SOCIETY OF TESTING LABORATORY ANALYSTS OF NIGERIA (SoTLAN)

9TH CONFERENCE OF PUBLIC ANALYSTS

COPA '26

BOOK OF ABSTRACTS

THEME:

ENVIRONMENTAL PROTECTION, WATER RESOURCES MANAGEMENT & SOLID MINERAL EXPLORATION IN NIGERIA:
The Role of Public Analysts in Sustainable Development

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SOCIETY OF TESTING LABORATORY ANALYSTS OF NIGERIA
Guaranteeing Consumer Environmental Safety
(SOTLAN)

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ABOUT SOTLAN

The Society of Testing Laboratory Analysts of Nigeria (SoTLAN) is the Association of Public Analysts in Nigeria. It is a non-governmental organisation and membership is open to interested analytical laboratory analysts across the country in the following categories-Fellows, Professional members, Honorary members, Student members and Corporate members.
The Association provides a platform for members to relate together, and work towards improvement on services, explore global opportunities and certification for members among others.
Our members engage in the testing of consumer products, food and beverages, chemicals, solid minerals, environmental samples, medical devices, water and wastewater, petroleum and petroleum products e.t.c. for export purposes, engineering designs, environmental management, quality assessment and protection of human health. Our clientele includes consultants, individuals and corporate organisations.
Public Analysts are registered members of the Institute of Public Analysts of Nigeria (IPAN) and the Regulatory arm is established by IPAN Act LFN CAP I16 of 2004 (Formerly by Decree 100 of l992).
Apart from the primary responsibility of testing materials and substances, our members are also trained to support forensic studies, toxicological assessment, veterinary drug residue, and public health concerns among others.
SoTLAN is a member of:

1. Association of Professional Bodies of Nigeria.
2. International Union of lndependent Laboratories(UILI).

Evolution of SoTLAN and Present status.
For a long time, Nigerians consumed industrial products whose qualities were not under proper surveillance. In 1970, the Federal Military Government established the Standards Organization of Nigeria for quality surveillance of all industrial products. As if to stress its recognition of the pre-eminence of preventive efforts over the curative (which the Nigerian Society hardly recognizes), the same Federal Military Government, in 1974, promulgated the Food and Drugs Decree. The main purpose of this decree is to ensure that Nigerians are given food, drugs and cosmetic of good and internationally acceptable quality. It made provisions for the control of adulteration and the preparation of foods, drugs and cosmetics under insanitary conditions, and for the prevention of the importation of such and sale of those certified unfit for human use. In order to carry out the provisions of the 1974 decree, there was need for the Government to fully recognize by law the available Analysts at the time especially in the then Federal Ministry of Health, Chemistry Division and other Higher Institutions so as to employ their services to attest to the quality of these products. Consequently in 1977, the Federal Ministry of Health designated the first set of Food and or Drug Analysts. There were 25 pioneer members of SPAN in 1978.

Society of Testing Laboratory Analysts of Nigeria (SoTLAN) therefore is an outgrowth of the Society of Public Analyst of Nigeria (SPAN)that was formed by the Government Chemists in 1978, taking after the Association of Public· Analysts(APA) of United Kingdom.

At its Extra-ordinary Emergency General Meeting of 28th of May, 1988 in Lagos, the name Society of Public Analysts of Nigeria (SPAN), was changed to Institute of Public Analysts of Nigeria (IPAN). In this same meeting, a resolution mandating the Executive Council to obtain a Charter was adopted. The Council obtained Charter for the Institute in 1992 by Decree 100 of the same year (now CAPLFN I16 of2004) and its first Governing Council was inauguratedon the 31" of March, 1994 with Mr. Daniel Akoh as the President of lPAN and Chairman of the Governing Council.

In a bid to better position the analysts, the professional arm of the Institute of IPAN was registered as SoTLAN in 2015 leaving IPAN with the exclusive responsibility of regulating the practice of Public Analysts, laboratory registration and accreditation of courses leading to qualification as Public Analysts in Nigeria in accordance with the Act.

SoTLAN Objectives
The objectives of SoTLAN are to:

a. create a forum where Public Analysts meet to discuss/deliberate on matters affecting the profession.
b. maintain a high standard of professional ethics and discipline.
c. coordinate information and disseminate knowledge among Public Analysts
d. encourage the development of new methods of analysis
e. promote the participation of the Society in national development and planning by initiating action on matters relating to the profession.
f. liaise with the Institute of Public Analysts of Nigeria with a view to achieving a common goal; improving the practice of Public Analysis.
g. collaborate with relevant local and international bodies and do such other things as may be incidental for the achievement of the objectives of the Association.

