretical and Quantum Computation Physics

TQP001

The Performance Analysis of Quantum-Mechanical Carnot Engine using the Woods-Saxon model.

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ABSTRACT.

The efficiency a Quantum-Mechanical version of the Carnot cycle which consists of two isoenergetic and two adiabatic processes, using Wood-Saxon Potential as a working substance by changing both its quantum state n and the width L of the well which moves at a finite speed is presented. The derived engine's efficiency is based on the generalized model with an arbitrary one-dimensional potential and other important performance parameters such as the engine's power output and optimal region. The maximum power output and the corresponding parameters are derived. The optimal region of the efficiency and dimensionless power ranges of our working substance are determined. Our derived result was reduced to that of Free particle [FP] and the solution is found to be exact.

Keywords: Quantum thermodynamics, Wood-Saxon Model, Carnot-like cycle, Quantum heat engines, isoenergetic.

TQP002

Investigation of Quantum Information Theory with the screened modified Kratzer and a class of Yukawa potential model

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ABSTRACT

In this research, the screened modified Kratzer potential plus class of Yukawa potential with the Schrodinger equation is solved using the Nikiforov-Uvarov method to determine the energy equation and total normalized wave function. For the low-lying states, the Shannon entropy, and the Fisher information are examined in position and momentum spaces with the obtained total wave function. The expectation values are also examined.It was discovered that the Bialynicki, Birula, and Mycielski, and Stam-Cramer-Rao inequalities for Shannon entropy and Fisher Information entropies respectively were satisfied. The expectation values of $r_b, r_b^2,$ and $\vec{p}^2$ are also calculated numerically. Our numerical results validate the Heisenberg uncertainty relation.

Keywords: Bialynicki-Birula-Mycielski inequality; Schrödinger equation; Shannon entropy; Fisher information

TQP003

THE GOLDEN METRIC TENSOR FOR GRAVITATIONAL WAVE GENERATION

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ABSTRACT

Gravitational waves are generated within spheroidal bodies, exhibiting oscillatory behavior. While Einstein's wave equation has been invaluable in describing gravitational wave propagation in symmetric systems, this new generalized Laplacian operator based upon a new metric tensor, hereby referred to as the "Golden Metric Tensor," offers a refined framework for scenarios where mass distribution varies with time and exhibits symmetric symmetry. This result not only expands the theoretical foundation of General Relativity but also beckons toward a new era of precision astrophysical observations.

Keywords: gravitational waves, spheroidal body, golden metric tensor, field equation

TQP004

THE EMERGENCE OF QUANTUM PHASE TRANSITION AND MULTIPLE DEGENERACIES IN A FRUSTRTATED TRIANGULAR MAGNETIC SYSTEM

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ABSTRACT

Frustrations arising from the geometries of triangular lattices have been studied with the aid of Ising and Heisenberg models. The study reveals that geometrical frustrations can generate quantum phase transition and multiple degeneracies in the ground state. The geometries studied were the three site and five site system. For this three-spin system, quantum phase transitions (QPT) are observed at critical longitudinal fields of J and 1.5J respectively for the Ising and Heisenberg models. At these critical fields, the ground states are observed to shift from quasi-antiferromagnet to ferromagnet. The observed QPT for the five-spin system occurs at critical longitudinal fields of 2J and 2.5J respectively for the Ising and Heisenberg models. At these critical fields, a movement of the ground states from quasi-antiferromagnet to ferromagnet are observed. Our theoretical investigations shows that the observed multiple degeneracies in the ground states are not completely removed by external magnetic field.

Keywords

TQP005

Chain decay and rates disorder in the totally asymmetric simple exclusion process

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ABSTRACT

We theoretically study the Totally Asymmetric Exclusion Process (TASEP) with quenched jumping rates disorder and finite lifetime chain. TASEP is widely used to model the translation of messenger RNAs by Ribosomes in protein synthesis. The exact solution of the TASEP master equation is analytically and computationally intractable for biologically relevant systems parameters. Canonical Mean-Field (MF) approaches to solving coupled non-linear differential equations are also computationally expensive for the scale of relevant biological data analysis. In this article, we provide an alternative framework for improving the accuracy of including correlations progressively via the exact solution of a small-size TASEP system. Leading order approximation in the biologically relevant entry rate limited regime shows remarkable agreement with the full Monte-Carlo simulation result for a wide range of system parameter space. These results could be of importance to the kinetic rates inference in Ribo-Seq data analysis and other related problems.

Keywords: Monte-Carlo simulation, Ribo-Seq, protein synthesis

TQP006

Effects of Solvents on the Structural and electronic properties of Sumanene Molecule Based on Density Functional Theory

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ABSTRACT

Sumanene ($C_{21}H_{12}$) is an organic semiconductor belonging to the group of polycyclic aromatic hydrocarbons. It is a bowl-shaped molecule with C_{3v} symmetry, composed of alternating benzene rings. This molecule has various applications, such as in organic photovoltaic cells, hydrogen storage, and field-effect transistors. This study investigated the effects of different solvents (methanol, acetone, toluene, chlorobenzene) on the electronic structure of Sumanene using Density Functional Theory (DFT) as implemented in the Gaussian 09 package with the B3LYP/6-311++G(d,p) basis set. The results showed that the solvents have effects on the structural and electronic properties of the molecule. The optimized bond length revealed that the molecule has a strong bond in methanol and acetone, both having the smallest bond length of about 1.0853Å compared to the gas phase and the remaining solvents. The molecule in the gas phase was found to be more stable with a HOMO-LUMO energy gap and chemical hardness of 4.655 eV and 2.33 eV, respectively. The energy gap was compared with that reported in the literature (4.759eV). The study concludes that the careful selection of solvents and basis sets can tune the frontier molecular energy gap of the molecule and can be used for organic optoelectronic devices.

Keywords: Gaussian 09, Sumanene, DFT, Solvents

TQP007

Analytical solution of heat transfer performance of magnetohydrodynamic blood flow through porous artery using third grade non-Newtonian model

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ABSTRACT

In this paper, the heat transfer performance of magnetohydrodynamic blood flow through porous artery using third grade non-Newtonian model was studied. The analytical solution for the temperature distribution was developed using the Laplace transform combined with Homotopy Perturbation Method. The obtained solution was validated using the limit case of the other model. The effect of physiological parameters was obtained and analyzed.

Keywords: Heat transfer, blood flow, analytical solution.

TQP008

The Effects of Generalized Uncertainty Principle on a One-Dimensional Anharmonic Oscillator

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ABSTRACT

The generalized uncertainty principle has been utilized in conjunction with the Schrödinger wave equation for a one-dimensional anharmonic oscillator, resulting in a sixth-order generalized Schrödinger equation expressed in the position representation. The eigenvalues and eigenfunctions of this sixth-order equation have been determined, revealing approximate correction terms to the energies arising from the modified uncertainty principle. Quantum partition functions, derived from the energy eigenvalues, facilitated the examination of the system's thermodynamic properties. This insight is pivotal for understanding the behavior of quantum systems under such modifications.

Keywords: Generalized uncertainty principle, Sixth-order generalized Schrödinger equation, Partition functions.

