



**CHEMICAL SOCIETY OF NIGERIA (CSN)**  
**ZARIA CHAPTER**



**ChemClass**  
**CONFERENCE**

**BOOK OF ABSTRACTS**

**THEME:**

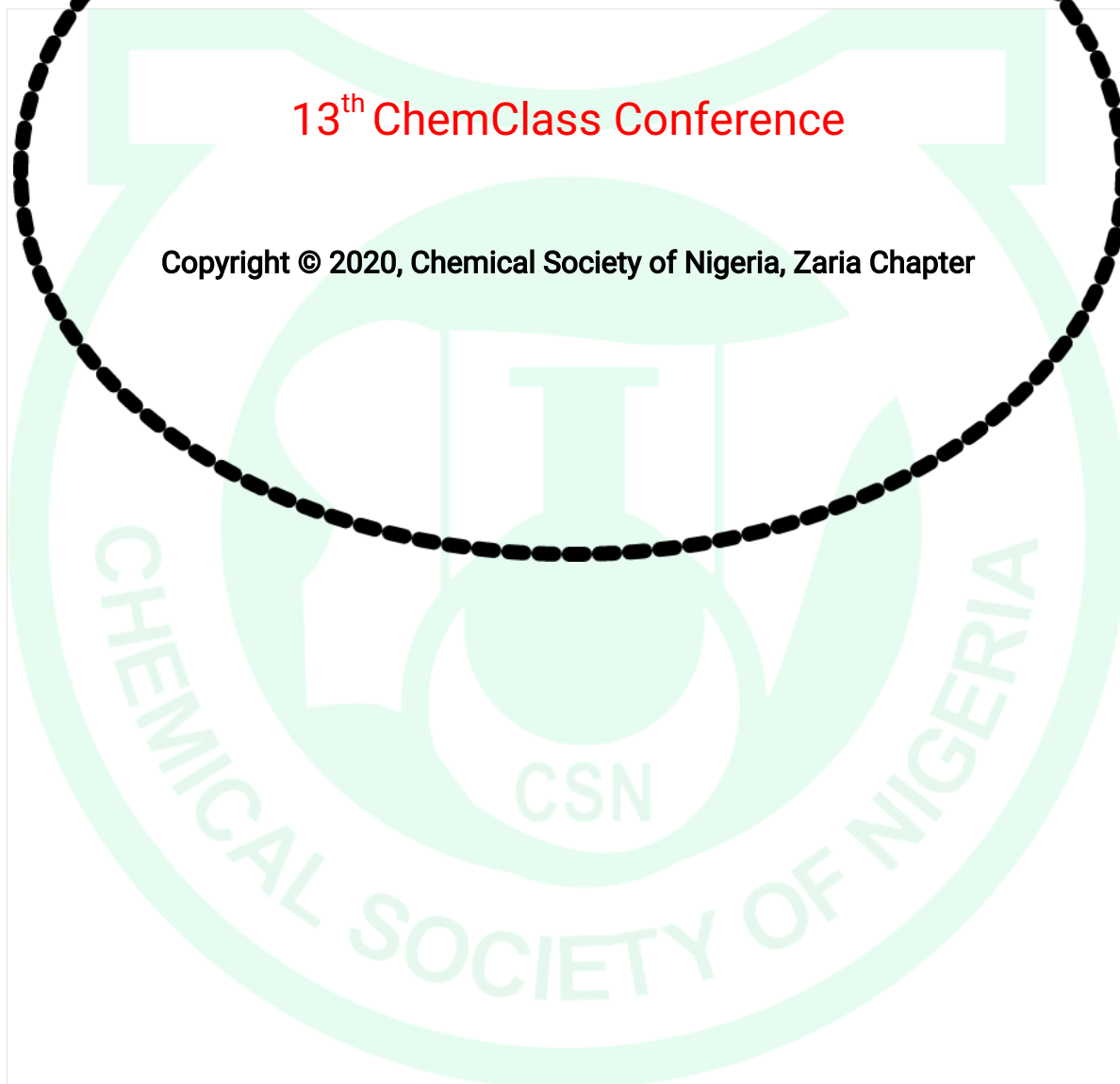
**EXPLORING ADVANCEMENT IN  
CHEMICAL SCIENCES AND TECHNOLOGY FOR  
NATIONAL SECURITY AND ECONOMIC DEVELOPMENT**

**DATE: 15th - 16th October, 2020**

# Book of Abstracts

13<sup>th</sup> ChemClass Conference

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## PROGRAMME OF EVENTS

### ➤ DAY ONE: Thursday, 15th October, 2020

OPENING CEREMONY		
Time (Hrs)	Activity	Action/Chairman
9:00	Introduction of Dignitaries	Conference Coordinator
9:05	Opening Prayers	
9:10	National Anthem	
9:15	Welcome Speech by Chairman, CSN Zaria Chapter	Dr. S.E. Abechi
9:30	Address by Chairman of the Occasion	Prof. J.T. Barminas
9:45	Goodwill Messages	National President of CSN; The HOD, Dept. of Chemistry, ABU, Zaria and Others
10:15	Keynote Address	Prof. E. B. Agbaji
10:35	Conference Declared Open by Chairman of the Occasion	Prof. J.T. Barminas
10:36	Plenary Lecture	Dr. Ahmad Galadima (FUGUS)
11:35	Vote of Thanks by Chairman, LOC	Prof. K.I. Omoniyi
11:40	Closing Prayers	
11:45	National Anthem	
12:00 - 14:00	Lunch Break	