Long live Public Analysts! Long live SoTLAN!! Long live IPAN and Long live Nigeria!!!

For more information visit SoTLAN website @www.sotlan.org or publicanalysts.org

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ABSTRACTS:
Environmental Protection

COPA-LJ26-ENV001

Health Risk Assessment and Quantification of Toxic Heavy Metals in River Meme, Lokoja, North Central Nigeria

Yahaya, Abdulrazaq[1]*; Ayeni, Gideon[2]; Aina, Oluseyi Abel [3].; Oloruntoba, Deborah Kike[4], Omale, Victor Fedoje[1], Ejukuwa, Emmanuel Ekpe[1]; Idris, Safiya Ayatu [1]

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Abstract

Water is very important for good health and has many uses, such as domestic purposes, food processing, and personal hygiene. Unfortunately, its quality has been affected by anthropogenic activities, including the discharge of untreated domestic and industrial wastewaters into water bodies. This leads to the release of toxic heavy metals into river bodies. These heavy metals bio-accumulate into plants/crops, aquatic animals (fish, snail, crab) and affect human health upon consumption of crops and aquatic biota. This study assessed the concentrations of toxic heavy metals (THM), which include cadmium (Cd), lead (Pb), arsenic (As) and mercury (Hg) in water samples from the Meme River in Lokoja, Kogi State, Nigeria. The samples were collected from five locations and analyzed using Atomic Absorption Spectroscopy (AAS) after digestion with a mixture of acids. Results revealed that concentrations (mg/L) are: Pb (below detection limit [BDL] - 0.112), Cd (BDL - 0.39), while As and Hg are BDL, and none of the analyts was detected in the control sample. Pb and Cd exceeded the World Health Organization (WHO) and National Environmental Standards and Regulations Enforcement Agency (NESREA) permissible limit of 0.01 and 0.003, respectively. It implies that the river was polluted. The health risk assessments were evaluated for dermal using the United States Environmental Protection Agency's (US EPA) standard method. However, the hazard coefficient (HQ) of THM < 1 indicates adverse effects are unlikely to occur to human health and aquatic biota. Hence, these findings emphasize the urgent need for pollution control, regular water quality monitoring, and public awareness to mitigate health risks associated with the consumption and use of Meme (2) River.

Keywords: River, toxic heavy metals, acids, water and health risk.

COPA-LJ26-ENV002

Waste to Wealth Strategies: Carbon Dots@Metal-Organic Frameworks Composite from Watermelon Peel for Electrochemical sensing of Organophosphorus Pesticides in Contaminated Water.

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Presenter: Adelaja R. Abisayo

Abstract

The vast use of organophosphorus compounds in agriculture and industry has necessitated the development of sensitive, cost-effective, and environmentally sustainable methods for monitoring their presence in water systems. This work reports the green synthesis of a copper-aminobenzoate metal-organic framework, $[Cu(aba)_2]$ via solvent-free mechanochemical milling and the preparation of carbon dots from watermelon peel waste (WCD) through hydrothermal carbonization. A nanocomposite (WCD@$[Cu(aba)_2]$ was fabricated via hydrothermal synthesis and employed to modify a Glassy Carbon Electrode (GCE) for the electrochemical detection of diethylphosphite (DEP), an important organophosphorus compound and environmental contaminant. Comprehensive characterization using FTIR, PXRD, SEM-EDX, TGA, UV-Vis, and fluorescence spectroscopy confirmed the successful formation of the MOF, carbon dots, and composite. The WCD@$[Cu(aba)_2]$ modified electrode exhibited synergistic enhancement in electrochemical performance, with 2.2-fold and 1.3-fold higher oxidation peak currents compared to WCD/GCE and $[Cu(aba)_2]$/GCE, respectively, which is attributed to the high surface area and catalytic Cu centers of the MOF combined with the conductive pathways provided by carbon dots. Under optimized conditions (pH 5.0 acetate buffer, 60 µL modifier loading), chronoamperometric detection of DEP showed a linear response from 0.3 to 2.1 nM ($R^2 = 0.9889$) with a Limit of detection (LOD) of 0.23 nM. The sensor demonstrated excellent repeatability (RSD < 0.81%), good storage stability (89.2% response retained after 14 days), and high selectivity against common inorganic ions and structurally related compounds (<±1.5% signal variation). Applicability was validated in spiked tap water samples, with recoveries of 96.7–104.0% (RSD = 0.23–1.92%). This work presents a sustainable approach combining agricultural waste valorization with green MOF synthesis for the development of high-performance electrochemical sensors for trace organophosphorus detection.