TQP009

QCA BASED DESIGN OF REVERSIBLE PARITY GENERATOR AND PARITY CHECKER CIRCUITS FOR TELECOMMUNICATION.

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ABSTRACT

Quantum-dot cellular automation (QCA) is a transistor-free technology used to implement nanoscale circuit designs. When compared to the widely used complementary metal oxide semiconductor (CMOS) technology, QCA circuits are faster, denser, and use less energy. It has some advantages in reversible logic, including its small size and low power dissipation. In this work, a model of a low-power 3-bit odd parity generator and checker circuit based on a reversible Feynman gate with 23 cells and 40 cells, respectively, is proposed. The proposed reversible odd parity generator and checker circuit can be used in telecommunication systems for bit loss detection and checking. The proposed circuits and the theoretical values are tested using QCA Designer simulator version 2.0.3 to ensure that the circuit works properly, and QCA Designer-E is used to estimate the energy dissipation of the circuits. According to the simulation results, the proposed circuits improve cell counts by 28% for the parity generator, 40% for the parity checker, and 27% for the nano-communication, and occupied area by 72% for the parity generator, 23% for the parity checker, and 14% for the nano-communication.

Keywords: Parity generator, Parity checker, QCADesigner-E, Quantum-dot cellular automata, and Telecommunication.

TQP010

SIMULATION OF SOLITON PULSE PROFILES IN SINGLE-MODE OPTICAL FIBERS WITH CUBIC NONLINEAR SCHRODINGER EQUATION (CNLSE)

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ABSTRACT

A theoretical approach is important for an understanding of the nonlinear effects in optical media. It is important for practicability and system design to study optical soliton propagation in optical nonlinear media. In this research work, ansatz method of solving differential equation was used to derive the solution of unperturbed and perturbed cubic nonlinear Schrödinger equation (CNLSE). The perturbation terms consist of Third-Order dispersion term and selfsteppening. The result of analytical study was used for the simulation using surfer simulation software and the data was generated using Microsoft office excel. The governing equation is the cubic nonlinear Schrödinger equation, (CNLSE), in the presence of perturbation terms. The input pulse and the nonlinear coefficient parameter at the wavelength of λ = 1.55 μm with pulse duration of Ts = 30 Ps for group velocity dispersion $\beta 2$ = -20 $Ps2/km$, nonlinear parameters γ = 1.0 W-1kg-1 third-order dispersion TOD $\beta 3$ = 0.01 $Ps3/km$, input power P0 = 1.2 mW. The method of ansatz was used. The ansatz was formulated and dimensionally verified. The CNLSE was divided into two, the perturbation term and the unperturbation term. The simulation shows that the unperturbed CNLSE become so large that the pulse cannot form a soliton and becomes broader than the input pulse, the effect of two perturbation terms such as TOD and Self steppening are responsible for improving the quality of the compressed pulse. From the simulations, it shows that the velocity of pulse profiles propagation increase by the influence of $b1$, the amplitude increases and the power loses decreases.

Keywords

TQP011

Supra Band Photon Absorption in Quantum Dot Photovoltaic Cells

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ABSTRACT

Supra band photon absorption in quantum dot QD photovoltaic cells is here presented. Hot electrons are produced in semiconductors upon the absorption of supra bandgap photons, which thermalize to the lattice temperature within the picoseconds regime. Thermalization of hot electrons is a major loss in the photovoltaic cells that dramatically reduced their power conversion efficiencies to the Shockley and Queisser limits. Supraband photon absorption aims to overcome the optical losses due to thermerlization by effective utilization of hot electrons at the elevated energies. However, exploitation of hot electrons is near impossible as hot electrons rapidly lose their excess energy in phonon emission. These limitations have been overcome by the use of quantum dot as a photovoltaic photo absorber. Our results have shown that electronic transition energy levels of quantum dots are quantized. This in principle enhances phonon bottleneck effect that significantly slows down hot carrier cooling leading to retention of hot carriers long enough to enable their exploitation. As a result the energetic hot electrons can be extracted while they are still 'hot' to create higher photo voltage cells and also the energetic hot electrons can be harnessed to produce more electrons through impact ionization for higher photo current cell. These two mechanisms would theoretically boost overall conversion efficiencies of the photovoltaic cells. It is found also that PbSe, PbTe, PbS, InAs, ZnS and InAs QDs exhibit exceptional electronic property for possible hot carrier absorber due to their widely spaced energy levels

Keywords: Hot electron, quantum dots, impact ionization, Photo current, Photo voltage, photovoltaic cells

TQP012

Size Dependent Electro-Optical Properties of Quantum Dots Using Particle in a Box Model

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ABSTRACT

Size dependent electro-optical properties of quantum dots have been studied using particle in a box model. It is found that the energy gap of the quantum dots is consistent with quantum confinement principles in a potential well. Thus, energy gap is inversely proportional to the square of the dot size. The computed energy gap over a large size range is compared to those of the bulks in order to investigate the electro-optical properties. With decreasing size, the following effects are observed: the electronic band-gap becomes size dependent and increases with the decreasing size, discrete electronic state were observed at band-edges of both the conduction band and valence band, absorption and emission spectra are blue shifted,. Among the three quantum dots considered, CdSe quantum dot exhibits an exceptional optical properties, such as, size – tunable photo-luminescence that span the entire visible spectrum, and should be used for optical display applications.

Keywords: Quantum dot, confinement, bandgap, discrete electronic state

Addendum

ASP033

A Comparison of Selected Artificial Neural Network Model, in Predicting Global Solar Radiation in Lagos and Abuja, Nigeria

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ABSTRACT

The enormous challenges that have affected not only the entire value chain but also the billing system which consumers have repeatedly rejected, resulting in violence against staffs of the distribution companies. Accurate estimation of global solar radiation is essential for the design and assessment of solar energy utilization system. The aim of this research work is to investigate the feasibility of using artificial neural network to predict, the global solar radiation of the selected site and to compare the effectiveness of the model. The stations under study are Lagos with latitude 6.39 ON, longitude 3.23 OE and Abuja at latitude 9.08 ON, longitude 7.40 OE. The six years data which was obtained from Nigerian Meteorological Agency (NIMET), Oshodi, Lagos, was split into three parts which are: the training, validation and testing datasets. The forecasting performance parameter such as root mean square error (RMSE), mean bias error (MBE) and absolute fraction of radiance (R2) for the tested location are found respectively. Among the model tested, the light GBM with R2= 0.8883, MSE=0.0619 and RMSE = 0.2488 emerged as the most appropriate model for Abuja and the light GBM with R2= 0.7340, MSE=0.2944 and RMSE = 0.5426 also emerged as the most appropriate for Lagos. The results of validation and testing indicates that the light GBM will be suitable for predicting GSR for both location and other locations having similar parameters

Keywords: RMSE, MBE, GBM, and NIMET

ASP034

OPTIMIZATION OF A COMBINED PHOTOVOLTAIC-THERMOELECTRIC HYBRID POWER GENERATION SYSTEMS FOR EFFECTIVE BATTERY CHARGING

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ABSTRACT

A Photovoltaic-Thermoelectric (PV-TE) hybrid System has been designed, developed experimentally and studied. This hybrid combination of PV-TE is a promising technique used in solar spectrum to improve the overall performance of the total output power. The hot side of the thermoelectric generator (TEG) modules were connected thermally to the back of the PV panel in series and parallel arrangement, the cold side is connected thermally to the circulating coolant heat sink system to improve the temperature gradient. Asynchronous Buck converter (ASBC) and Asynchronous Boost converter (ASBTC) were designed to regulate the power generated from the Hybrid system. The daily average efficiencies obtained from the conventional and cooling method adopted were 3.568% and 7.386% respectively. The daily average efficiencies of the converters developed were 88.10% for Buck and 88.97% in the case of Boost converter. A constant regulated DC voltage of 12V from the Hybrid PV-TE system is achieved for charging batteries by exploiting the system's daily average efficiency of 29.27%. The improvement was as a result of the Hybrid power the TEG and the solar tracking mechanism contributed, which is an indication of waste heat recovery.