TECHNICAL SESSION		
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➤ **DAY TWO: Friday, 16th October, 2020**

TECHNICAL SESSION CONTINUE...		
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9:00– 16:00	Organic Chemistry Paper	ORG 026 –
9:00– 16:00	Inorganic, Polymer, Physical, Industrial, Environmental Chemistry & Education Papers	All Papers
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16:05 – 16:10	Closing Prayer	
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## Officials For the Technical Sessions of ChemClass Conference 2020

Coordinator (Technical/Online Event) - Dr. E.D. Paul

Date	Technical Sessions	Chairmen of Sessions	Rapporteurs	Communication Assistants
Day 1 (Thur.15/10/2020)	Anal./Env./Educ.	Prof. V.O. Ajibola Prof. K.I. Omoniyi	Dr. I. Akawu Dr. Z. Garba	Dr. E. Adegbe Mr. Salisu A.
	Org/Polymer/Ind	Prof. I.G. Ndukwe Dr. I.A. Bello Dr. A. Babando	Mr. O. Najeem	Mrs. J. Okoduwa Mr. Y.O. Usman
Day 2 (Fri. 16/10/2020)	Org/Polymer/Ind	Prof. I.G. Ndukwe Dr. I.A. Bello Dr. J.D. Habila	Mr. O. Najeem Mr. S.A. Apampa	Mrs. J. Okoduwa Mr. Y.O. Usman
	Inorg/Phys	Prof. S.O. Idris Dr. A.D. Onu Dr. I. Abdulkadir Dr. S.E. Abechi	Dr. I Akawu Dr. Z. Garba	Dr. E. Adegbe Mr. Salisu A.

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(A- 001)

**EFFECT OF SOME SELECTED HEAVY METAL SALT ON BIOMETHANE PRODUCTION  
FROM POULTRY DROPPING**

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**ABSTRACT**

In this research the effect of  $\text{Fe}_2(\text{SO}_4)_3$ ,  $\text{CuSO}_4$  and  $\text{NiSO}_4$  on biogas production from poultry dropping was studied by investigation the amount of gas produced, degradation of poultry dropping, and retention time. System poisoning was observed on bio-digesters containing  $\text{CuSO}_4$  and  $\text{NiSO}_4$  which inhibit the production of biomethane, this result to decrease by 60% ( $\text{CuSO}_4$ ) and 70% ( $\text{NiSO}_4$ ) in volume of biomethane produced from the digesters compared to the control set-up while the bio-digester with  $\text{Fe}_2(\text{SO}_4)_3$  shows spontaneous production of biomethane on daily basis for 30 days with 5% increase in total biomethane produced as compared to the control set-up. 80% degradation of poultry droppings was observed in bio-digester containing  $\text{Fe}_2(\text{SO}_4)_3$  this indicate reason behind high yield of biomethane while only 40% and 45% degradation was observed  $\text{NiSO}_4$  and  $\text{CuSO}_4$  respectively.

**Keywords:** Biomethane, poultry dropping, spontaneous, bio-digester

(A- 002)

**ASSESSMENT OF HEAVY METAL POLLUTION THROUGH INDEX ANALYSIS FOR  
KWANAR ARE DAM WATER IN KATSINA STATE, NIGERIA**

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**ABSTRACT**

The present study assessed the heavy metal pollution of Kwanar Are Dam water in Katsina State at sites coded K1, K2, K3, K4, K5 and K6 for wet and post-rainy seasons. Mean concentration of heavy metals followed the order Zn> Fe> Pb> Mn ≥ Cr> Cu>Ni> Cd in wet and Zn> Mn> Fe> Pb> Cr> Cu> Ni> Cd in post-rainy seasons. Cd, and Cu were within the permissible limit for drinking water quality at all sites in both seasons. Cr and Mn increased during post-rainy season against their covalent index. Mean heavy metal pollution index (HPI) for each sampling site reflected highest pollution during the wet season compared to post-rainy season. Mean HPI for Kwanar Are Dam water in wet season decreased conspicuously in post-rainy season. Metal quality index (MQI) values followed the order K4> K2> K1> K3> K6> K5 in wet season and K3> K6> K2> K1> K4> K5 in post rainy season. The values of the metal quality index indicated high pollution. Study on heavy metal pollution of Kwanar Are Dam water shows that almost all the samples are highly polluted mainly due to discharge of waste materials from the nearby construction and excavation company belonging to mother cat limited. HPI of Kwanar Are Dam shows that the Dam is critically polluted with heavy metals and unsafe for drinking in both summer and post-rainy seasons. MQI was far >1 at all sites in both seasons also indicating high metal pollution.