Keywords: Electrochemical Sensor, Metal-Organic Framework, Carbon Dots, Watermelon peel, Diethylphosphite, Sustainable Synthesis.

COPA-LJ26-ENV003

Analyses of Smoked Fish from Selected Food Vendors in Gwagwalada Area Council, Federal Capital Territory, Abuja

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Abstract

Smoked fish remains a traditional and widely consumed delicacy in African cuisine, prepared by subjecting fresh or frozen fish to dry heat generated from burning wood. This process extends shelf life, enhances flavor, preserves nutritional value, and inhibits pathogenic microbial growth through dehydration and antimicrobial smoke compounds. To assess quality, safety, and compliance with national standards, twelve (12) smoked fish samples were randomly collected from food vendors in Gwagwalada Area Council, Federal Capital Territory, Abuja, Nigeria, and analyzed using standard laboratory methods. The Parameters evaluated included sensory attributes (appearance, odour, texture, flavour), proximate composition (moisture, sodium chloride, ash, acid-insoluble ash), microbiological contaminants (total plate count, coliforms, moulds, Salmonella sp., Escherichia coli, Listeria monocytogenes, Vibrio cholerae, Vibrio parahaemolyticus), heavy metal contaminants (arsenic, lead, mercury, cadmium), hygiene practices, packaging, labelling, and handling/storage conditions. All results were compared against the Nigerian Industrial Standard (NIS 982:2018) for smoked fish and related requirements (e.g., NIS 168:2004 for ingredients). The samples met or exceeded all specified limits: moisture content was 3.091% (max 8%), sodium chloride 0.145% (max 5%), ash 3.728% (max 11%), acid-insoluble ash 0.208% (max 0.6%); all microbial counts were either zero or absent where required; heavy metals were undetectable (below maximum limits of 1.0 mg/kg for As and Cd, 0.2 mg/kg for Pb, 0.5 mg/kg for Hg); sensory qualities were characteristic and acceptable; and hygiene, packaging, labelling, and handling complied fully with Good Manufacturing Practices (GMP). These findings indicate that the commercially available smoked fish from the sampled vendors are of high quality, safe for consumption, and compliant with NIS standards, with no evidence of spoilage, contamination, or health hazards.

Keywords: *food safety, contaminants, standards, quality, shelf-life, Nigeria,*

COPA-LJ26-ENV004

Geo-index of Assessment of the Heavy Metal Accumulation in Soil and Water Stream in Lokoja and Kabba Local Government Area, Kogi State of Nigeria.

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Abstract

This study assessed environmental risks of heavy metal accumulation in agricultural soils and water in Lokoja and Kabba Local Government Areas in Kogi State of Nigeria. Samples were collected during the dry and rainy easons in both of the Local Governments. The results showed elevated levels of Pb up to 501.87 mg/kg, Cd up to 28.72 mg/kg, Cu, Ni, and Zn in soils, with Lokoja having higher concentrations. Water samples contained Pb (1.0-3.0 mg/L, Cd (0.1 mg/dm^3), and other metals. The I-geo value for Pb was 5 (strongly polluted) for Lokoja while the Kabba soil was classified as grade 3 (moderately polluted) which indicates that the concentration of Pb exceeded the average shale value. Zn is the only moderately polluted metal according to I-geo classification in the study area, this is in line with the findings by Odoh *et al*, (2018). The Lokoja and Kabba I-geo for Cu are >1, which falls into the category of "moderately polluted". The Pollution Load Index (PLI) indicated moderate to high ecological risk, with LKJ showing higher PLI (5.95 dry season). Pearson correlation analysis suggested common origins for most metals in Lokoja, except for Cu/Zn (0.4), Cd/Zn (0.33) and Cd/Ni (0.21) which did not show correlation in the Kabba soil samples. Physicochemical parameters like pH and organic matter influenced metal mobility. Findings highlight potential environmental and health risks, necessitating monitoring and mitigation strategies.