Keywords: Seebeck effect, Hybrid PV-TE, Waste-Heat Recovery.

APS035

ASSESSING SOLAR RADIATION WITH THERMOELECTRIC PYRANOMETER FOR RENEWABLE ENERGY IN NIGERIA TO BOOST ECONOMIC DEVELOPMENT THROUGH TECHNOLOGICAL INNOVATION.

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ABSTRACT

Amid growing global apprehensions regarding climate change and the imperative for sustainable energy alternatives, renewable energy has emerged as a promising remedy. Nigeria, endowed with ample solar resources, offers a significant opportunity for harnessing solar energy to propel economic advancement. This study centers on evaluating solar radiation intensity through thermoelectric pyranometer devices, ensuring precise measurements of solar irradiance. By meticulously collecting and analyzing data, the research aims to furnish valuable insights into Nigeria's solar energy potential across diverse regions. This understanding enables policymakers, energy developers, and stakeholders to strategically devise and execute renewable energy projects tailored to local environments. The focus lies on assessing various natural radiation types encountered and the methodologies employed to quantify and categorize them. Employing thermoelectric pyranometers, the study estimates solar intensity in the Abraka and Obiaruku regions over a three-month period. Results reveal varying intensities under different weather conditions, with peak intensity observed during clear hot days in Abraka region was measured to be 3291.61 w/m2, 3104.12 w/m2, 1687.47 w/m2 and1541.64 w/m2 respectively, while that of Obiaruku region was measured to be 3479.1 w/m2, 2770.79 w/m2, 2583.29 w/m2 17083.29 w/m2 and 1708.3 w/m2. Additionally, the research explores the pivotal role of technological innovation in advancing renewable energy endeavors. By embracing innovative solutions like thermoelectric pyranometers, Nigeria can surmount challenges linked to conventional energy sources, fostering a transition toward a sustainable energy landscape. This technological transition not only curtails greenhouse gas emissions but also fosters job creation, industrial progress, and socio-economic prosperity.

Key Words: Pyranometer, thermoelectric, solar radiation, Photovoltaic, ambient temperature, etc.

ENT049

Li-Fi Wireless Network Using Space Division Multiplexing for Internet of Things Applications

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ABSTRACT

Recently, there have been some efforts to replace/ enhance the existing Wi-Fi wireless network with Light Fidelity (Li-Fi) to improve network connectivity. A Li-Fi-based wireless communication system uses visible light technology. Consequently, enhanced RF wireless usability in the Internet of Things (IoT) and mobile communication demands a high data rate and a low latency in 5G and beyond network connection. Recent advancements in solid state-based light technology have greatly accelerated studies on the Li-Fi system's architecture. This study suggests utilizing numerical modeling to investigate the feasibility of coopting an MDM-based approach into Li-Fi to supplement or improve the current Wi-Fi technology for the Internet of Things. the study employs a spatial light emitting diode (SLED) to generate Hermite Gaussian (HG) channels and a spatial photodetector PIN at the receiver. The results

presented are based on the eye diagrams and channel gain of several HG beams in the Li-Fi network

Key Words: space division multiplexing, light fidelity, WiFi, wireless communication system, Internet of Things

ENT050

4 × 25 Gps - 40 GHz RZ-DQPSK Versus RZ-ASK Transmission Over Multi- MDM Channels Optical Wireless Link for 5G Network

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ABSTRACT

This research employs a direct detection (DD) approach to numerically evaluate the transmission performance of dual modulation methods: a mode division multiplexing (MDM)-based return to zero-amplitude phase shift keying (RZ-ASK) and a 4 × 25-Gbps at 40 GHz return-to-zero differential quadrature phase-shift keyed mode-division multiplexing (RZ-DQPSK-MDM). The wireless optical structure was utilized to model the dual links to carry 100 Gbps aggregated data for the four independent mode channels. Bit error rates and eye diagrams are used to demonstrate the results. The proposed technique can be adopted to improve the transmission capacity rate of a wireless network.

Keywords: optical wireless communication, 5G network, space division multiplexing, mode division multiplexing,

ENT051

NIGERIA'S CAPACITY OF ENERGY VALUE FROM DOMESTIC WASTE

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ABSTRACT

One of the challenges facing power industries in Nigeria today is shortage of gas used in thermal generating stations which has led the companies to low generating capacities relative to installed capacity. This paper intends to estimate capacity of energy value that could be realized from domestic waste using last population data of some selected state in

the country. With specific value of waste to energy conversion using thermal technology machine, the findings revealed that domestic waste could be an alternative to gas shortage and enhance electricity production when properly managed. With expected 16,000 tons of domestic waste per year for the thirteen selected state 2,500MW of energy could be realized. This is 20% of present installed capacity, 56% of present electricity generation, 10% of current estimated national consumption need and 2.5% of future potential demand of the country. One of the recommendations is for government through sanitation agency educates the public on proper way to waste management and to start house to house waste collection.

Key words: Economic diversification, electric power, domestic waste sustainable development and thermal technology.

ENT052

COST-EFFICIENT HEAVY METAL MONITORING: PREDICTING CONCENTRATIONS VIA MACHINE LEARNING AND DATA AUGMENTATION FROM PHYSICO-CHEMICAL PARAMETERS

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ABSTRACT

Heavy metal pollution poses a significant threat to environmental and human health. Frequent and accurate monitoring is crucial. Traditional methods can be expensive and time-consuming, this study addresses this challenge by developing a cost-effective approach to predicting heavy metal concentrations using machine learning and data augmentation. This study used heavy metal concentration from water samples collected around Birnin-Yauri mining sites, Kebbi, Nigeria. The random forest regression algorithm was employed. Importantly, the model relies on readily measurable physico-chemical parameters, such as temperature, pH, and magnesium. Our machine learning model achieves outstanding predictive accuracy for various heavy metals, arsenic (R-squared: 0.85, RMSE: 0.04), iron (R-squared: 0.99, RMSE: 0.03), manganese (R-squared: 0.96, RMSE: 0.02), and lead (R-squared: 0.93, RMSE: 0.01). Feature importance analysis reveals that different parameters influence the prediction of each metal. For instance, pH plays a dominant role in manganese prediction, while temperature is crucial for iron and lead. Data augmentation techniques further enhance the model's robustness and generalizability. This approach offers a significant advantage over traditional methods by enabling more frequent and widespread heavy metal monitoring around mining sites and other polluted areas. This can lead to improved environmental management, reduced health risks, and contribute to a healthier planet.

Key Word: Heavy metal monitoring, Machine Learning, Data Augmentation, Physico-chemical parameters

ENT053

THE QUALITY OF ELECTRICAL WIRING CABLES AVAILABLE IN NIGERIA

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ABSTRACT

In a world that heavily relies on electricity to power our homes and businesses, the safety and reliability of electrical systems are paramount, unfortunately, a rising concern in recent years has been the proliferation of counterfeit electrical cables in Nigerian market, these fake cables pose significant dangers to users, studies have also traced the various cases of fire outbreaks in homes and offices to imported wires which are usually below standard, these counterfeit electrical cables are often produced using substandard materials and manufacturing processes, compromising their safety and performance to cut costs and maximize profits, unscrupulous manufacturers and sellers produce cables that may resemble authentic ones but lack the necessary quality and compliance standard, in this work, a Kelvin resistance method was used to investigate the quality of various cable samples available in Nigerian markets, the investigation shows that all the samples have their quality below standard, this will necessitate policy makers to make a regulation on the use of these cables.

keywords: Electrical cables, Fake cables, Fire-Outbreak, Kelvin resistance method

HEP035

INVESTIGATION OF THE COLOUR VISION DEFICIENCIES OF MEDICAL SCIENCE STUDENTS IN SOME SELECTED SCHOOLS IN BAUCHI STATE, NIGERIA

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ABSTRACT

Color vision deficiency (CVD) is a prevalent condition affecting a significant portion of the population. For medical science students, color vision plays a critical role in accurately interpreting various medical results like pathology slides, x-ray imaging, visual cues for patient assessment etc. Consequently, this research investigated the prevalence and severity of red-green color vision deficiencies among medical science students in some selected institutions in Bauchi State, Nigeria. The Ishihara test was used for screening color vision deficiencies. A total of 900 medical science students were included in the study. The students

underwent individual assessments using the Ishihara test made up of plates designed to detect red-green color deficiencies. The results showed that out of the 900 medical science students, a significant proportion of 10.22% exhibited red-green color vision deficiencies. The prevalence and severity of CVD varied among genders with male students having a prevalence of 5.78% and female students having a prevalence of 4.44%. This research further emphasizes the need for the formulation of specialized training tailored towards students with CVD to minimize the problems they may face due to CVD.

Keywords: CVD (colour vision deficiecncy), Ishihara test, red-green colour deficiency

HEP036

Molecular Docking Analysis of Synthesize Compounds as Potent Drug Against Inflammatory Disorder

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ABSTRACT

Nonsteroidal anti-inflammatory drugs (NSAIDs) are commonly used in the treatment of inflammation, pain, and cancer by blocking the cyclooxygenase enzymes (COXs). It is widely known that the therapy with COX inhibitor is linked to a variety of side effects, such as gastrointestinal erosions, renal and hepatic insufficiency. COX-1 inhibition is largely responsible for such severe adverse reactions. As a result, the search for a safer drug candidate with low or no toxicity is required. In this work, two synthesized compounds were prepared and tested for their inhibitory effects against COX-1. Molecular docking simulation used to quantify binding energy of each. Results obtained showed that the synthesize compounds displayed stronger binding energies of -8.5 kcal/mol and -9.2 kcal/mol for Benzox and benzoxcf3 respectively. The controls that possess least binding energies were ibuprofen and Mofezolac (-6.9 kcal/mol). The strongest binding obtained might be due to formation of electrostatics interactions with Thr212, and His388. Therefore, the synthesize compounds serve as potent drugs of inflammatory and further analysis like molecular dynamics simulation is recommended to employ solvation and conformational effects.

Keywords: Binding energy, Inflammation, Molecular Docking.

HEP037

In Silico Analysis to Study the Inhibitory Effects of Coriander Compounds Against Diabetic Receptor

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ABSTRACT

Diabetic mellitus (DM) is characterized by increased blood glucose level due to insufficient or inefficient insulin. Aldose Reductase is the key enzyme in the polyol pathway, it is implicated in the development of complications associated with diabetes. Due to the several factors that are associated with diabetes such as cost of therapy, notable side effects, route of drug administration and time spent on managing the illness, traditional medicines as a substitute proposes a wide range of remedies for managing the symptoms associated with chronic disorders of diabetes mellitus. In this work, the phytochemical compounds of Coriander leaves were selected to test their inhibitory effects. Epalrestat, a known aldose reductase inhibitor was used as the standard. In silico docking studies were performed with AutoDock vina. Results obtained showed that all the selected phytochemical compounds gave binding energy ranging from −8.91 kcal/mol to −4.26 kcal/mol. The geraniol, α-pinene and camphor demonstrated strongest binding energy. These compounds have amino acid residues of Ser2, Pro13, Ile14, Leu15, Gly38, Arg40, His41, and Phe273 in common, and are major active residues within the binding pocket. These finding could lead to the further progress of effective aldose reductase inhibitors for the treatment of diabetes.

Keywords: Amino acids, Diabetes, Coriander, AutoDock vina.

HEP038

A SURVEY OF PATIENTS PERCEPTION AND AWARENESS OF RADIATION RISK IN SELECTED HOSPITALS IN LAFIA METROPOLIS

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ABSTRACT

A survey was conducted in two public Hospital (Hospital A and Hospital C) and one private Hospital (Hospital B) in Nasarawa state to evaluate patients' awareness of radiation risk. Out of 250 participants, 63.6% were females, and patients between the ages of 20-29 years, and those without any formal education participated more. The results showed poor knowledge

about ionizing radiation with higher values in Hospital A (56%) and Hospital C (64.6%) compared to Hospital B (47%). Most patients were not given orientation about the effects of ionizing radiation (76.5% in Hospital A, 74.5% in Hospital C and 70% in Hospital B), and the majority (84.8%) selected lead aprons as basic radiation protective materials. However, this percentage became lower when other options of radiation protective materials such as gloves, eye shields rubber apron were presented to the respondents. The research concludes that within the period of the research, there is low level of patients' perception and awareness of radiation risk in the Hospitals. Nonetheless, patients showed interest in knowing more about x-ray radiation effects. The research recommends continuous orientation for better management of patients undergoing radiological exposure.

Keywords: X-Ray, Ionizing Radiation, Hospital and Radiation Protection

HEP039

Artificial Intelligence in Detecting and Classifying Gastrointestinal Diseases Across Xray, CT and Endoscopy.

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ABSTRACT

Gastro-Intestinal (GI) diseases are conditions that affect the digestive tract, which extends from the mouth to the anus. The first line of diagnostic examination for most of GI diseases are x ray, Computerized Tomography (CT) and endoscopy scans. The diagnosis is hindered by the availability of an immediate expert radiologist or gastroenterologist. To increase diagnosing efficiency, Artificial Intelligence (AI) has been deployed in analyzing and reporting radiographs as well as endoscopy. Literatures were reviewed using Google Scholar and the most recent and relevant search results were sorted and tabulated for x ray, CT and endoscopy. The pragmatic search revealed the extent to which AI was applied to eight (8) diseases across the three (3) modalities. Most of the literatures concentrated on the application of deep Convolutional Neural Network (CNN) algorithm to parts of the gastrointestinal tract such as the colon, stomach, and distal small bowel individually. In some cases, such as oesophageal diseases, hiatal hernia and GI haemorrhage, AI was applied only to Endoscopy, whereas in volvulus there is no deep learning for both x ray, CT and endoscopy diagnostics. To sufficiently diagnose GI diseases, we proposed leveraging Ensemble transfer learning to build a robust model for classify gastrointestinal diseases on X-rays, CT and endoscopy.