Keywords: Environmental Soil, Water, Heavy Metals, Pollution Index

COPA-LJ26-ENV005

Assessing Public Analysts' Role in Environmental Protection and Resource Management in Nigeria: A Laboratory Audit of a Gas-Fired Power Plant in Ajaokuta, Kogi State.

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Abstract

Environmental protection, water resource management, and sustainable energy production are essential for achieving sustainable development in Nigeria. This study presents the findings of an environmental audit conducted at a gas-fired power plant in Ajaokuta, Kogi State, highlighting the critical role of public analysts in laboratory-based environmental assessment. The quality of water, soil, sediment, and air was evaluated against NESREA and FMEnv regulatory standards using standardized analytical procedures, including ISO 14040 Life Cycle Assessment and APHA methods. Water analysis revealed near-neutral pH levels (6.8–7.3) and well-aerated conditions, with dissolved oxygen ranging from 6.2 to 7.1 mg/L. Total dissolved solids (250–320 mg/L), nitrates (1.8–3.2 mg/L), sulphate (12–20 mg/L), and chlorides (18–26 mg/L) were all within permissible limits, while heavy metals were present only in trace concentrations. Soil and sediment analyses indicated pH values of 6.2–6.8 and organic carbon content of 1.5–2.3%, suggesting moderate fertility and geochemical stability. Air quality assessment recorded low emissions of NOx (2.17×10^{-5} g/kWh) and SOx (5.01×10^{-5} g/kWh), while CO_2 emissions (1.36×10^{3} g/kWh) were attributed to controlled natural gas combustion. Operational evaluation confirmed natural gas as the primary energy source, with water consumption ranging from 160 to 180 m^3 per month and a material balance efficiency of 96.83%, reflecting efficient resource utilization and minimal waste generation. The audit results confirm compliance with applicable environmental standards and demonstrate effective environmental management practices. The study highlights the critical role of public analysts in generating reliable environmental data to support regulatory compliance and sustainable decision-making. It recommends continuous environmental monitoring, strengthened regulatory enforcement, the adoption of ISO 14001 environmental management systems, improved waste management strategies, and enhanced technical capacity building to promote sustainable power generation and effective environmental governance in Nigeria.

Keywords: Environment, Audit, Sustainable, management, Nigeria

COPA-LJ26-ENV006

Exploring Issues in the Environment as a Threat Deter

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Abstract

The worlds Environment is full of problems with immediate, practical threats to health, economic growth and the weight of psychological traumatic issues from kidnapping, manslaughter further pressing to human instability and needs resource management. Is against this back drops that these vices especially in present society requires human resource protection and managing of the environment to deter harmful "vices" or threats as well as reducing the conditions that allow those problems and harmful actions to grow in the first place. This work will use mixed methodology with focus aim on issues in the environment with the view to deter threat the objective includes sustainable ways to protect the environment from these vices, the need to maintain environmental and human resource sustainably, ways to make sustainably efforts on those social pressure, solutions against destructive practices. This work concludes on using education, training, community efforts and some other practical solutions on threat and vices.

Keywords: Deter, sustainability, threat, human resource, management

COPA-LJ26-ENV007

Valorisation of *Saccharum officinarum* Bagasse via Hydrolysis Acid and Deacetylation

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Abstract

A plethora of low-grade agro-waste, such as sugarcane bagasse is available, yet the potential high-value applications of these waste materials have not been fully tapped. This study aimed at utilizing catalytic processes for converting low-grade sugarcane bagasse into high-utility biopolymers. In this study, Sugarcane bagasse was obtained, crushed, washed, and dried. The dried powder was dewaxed using toluene-ethanol in a Soxhlet apparatus. Cellulose was then isolated from the dewaxed bagasse via an acid hydrolysis method, which involved sequential treatments with sodium hydroxide, hydrogen peroxide, acetic acid, and sodium hypochlorite. This extracted cellulose was used to prepare cellobiose acetate. The process involved acetylating the cellulose with acetic anhydride and concentrated sulfuric acid as a catalyst, followed by crystallization and purification, yielding a 75.5% white powder. Finally, cellobiose acetate was deacetylated using a sodium methoxide solution in methanol, resulting in crude cellobiose, which was purified via recrystallization, yielding 79.5% pure, white solid cellobiose. These value added products were characterized using Fourier transform infrared spectroscopy (FTIR), CHN, X-ray diffraction (XRD), Scanning electron microscopy (SEM), Brunauer-Emmet-Teller (BET)) and Matrix-assisted Laser Desorption/ionization Time of Flight Mass Spectrometry (MALDI-TOF MS).