Keywords: Artificial-Intelligence, CNN, CT, Endoscopy, Xray.

NPP094

Assessment of Natural Occurring Radioactive Materials and Radiological Hazards Exposure in Soil of Ohia in Umuahia South Abia State Nigeria, Using High Purity Germanium (HPGe) Gamma Ray Spectrometry

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ABSTRACT

Evaluation of natural radioactivity concentration and radiological exposure are important. The main goal of this work was to determine the natural radioactivity level and radiological exposure risk in Umuahia, using High Purity Germanium Gamma Ray Spectrometry at IPEN, Brazil. The radionuclides (RDNs) such as: 40K, 210Pb, 226Ra, 228Ra, 232Th and 238U radiological parametric indices (RPIs) such as: absorbed dose rate (AD), $AEDE_{out}(mSvy1)$, $AEDE_{in}$(mSvy1), REA(BqKg-1), excess life time risk (ELTCR), Internal hazard index (IHI), external hazard Index (EHI), AGED(μSvy1), and exposure risk(ERμR/h) were determined. The mean value of 40K, 210Pb, 226Ra, 228Ra, 232Th and 238U in Bqkg-1 were: 146.99±11.14, 63.54±8.37, 27.62±2.17, 33.7±4.66, 30.74±5.17 and 22.49±3.59 while the RPIs for AD, AGED, ELTCR, AEDE, IHI EHI and RAE were: 47.74±4.58, 0.06±0.01, 0.23±0.02, 105.71±10.42, 0.75±0.07, 0.39±0.03, 0.29±0.03, 332.11±31.8, 0.19±0.01 and 372276.39±119.02 respectively. Mean value of RDNs were found to be lower than 420, 2325. 35, 131, 30 and 35 (BqKg-1) recommended limit according to (UNSCEAR) while RPIs were lower than 59nGyh-1, 0.08, 370(BqKg-1), 0.00029, 1, 1, 1, 300μSvy^{-1} and 134±4.7(ERμR/h) respectively except ELTRC and AGED that were higher than recommended limit according to (UNSCEAR). It is concluded that the soil is not radiological safe for agriculture, building and construction.

Keywords: Soil, Natural Radioactivity, Radiological Exposure Risk, Umuahia, High Purity Germanium (HPGe).

NPP095

Radiation Area Survey of Building Site in Veritas University

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ABSTRACT

The activity concentrations and the gamma-absorbed dose rates of the terrestrial naturally occurring radio nuclides. 226Ra, 232Th and 40K were determined in soil samples from the site of the proposed College of Medicine, Veritas University, Abuja (Veritas) using gamma ray spectrometry. The soil activity ranges from 14.02 to 49.48 Bq kg−1 for 226Ra, 48.80 to 120.30 Bq kg−1 for 232Th and 334.059 to 674.81 Bq kg−1 for 40K with mean values of 22.360, 96.27 and 466.0 Bq kg−1, respectively. The mean concentration of 226Ra was found to be lower than the world average 32 Bq/kg and that of 40K was slightly higher than the world's average values 460 Bq/kg while the mean value of 232Th was higher than the world's average value of 45 Bq/kg. All the soil samples have radium equivalent activities lower than the limit set in the OECD report (370 Bq kg−1). The overall mean outdoor terrestrial gamma dose rate is 87.1 nGy h−1 and the corresponding outdoor annual effective dose is 0.11 mSv. The mean radium equivalent activity concentration, the mean external and internal hazard indices in the study was less than the world averages.

Keywords: **NaI, Gamma spectroscopy, NORM, Hazard Indices,**

NPP096

STRONG ABSORPTION AND THE DOUBLE FOLDING MODEL USING B3Y-FETAL INTERACTION

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ABSTRACT

This work examines the effects of strong absorption arising from nuclear potentials which are crucial to the understanding of the problem of nuclear interactions in other nonelastic channels. The double folding model was used to derive both the real and imaginary part of the nuclear optical potential using a mass-dependent B3Y-Fetal effective interaction constructed using the lowest order constrained variational (LOCV) approach. The absorption effect was incorporated in the calculations through the imaginary part of the optical potential. The folded potentials were found to be attractive and short-ranged over short internuclear distances of about $0 \leq r \leq 6\ fm$. The results of the plot of the S-matrix elements and those of the differential cross-sections of deuteron scattering from ^{24}Mg were obtained. It was observed from the plots of the S-matrix elements that regions for which $|S_L| \sim 0$ existed between $0 \leq L \leq 5$ within the incident energies of $60 - 80\ MeV$, implying

strong absorption at these small impact parameters. Pronounced success was also achieved in the fit of the differential cross-section of $d + {}^{24}Mg$ within the energy range of $60 - 170\ MeV$.

Keywords: B3Y-Fetal, Double-folding model, Cross-sections, Folding potential, Strong absorption, S-matrix.

NPP097

Evaluation of Radiation Dose Received by Paediatrics Patients during Routine X– Ray Examinations of the Chest in Three Selected Hospitals in Yobe State, Nigeria.

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ABSTRACT

The radiation risks associated with children are higher than the risks for adults. Children have growing organs and they have a longer life expectancy than that of adults. Consequently, the effects of damage from radiation could be greater in children than in adults. This study sought to measure the mean Entrance Surface Dose (ESD) and third quartile values for paediatrics chest X–ray examinations, compare these to findings and recommendations from other studies and propose methods of dose reduction in three hospitals (DTR, GSH & PKM) in Yobe State, Nigeria. The age groups considered in this study were <1 year, 1–< 5 years, 5–<10 years and 10–15 years. The mean ESD for the chest AP in the age range < 1year in the three hospitals (H1–H3) were respectively 0.10, 0.09, 0.66 mGy; for the age 1-<5years were respectively 0.12, 0.10, 0.48 mGy and for the age range 5-<10 years were respectively 0.13, 0.09, 0.34 mGy.

Key words: Entrance surface dose; Paediatrics; Optimization.

NPP098

Critical Examination of Gamow's Theory of Alpha Particle Decay

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ABSTRACT

Gamow's Theory of Alpha Particle Decay was initially formulated for a limited set of nuclei. In this study, the researchers extend the scope and assessed the applicability of the theory to a broader range of nuclides especially those with different proton and neutron compositions. Three objectives were formulated to undertake the research. The researcher utilized one-dimensional WKB approximation to calculate the probability of tunneling

through the potential barrier, which is a simplification compared to other formulas. The Geiger-Nuttall law, which describes a dependence of the disintegration constant on the range of α-particles, was deduced using the Gamow theory describing the passage of the α-particles through the Coulomb barrier by the quantum mechanical tunneling effect. Ground-to-ground state α-transitions for α-active nuclides were analyzed based on their half-lives and their dependence on various factors. The study revealed that all α-active nuclides whose Z ranges between 70 to100 undergoes similar alpha decay processes.

Keywords:

STC070

Analysis of Morphological and Elemental Composition in Rice, Beans, and Groundnut Husk

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ABSTRACT

This study presents a comprehensive analysis of the morphological and elemental composition of three widely consumed agricultural products: rice, beans, and groundnut husk as a partial substitute for sand due to its high content of calcium, silicon, aluminum, iron, and other elements when properly controlled. Transforming them into practical materials in order to reduce their detrimental impact on the environment. An equal weight of 50 g of Rice husk, 25 g of bean husk, and 25 g of groundnut shell were measured out of 100 g of untreated samples and oven dried at 1000c for 4 hours. The samples were the crushed to fine particle and sieve, which was burned at a temperature of 5500C in an electric furnace for 4 hours. The result obtained microscopic techniques such as Scanning Electron Microscope (SEM) with Energy Disperse X-ray fluorescence (EDXRF) and X-ray diffraction (XRD), were used to observe the surface and element presence in RBGH. The result among other things shows that untreated RBGH atomic concentration of Si is 65.79%, K is 16.01.53%, P is 5.14% Ca is 3.36% and Mg is 3.35% respectively, and the SEM shows that it has a porous cellular structure and consists of irregular-shape particles. The findings shed light on the potential industrial applications of these agricultural byproducts

Keywords: Rice, Bean, Groundnut, SEM-EDXRF, XRD

STC071

A Thorough Review on Phase Change Materials (PCMs) for Building Applications

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ABSTRACT

Building sector is the largest energy-consuming sector, accounting for over one-third of the energy consumption in the world. it is responsible for 40% of the total energy consumption of which heating, cooling and hot water are responsible for approximately 70%. Currently, around 75% of the primary energy supply for heating and cooling is based on fossil fuels. Towards an energy sustainability, efficiency, environmentally friendly and low-carbon building sector, Thermal energy storage systems, using Phase Change Materials (PCMs) are gaining attention due to its role in achieving energy conservation in buildings. This paper offered an overview of previous works and recent studies of the integration of different PCMs into passive buildings materials. Previous research articles were presented, their results regarding the incorporation of PCMs in buildings structures and its impact on the energy conservation and thermal comfort were analyzed. It has been found that using PCMs, energy efficiency of buildings was improved, energy consumption cost was minimized, and the thermal comfort requirements were assured. In addition, PCMs can provide key solutions to energy shortages, carbon emissions and their serious threat to the environment. Based on the findings, future recommendations were proposed to work on the areas of research for further improvements.

Keywords:

STC072

ROLE OF ANNEALING TIME AND TEMPERATURE VARIATION ON SPECTROSCOPIC PROPERTIES OF TITANIUM DIOXIDE THIN FILMS PRODUCED BY A SPIN-COATING TECHNIQUE

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ABSTRACT

spin coating is one of the most common practices used across the coating industry for the deposition of semiconductors, and transition metal oxides (TMO) films. Titanium dioxide (TiO2) is one of such TMO semiconductors that has gained massive recognition due to its various properties such as thermal stability, non-toxicity, and long-term photo-capability. This diverse property makes it useful in many applications such as solar cells, photocatalysis, and sensors. Understanding the influence of annealing time and deposition temperature on the spectroscopic properties of TiO2 thin films is vital for optimizing their functionality and efficiency. This study investigates the impact of varying annealing time and temperature on

the spectroscopic properties of titanium dioxide (TiO2) thin films prepared using a spin-coating technique. The comprehensive spectroscopic analysis, Fourier-Transform Infrared (FTIR) spectroscopy in correlations to varying annealing time and temperature were analyzed. The findings reveal that prolonged annealing times to 6 hrs. can enhance the purity of TiO2 thin films by driving off contaminants and impurities. The FTIR spectra showed a reduction in specific absorption bands related to impurities, suggesting an improvement in film purity. Similarly, annealing temperature beyond 500 ℃ indicates distinct changes in the molecular structure and vibrational modes, suggesting a transformation in the crystal lattice and chemical bonding configurations.

Keywords: Titanium Dioxide; spin coating; thin films; annealing time.

STC073

Computational Study of structural, Electronic and optical Properties of Tetragonal Lithium-Indium disellenide ($LiInSe_2$) as possible candidate for lithium battery

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ABSTRACT

We report theoretical calculations of the band structure and density of states for tetragonal LiInSe2. These calculations are based on the plane wave (PW) method within a framework of density functional theory (DFT) as implemented in Quantum ESPRESSO. Our calculations show that LiInSe2 is a direct band gap material with the valence band maximum (VBM) and the conduction band minimum (CBM) located at the high symmetry point gamma Γ, the calculated band gap is about 1.60 eV. For the total and partial DOS we observed that the VBM is dominated by Se and Li states, while the CBM is dominated by In, Se and small contributions of Li and In states. There is Li states hybridization below the Fermi energy (EF), while some state of Li hybridizes with some states of In below and above EF. Also, some states of Se hybridizes with some states of In atom below and above EF.

Key words: Band gap, DFT, DOS, Fermi Energy (EF)

STC074

Towards Sustainable Solar Energy Storage: A patent Analysis for improving Energy Density, Cycle durability and Rate capacity for Hybrid Lithium-ion Battery ($LiFePO_4$)

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ABSTRACT

The adoption of renewable energy is accelerating globally, particularly in wind and solar energy generation, as governments and other corporations work towards meeting climate change-related emission reduction targets. Solar energy storage capacity is currently under-utilize in terms of minutes to hours of output at full power capacity. In this study, we explored the essentials of long-duration energy storage systems, by analyzing energy density, cycle durability and capacity rating for Hybrid Lithium-ion Battery (LiFePO4). The techno-economic performance of the battery (LiFePO4) technology is evaluated using purpose-built models and varying system size and duration. Sensitivity to key parameters was assessed and the resulting indicators compared. The study showed a fast response time with improved energy density leading to 42% relatively high efficiency. However, cycle durability was highly influenced by DoD lead to relatively short lifetime 3.5 hour which is common for systems with charge management. To this end, three key strategies were identified to improve Li-ion batteries: finding alternative electrode materials to both improve energy density and decrease the environmental and societal impact of the raw materials, implementing self-healing mechanisms to improve cycle lifetime, and improving the efficiency to decrease costs.

Keywords: Energy Density, Cycle durability, Rate capacity, Lithium-ion Battery (LiFePO4),

STC075

Preparation and characterization of Rice Husk Activated Carbon

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ABSTRACT

A rising number of studies have explored different approaches for transforming agricultural bio-wastes into sustainable and highly efficient biochar. Among these agricultural bio-wastes, rice husk (RH) is a good alternative because of its large quantities of silica and organic matter contained in it. In this study, proficient activated carbon (AC) was produced from rice husk via a physio-chemical method. The physical and chemical properties of the prepared ACs were characterised using thermogravimetry (TG), X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), Brunauer, Emmet and Teller (BET). The thermal decomposition behavior TGA confirmed a suitable temperature of about 350 oC for the carbonization of the RH precursor, the structural analyses using XRD confirmed the successful transformation of the RH into an amorphous and carbonaceous material. FTIR analysis shows that after activation, more structures and functional groups in the RH char remained. The micrographs (SEM), as well as the (BET) analysis showed good porosity and surface area properties of the RH AC. These results suggested that RH derived AC is a promising candidate for applications that requires high surface area materials. In conclusion, RH is considered a higher-efficiency precursor for the preparation of sustainable and highly efficient biochar.