Key words: Deacetylation, acid hydrolysis, sugarcane bagasse, disaccharide, and catalyst

ABSTRACTS:

Water Management and Resources

(WMR)

COPA-LJ26-WMR001

Integrated Water Resources Management in Nigeria: Implications for Hydropower Sustainability and National Development

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Presenter: Ahmed, K.

Abstract

Nigeria's water resources, dominated by the Niger-Benue River system and over 323 reservoirs, constitute crucial infrastructure for national development; however, they face escalating pressures from population growth, climate variability, and institutional fragmentation. Despite possessing an established hydropower capability of about 2,064 MW from major plants such as Kainji (760 MW), Jebba (578 MW), and the recently commissioned Zungeru (700 MW), the sector still experiences challenges like water availability fluctuations, with generation decreasing by 1.68% in Q4 2024 because of seasonal river flow variations. This study examines the application of Integrated Water Resources Management (IWRM) concepts to reconcile competing needs among hydropower technology and generation, agricultural irrigation, and domestic water supply, whilst ensuring environmental sustainability.

This review takes a look at the pivotal role of Public Analysts in operationalizing IWRM through rigorous water quality monitoring using electrochemical sensors and spectroscopic techniques, and in compliance enforcement with the National Environmental Standards and Regulations Enforcement Agency (NESREA) standards. Studies reveal important governance gaps, together with fragmented institutional coordination among River Basin Development Authorities, weak enforcement mechanisms, and insufficient real-time tracking structures, which undermine reservoir control performance. The Niger Basin case study demonstrates how transboundary challenges, sedimentation, and pollution from agricultural runoff necessitate fact-driven decision-making and basin-level integrated planning.

Findings indicate that strengthening analytical abilities for tracking physico-chemical and biological parameters, including pH, dissolved oxygen, heavy metals, and microbial contamination, is essential for predicting reservoir overall performance and optimizing water allocation. The paper recommends institutional reforms integrating GIS-based monitoring, stakeholder engagement frameworks, and policy harmonization to enhance hydropower sustainability. This review emphasizes that effective IWRM implementation, supported by scientific water quality assessment and Public Analyst know-how, is essential to achieving energy security and sustainable development in Nigeria.

Keywords: Integrated Water Resources Management, Hydropower Sustainability, Water Quality Monitoring, Reservoir Management.

COPA-LJ26-WMR002

Critical Role of Testing Laboratory Analysts in Water Pollution Control and Sustainable Development.

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Abstract

Water pollution is a major threat to human health, the environment and sustainable development. Testing laboratory analysts play a vital role in controlling water pollution by analyzing water samples and detecting pollutants. This study highlights the importance of testing laboratory analysts in water pollution control and their contribution to sustainable national development. They are professionals who analyze samples, including water, air and other substances using techniques that measure the level of pollutants and the presence of biological agents such as bacteria, and inorganic substances such as chemicals and heavy metals. They monitor water quality through physicochemical and microbiological analysis, investigating the source to protect human and animal health from water borne, and water related diseases, to support economic growth and development and to conserve the natural environment.

Water, including rainwater, have been polluted to the level that requires purification before consumption. Earth is a water-rich planet while freshwater comprises only 3% of the total water available on earth, of which only 0.06% is readily accessible, this justifies why over 80% countries suffer from water deficit. The shortage of clean drinking water has forced an estimated 1.2 billion people around the world to drink unsafe water today, this has caused water- related diseases which kill about 5 million people a year mostly children around the world. The United Nations estimates that about 2.7 billion people will face water shortage by 2025. This is apparently clear that water is a scarce but valuable commodity whose quality needs to be sustained to ensure sustainability. Drinking water comes from rivers, lakes, wells, and sometimes springs, these sources are sometimes exposed to a variety of conditions that can contaminate them. However, failure to implement proper waste management measures and disposal of thousands of organic and inorganic compounds can pollute the sources.