Keywords: Activated carbon, Rice husk, porous structure, bio-wastes.

STC076

Structural Analysis of Titanium Dioxide Thin Film Using Debye Scherer and Williamson-hole Technique Synthesized by Spin Coating Method

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ABSTRACT

Investigations of real structures and film properties have been in progress for many years. Structurally, titanium dioxide (TiO2) can be found in three natural phases, namely, anatase, rutile and brookite, out of which anatase shows greater photo-catalytic activity. However, TiO2 thin films depositions could be achieved by diverse techniques such as, chemical vapour deposition, chemical bath, aerosol pyrolysis, and spin coating method Among these methods, spin coating is the most simple and effective for thin film deposition. In this work, titanium dioxide powder and ethanol were mixed in some certain ratio with constant stirring, and then the resultant solution was turned milky. Then, 0.1 ml of concentrated polyvinyl acetate was added to make the solution clear and homogeneous. The solution was kept in an air-tight bottle for 8 hours for complete hydrolysis and condensation reactions. Then 3, 6 and 9 drops were made on the glass substrates and spin-coated with a spinning speed of 2,000 rpm for 40 s. The films were pre-heated for 15 min at 50 ^{0}C on a hot plate.

Debye-Scherrer and Williamson-hall technique were used for the crystallite analysis. The crystallite size using Debye-Scherrer was found to be 7.42, 13.49 and 16.09 nm for 3, 6 and 9 drops respectively. While using Williamson-hall technique, the crystallite size was found to be 6.71, 12.52 and 17.33 respectively. The variation in the crystallite size proves the importance for using the two methos for the structural analysis of the material.

Keywords: Debye-Scherrer; Williamson-hall; Titanium Dioxide; Spin coating

STC077

Analysis and Exploration of Kronig and Penney Potential Models in Crystal Lattice Structures

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ABSTRACT

This study delves into the intricate influence of crystal lattices on material properties, employing the Kronig and Penney potential model (KP) to understand wave functions and electronic band structures. Investigating classical and quantum mechanics, the research explores discrete atomic states through Schrödinger's equation, considering both finite and infinite potential scenarios. The results found that as (αa) increases, the energy within the +1 power scatter barrier experiences damping, reaching a constant defined by $F(\alpha a) = 6 \times 10^{-5}\,(\alpha a) + 0.9888$. Electron confinement within the unit atom results in an infinite power scatter barrier, and energy (En) for any lattice is determined by $E_n = 13.7\,n^2$. Temperature-induced variations signify increased energy, indicating free electron movement and a finite power scatter barrier. The electron's negligible velocity in the lattice plays a crucial role in determining amplitude. A decrease in ET corresponds to an increase in the velocity vT of the free electron. Extreme phonon energy in lattice structures is negligible due to its massless nature. The study notes increased energy in restricted electrons, causing a reduction in free electron energy due to an energy gap or barrier scatter. High temperatures are essential to reduce the energy band, facilitating electron transitions and resulting in an electron lifetime of $1.63 \times 10^{-50}\,s$. These insights deepen our understanding of crystal lattice dynamics, offering avenues for innovative applications in materials science and quantum physics.

Keywords: Kronig and Penney potential, Energy Levels, Periodic potential, crystal lattice,

STC078

Effects of Biomass Additives on Technological Properties of Nkalaha Fired Clay

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ABSTRACT

The effect of biomass additives on technological properties of Nkalaha fired clay was investigated. The clay sample obtained from Nkalaha clay deposited in Ebonyi State, and while two biomass additives (rice husk and palm kernel) samples were sourced from Abakaliki, Ebonyi State, Nigeria and then was purified through the process of picking/sorting, crushing/grinding and sizing (sieving). The sieved clay sample was thoroughly mixed two different biomass additives (rice husk and palm kernel) separately at ratios of 90:10, 80:20, 70:30 and 60:40 by weight. The mixtures moulded into rectangular shaped brick of 30 mm× 35 mm×35 mm dimension and then fired in the furnace at 1200oC. The characterized properties were porosity, bulk density, and water absorption. The samples were tested according to American Standard of Testing of Materials (ASTM) and compared with its specifications. The atomic Absorption Spectrophotometer was used to determine the chemical compositions of blended clay with rice husk and palm kernel. The result revealed that the biomass additives possess the ability to enhance the properties of the clay. It can be utilized in fired building bricks by taking advantage of its environmental friendly and low cost. The values of foundry properties obtained for the moulding mixtures produced consisting of the clay and biomass additives (rice husk and palm kernel) were recommended to the production of foundry materials and bricks making. It could be concluded that the blended clay containing 40 wt % rice hush ash and palm kernel ash and 60% Nkalaha fire clay, had the best combination of mechanical properties of all the composites produced. Therefore, blended clay can be recommended for the production of foundry materials and bricks making.

Keywords: Clays, rice hush, palm kernel ash, ceramics

STC079

Ab-Initio Study on the Effect of Rare earths Atoms Doping on Structural, Electronic and Optical Properties of mono-layered Niobium Disellenide (NbSe2)

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ABSTRACT

Two dimensional transition metal dichalcogenides (2DTMDC) Monolayers such as Niobium Disellenide (NbSe2) Monolayers have great potentials for use as atomically thin photovoltaic material due to their favorable electron transport properties. NbSe2 at its bulk have a semi metallic nature despite been among the most interested 2DTMDC. When turn into monolayers its gives a semiconducting nature with promising band gap. In this work, we investigates the structural, electronic and optical properties of pristine, Lanthanum doped (La-doped) and samarium doped (Sm-doped) NbSe2 monolayers using density functional

theory (DFT) with Generalized Gradient Approximation (GGA) as exchange correlation functional. Our results indicate that La-doped is a semiconductor with n-type nature and favorable band gap of about 1.13eV while the Sm-doped showing a p-type with the band gap of about 1.17eV. For the optical properties investigations, the doped materials have shown a high transmittance in the visible region and hence they could be promising materials for photovoltaic solar cell.

Keywords: DFT, NbSe2 Monolayer, photovoltaic solar cell, La-doped NbSe2, Sm-doped NbSe2 monolayer.