Keywords: Testing, Laboratory Analyst, Water, Polluti on, Control

COPA-LJ26-WMR003

Comparative Study of Physico-Chemical Parameters and Phyto-Plankton Diversity of Downstream Chanchaga Reservoir, Minna, Niger State.

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Presenter: Adelaja Abisayo Ruth

Abstract

This study evaluated the physico-chemical parameters and phyto-plankton composition and diversity of the downstream Chanchaga reservoir, Minna, Niger State. Monthly variations in physico-chemical and phyto-plankton composition were studied twice each month for a period of four months (March-June 2017). Results showed a monthly variation of physico-chemical parameters. The mean of the monthly values of temperature range between 29.00 and 32.13°c. Dissolved oxygen (DO) and Biological oxygen demand values range between 4.38±0.43 mg/L - 6.13±0.61 mg/L and 2.19±0.25 mg/L - 3.13±0.51 mg/L, respectively. Phosphate and nitrate values range between 0.09±0.02 mg/L - 0.28±0.03 mg/L and 3.40±1.03 mg/L - 5.21±1.23 mg/L, respectively. Potential Hydrogen ion concentration (pH) ranges between 7.36±0.08 -7.81±0.07. Six phyto-plankton phyla were recorded; they were dominated by *Chlorophyceae*, then *Dinophyceae*, followed by *Baccillariophyceae*, *Cyanophyceae*, *Euglenophyceae*, and *Chrysophyceae.* The correlation matrix showed that there were significant correlations between phyto-plankton and physico-chemical parameters. The compositions of phyto-plankton of the downstream Chanchaga reservoir were affected by seasonal variations and fluctuation of physicochemical parameters.

Keyworsds: Dissolved Oxygen(DO); Biological oxygen demand(BOD), Phyto-plankton;

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Removal of Lead from contaminated water using 3D-Metal Coordination polymers prepared from carboxylate and nitrogen donor Ligands

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Abstract

Environmental pollution by toxic metals, such as lead is a challenge that requires continuous attention. Coordination polymers prepared by green and eco-friendly processes have been used as efficient adsorbents to combat this menace in recent times. Thus, in this study, a Zn^{2+} based coordination polymer, formulated as $Zn(Dph)_2(4,4Bpy)_2 \cdot H_2O$, was synthesized via solvent-free and solvent-based methods. Characterization of the compound carried out by FTIR, CHN, and PXRD techniques showed that the two compounds are similar despite prepared through different routes. BET values indicated a decrease in the surface area, as well as the pore volumes and sizes of the adsorbent after the adsorption process. SEM analysis showed difference in the monographs before and after the adsorption study. The synthesized solvent-free compound was used as adsorbent in the removal of lead ions, a ubiquitous heavy metal of great concern from aqueous medium using batch adsorption technique. The equilibrium time for the adsorption process was 50 min, and the maximum adsorption capacity was found to be 26.385 mg/g. The kinetic data fitted the pseudo-second order kinetics with R^2 value of 0.9996, while the Free energy value, E, calculated for the process was 10.0 kJ/mol, suggesting that the rate-limiting step was chemisorption. The adsorption data was best described by the Freundlich isotherm model ($R^2 = 0.9704$), implying that it followed a multilayered approach. Thermodynamic results showed that the adsorption process was orderly and endothermic. Thus, the obtained results portray the material as promising in wastewater treatment.

Keywords: Metal carboxylate, Coordination polymer, Lead, Adsorption, Wastewater

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Seasonal Assessment of Water Quality, Heavy Metals, Hydrocarbons, and Ambient Air at Abuja Aviation Depot (June 2022 – June 2024)