STE011

TOWARD PROMOTING SECONDARY SCHOOL STUDENTS' ACHIEVEMENT AND INTEREST IN PHYSICS: AN EXPERIENCE LEADING STUDENTS IN THE CONSTRUCTION OF SOLAR (FLAT-PLATE) COLLECTOR

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ABSTRACT

The purpose of this study was to find out the effect of secondary school students' academic achievement and interest in physics in technology when lead in the construction of solar (flat-plate) collector. Two (2) research questions and hypotheses guided the study. The study adopted quasi-experimental design; specifically, static-group pre-test post-test design. The subjects were 82 Senior Secondary 1 students from University of Nigeria Secondary School Nsukka, (UNNSSN) purposively sampled from all secondary schools in Nsukka, Enugu State. The experimental group was taught and led in the construction of construction of solar (flat-plate) collector, while the control group was taught using conventional lecture method. The instrument for obtaining the data were solar concept evaluation test (SCET) and Physics in Technology interest scale (PTIS). The data generated from the SCET and PTIS were analyzed using mean and standard deviation, and Analysis of Co-variance (ANCOVA) at 5% level of significance. The findings of the study revealed that the academic achievement of students led in the construction of solar (flat-plate) collector improved significantly compared to their counterparts in control group. Also, students' interest in physics improved significantly in experimented group compared to those in control group. Based on the findings, some recommendations were made.

Keywords: **Solar (Flat-plate) Collector, Achievement, Interest, Physics in Technology**

TQR013

Expectation values of heavy mesons via two analytical methods; applications to Fisher information theoretic measures

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ABSTRACT

The expectation values play important role in atomic physics and quantum mechanics. They are vital to obtaining the quantum information theoretic measures, Compton profile, electronic kinetic energy, Langevin-Pauli diamagnetic susceptibility, Dirac exchange energy and so on. In this work, however, we utilized accurate bound state solutions of the non-relativistic Schrödinger equation under the Cornell potential to obtain the expectation values: $\langle p^2 \rangle_{nl}, \langle T \rangle_{nl}, \langle V \rangle_{nl}\ \langle r^2 \rangle_{nl}\ \langle r^{-1} \rangle_{nl}$ and $\langle r^{-2} \rangle_{nl}$ using two analytical methods such as the integral approach and the Hellmann-Feynman theorem method. We applied the mean values to obtain the Fisher information theoretic measures for the Charmonium and Bottomonium mesons. We found that the mean values and probability densities are sensitive to the meson masses and the principal quantum number for fixed orbital quantum states. The Dirac exchange and the kinetic energies obey the lowest bound inequalities for 3D atomic systems. Also, the results obey the Fisher uncertainty product, Cramer-Rao and the Heisenberg uncertainty inequalities for 3D quantum systems.

Keywords: Mesons spectroscopy, Hellmann-Feynman, theory Expectation values, Fisher information measure

TQR014

Effects of Biomass Additives on Technological Properties of Nkalaha Fired Clay

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ABSTRACT

Abstract: The Effect of blood viscosity on the overall blood volume flux was determined based on the four viscosity models. The work is carried out in a COMSOL Multiphysics Simulation Environment. The three viscosity models (Power, Carreau and Walburn-Schneck model) concurrently reported equal percentage change of blood flux variation with the

corresponding variation of the viscosity due to change in strain rate. This therefore indicates the dependence of the flow rate on the viscosity of the blood.

Keywords: Blood Flow, Blood Flow Rate, Blood Viscosity Models, Power Law, Carreau Model, Walburn-Schneck Model

TQR015

Emissivity of Tungsten Filament Lamp

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ABSTRACT

Emissivity is the portion of black body radiation energy that constitutes the radiation energy of a given body. It determines the radiation property of a substance be it a black body or a grey body. The emissivity of Tungsten Filament was determined using commercial filaments of various wattages. Filaments powered by stable alternating currents produced visible spectrum obtained by dispersion through an equilateral triangular glass prism. Power parametization law was applied to obtain the resistances of filament at corresponding chosen temperatures while reference was made to laboratory temperature and fundamental resistance of the filament while not conducting. Wien's law was used to deduce the wavelengths of radiation at various temperatures attained. Stefan-Boltzmann's model was used to determine the emissivity of tungsten filaments at corresponding temperatures obtained. The optical effect created by visible light as accentuated by dispersion has an emissivity of 0.4 and an average emissivity greater than 0.3. The emissivity due Joule's effect arising from infra red radiation accounts for power loss mainly by a multiplier effect in the internal diameter of the coiled filament – an analogy of radiation in the hole of a cavity which is a physical example of black body. By coating the internal part of the filament with a metal of higher work function, black body effect is largely diminished and excess power loss is minimized just as average emissivity may reduce, to allow for the desired high reflectivity.

Keywords: Emissivity, Tungsten Filament, Dispersion, Wavelength

TQR016

A Density Functional Theory Study on Effect of Cations and Anions Co-Alloyed Cu_2ZnSnS_4 Kieserite on Structural and Formation energy as possible Photovoltaic Material

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ABSTRACT

Cu2ZnSnS4 (CZTS) has the potential to be applied as an earth-relatively abundant and non-toxic material in thin-film solar cells, based on its suitable electrical and optical properties. However, many challenges have prevented the achievable efficiencies from exceeding 12.6%, which is well below desirable efficiencies compared to other competing solar cell technologies. One of the problems with the development of Cu2ZnSnS4 solar cells is the number of defects leading to severe potential fluctuations. This research work investigates the effect of alloying CZTS with Silver (Ag) (Cation) and Selenium (Se) (Anion) theoretically using Density Functional Theory (DFT). The optimized lattice parameters were found to increase from 5.26 to 5.85 and 10.60 to 12.32 respectively due to the introduction of Ag and Se. The volume of the crystal unit cell increased from 162.747 3 to 219.472 3 respectively. The formation energy was found to be reduced from 0.663eV to 0.476eV. From the obtained results, it can be seen that the alloyed Ag2ZnSnSe4 compound has a low-range energy structure and its stable within a low temperature range. This result is expected to enhance the properties of kesterite due to the alloying.

Keywords: Kesterite, DFT (Density Functional Theory), Solar cell, Chalcogenide, Alloying.

GPR073

Groundwater Potential Mapping in Miango and Its Environs Using Electrical Resistivity Methods

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ABSTRACT

Groundwater Potential Mapping Using Electrical Resistivity Methods was carried out in Miango and Its Environs with the aim of investigate the groundwater potential using the Electrical Resistivity Method. The underlain rocks are predominantly Newer Basalt, Micro

granites and Migmatites. Fifteen (15) Vertical Electrical Sounding (VES) were probed using Schlumberger array with maximum current electrode spacing (AB/2) of 100 m at each point using the ABEM SAS 300C Terrameter. The data were interpreted using the partial curve matching and computer iteration Programme using IX1D (version 3.20) and Surfar 9 (version 9.0). Parameters such as overburden thickness and basement resistivity were calculated and used for evaluating the groundwater potential and aquifer vulnerability of the study area. The predominant VES curve types obtained are HK, QH, HA, HQ and QA. The geoelectric sections show that the area is underlain by 2–4 layers: the topsoil (124.6–3663.9 Ω m), Laterite (0–1398.3 Ω m), fractured/weathered basement (112.8–8747.2 Ω m) and the fresh basement (17.6–438.4 Ω m). The groundwater potential ratings for the Fifteen (15) VES locations in the study area shows that borehole should be drilled along VES 2, VES 12, VES 29 and VES 33. The study therefore helped in identifying favorable groundwater potential and the aquifer vulnerability of the area.

Keywords: Geophysical Survey, Vertical Electrics Sounding, Groundwater potential Zones, Aquifer