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Abstract

This study assessed heavy metal, microbiological, and ambient air quality parameters at an Aviation Depot within Nnamdi Azikiwe International Airport, Abuja, from June 2022 to June 2024. Data were analyzed according to seasons: Wet Season (April – October) and Dry Season (November – March). During the wet season, pH ranged from 6.23–7.9, conductivity from 67.5–173.2 µohms/cm, and total dissolved solids (TDS) from 72–150 mg/l. In the dry season, pH ranged from 6.71–7.76, conductivity from 109.6–153.4 µohms/cm, and TDS from 117–141 mg/l. Alkalinity was generally higher in the dry season (170–340 mg/l) compared to the wet season (40–300 mg/l). Turbidity peaked in December at 13.1 NTU. Heavy Metals such as Lead (Pb) were detected in both seasons, the wet season (0.07–0.143 mg/l) and dry season (0.106–0.408 mg/l), with the highest value (0.408 mg/l) recorded in March (dry season). Iron (Fe) showed a sharp dry season peak in January (5.126 mg/l). Mercury (Hg) was detected only in January (dry season) at 1.596 mg/l. Cadmium (Cd) was present in both seasons but was notably higher in dry season months (0.07–0.318 mg/l) compared to wet season (0.015–0.047 mg/l). Zinc (Zn) peaked in March (dry season) at 0.575 mg/l. Compared to FMEnv/NMDPRA guidelines, Pb (0.408 mg/l), Hg (1.596 mg/l), and Cd (0.318 mg/l) exceeded permissible limits. Hydrocarbons, Total Petroleum Hydrocarbon (TPH), remained stable across both seasons (1.045–1.189 mg/l). Total Hydrocarbon Content (THC) was consistently low during the wet season (0.010–0.017 mg/l) but increased markedly during dry season months (January–March), ranging from 1.002–1.150 mg/l. BTEX levels were similar across seasons (0.010–0.015 mg/l) except for an elevation (0.038 mg/l) in April (early wet season). Polycyclic Aromatic Hydrocarbons (PAH) showed a temporal decline from 0.437 mg/l (June 2022, wet) to 0.036 mg/l (March–June 2024). Nutrients and Other Chemicals, such as Phosphate, were consistently higher during the dry season (January–March), peaking at 5.954 mg/l in March, compared with wet-season values (0.678–4.244 mg/l). Nitrate showed peaks in June 2022 (20 mg/l, wet season) and December 2023 (20.36 mg/l, dry season), declining to 5.27 mg/l by June 2024. Coliforms and *E. coli* remained nil throughout both seasons. Total bacterial count was generally higher in wet season months (270–630 CFU/ml) compared to dry season (148–210 CFU/ml), with the highest value (630 CFU/ml) recorded in October (wet season). Ambient Air and noise levels conducted during the dry season showed CO and NO_2 at zero across all areas. Shown carbon IV oxide concentrations at the office area, gantry/operational area, tank farm, generator house, and control point are 760.0, 396.0,374.0, 401.0, and 382 mg/l, respectively, and were above the limit (350mg/l). TVOC and HCHO peaked in the control room (1.999 mg/m³ and 0.703 mg/m³, respectively). Noise levels in the generator house (77.6 Leq) marginally exceeded the FMEnv limit of 75. Conclusion: Distinct seasonal variations were observed. Alkalinity, heavy metals (Pb, Cd, Zn, Hg), and hydrocarbons (THC, phosphate) showed elevated levels during the dry season (November–March), with Pb, Hg, and Cd exceeding FMEnv permissible limits. Bacterial counts were higher in the wet season (April–October), while turbidity peaked in the dry season (December). These findings underscore the need for season-specific monitoring and targeted mitigation strategies at the aviation depot in Abuja.

Keywords: Heavy metals, Polycyclic Aromatic hydrocarbons, Coliforms and Seasons,

ABSTRACTS:

Minerals

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The Public Analyst as a Guardian of Sustainable Development: Bridging the Regulatory Gap Between Resource Extraction and Environmental Safety

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Abstract

As Nigeria intensifies the diversification of its economy through the Solid Minerals Development Roadmap, the tension between aggressive resource extraction and environmental preservation has reached a critical juncture. While the extraction of gold, lead and limestone offers significant GDP growth, the resulting environmental implications which include soil degradation and heavy metal leaching, pose a direct threat to the UN Sustainable Development Goals (SDGs 6 & 12). This paper examines the institutional role of the Public Analyst as the "techno-legal" bridge between industrial output and environmental safety. Through a comparative analysis of current Nigerian mining regulations and international best practices, this study identifies a "data-compliance gap" in the monitoring of mining effluents. We argue that the Public Analyst is not merely a provider of laboratory results, but a statutory auditor whose certified data serves as the only objective measure of environmental compliance. The research proposes a "Tripartite Analytical Oversight" (TAO) model and concludes that, for Nigeria to achieve "Green Mining" status, the Society of Testing Laboratory Analysts of Nigeria (SoTLAN) must be integrated into the primary tier of the Environmental Impact Assessment (EIA) process.

Keywords: *Public Analysis, Policy Framework, Mineral Exploration, Sustainable Development, Environmental Safety*