**Keywords:** Kwanar Are Dam water, Analysis, pollution index, heavy metals.

**HEAVY METAL CONCENTRATION OF SELECTED SOIL SURFACE WITHIN  
BIRNIN KEBBI, KEBBI STATE, NIGERIA**

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**ABSTRACT**

Soil is a crucial component of rural and urban environment, and land management is key to soil qualities. This work presents the concentration of five (5) heavy metals (Fe, Ni, Pb, Zn and Cd) in surface soil from different areas within Birnin Kebbi, Kebbi State using Atomic Absorption Spectrophotometry. The result shows that all the metals investigated were present except Cd which was below detection limit (BDL). The concentration (state the unit of concentration) range for each of the selected metals are: Fe ( $1.16 \pm 0.01$  -  $3.06 \pm 0.21$ ); Ni ( $0.01 \pm 0.002$  -  $0.31 \pm 0.01$ ); Pb ( $0.01 \pm 0.003$  -  $0.08 \pm 0.003$ ); Zn ( $0.14 \pm 0.001$  -  $0.31 \pm 0.01$ ) and Cd (BDL). The result shows that all the parameter investigated are less than the FAO / WHO maximum allowable limit for the heavy metals in soil and the degree of heavy metal pollution varies with the level of activities within the town. Give the concluding sentence.

**Key words:** Atomic Absorption Spectrophotometry, Birnin Kebbi, Heavy metals, Soil, Toxic metals.

(A- 004)

**EVALUATION OF HEAVY METALS LEVEL IN SELECTED BLACK HAIR DYES AND THEIR POTENTIAL HEALTH RISK**

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**ABSTRACT**

The research was undertaken in order to determine some heavy metal content in selected black hair dye samples which are marketed at Samaru market Zaria. Wet digestion was done on the samples using the mixture of HNO<sub>3</sub>/ HCl and H<sub>2</sub>SO<sub>4</sub>/H<sub>2</sub>O<sub>2</sub>. The concentration of heavy metals (Pb, Cr, Cd, Ni, and Cu) was determined using atomic absorption spectrophotometer (AAS). The result shows the concentration in mg/kg of heavy metals for pure mineral dye: Pb: 97.10±0.013, Cr: 42.45±0.002, Cd: 3.80±0.005, Ni: 7.40±0.008, Cu: 65.10±0.003. Henna: Pb: 19.50±0.003, Cr: 7.20±0.000, Cd 5.40±0.002, Ni 6.60±0.005, Cu 22.00±0.001. Black shampoo oil: Pb: 5.52±0.003, Cr: 3.92±0.004, Cd: 1.50±0.013, Ni: 5.68±0.010, Cu: 33.60±0.001. Black shampoo jelly: Pb: 6.76±0.007, Cr: 7.36±0.004, Cd: 1.20±0.002, Ni: 5.76±0.004, Cu: 3.50±0.029. These results show that the pure mineral and Henna dyes have higher concentrations of the heavy metals than the synthetic dyes, and only the concentrations of Pb and Cd in black shampoo oil and jelly which are synthetic dyes were lower than the recommended limit set by Canada Health Standard. Pure mineral and Henna dyes pose more health risk to human health than the synthetic dyes. Regulatory agencies saddled with maintaining standard of products should regularly monitor these products for long-term health benefits of the users,

**Keywords:** Cosmetics, Hair dyes, Heavy metals, Health risk, Toxicity



(A- 005)

**A REVIEW ON THE ADVANTAGES OF SORPTION ENHANCED STEAM REFORMING  
PROCESS OVER THE CONVENTIONAL STEAM REFORMING PROCESS**

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**ABSTRACT**

The advantages of sorption enhanced steam reforming process (SE-SR) over the conventional steam reforming (C-SR) process cannot be over emphasized. Some of the advantages include but are not limited to the potential to use a lower operating temperature, decrease of purification steps and extend of the reduction, decrease of reactor size and the amount of steam to be used during the SE-SR process compared to the C-SR. The general advantage can thus be regard as decrease in the overall operating cost of the SE-SR process plant as opposed to the C-SR process. Previous studies has proved that the SE-SR process has the ability to decrease the overall energy required by the system with a potential of saving up to 20–25% in contrast to the C-SR process. Furthermore, the SE-SR process has the advantage of increasing feed conversion, producing high purity hydrogen with a minimum CO<sub>2</sub>, effective CO<sub>2</sub> capture from the product as CaCO<sub>3(s)</sub>, and potential to generate pure CO<sub>2</sub> during the sorbent calcination step that is suitable for subsequent use or sequestration.

**Keywords:** Hydrogen, Sorption, Steam, Reforming, Energy

(A- 006)

**THERMAL GRAVIMETRIC ANALYSIS (TGA) OF BIO OIL EXTRACTED FROM  
AVOCADO SEEDS**

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**ABSTRACT**

Bio-oil was extracted from avocado seed using n-hexane as solvent under soxhlet extractor. The combustion characteristics of the extracted bio-oil from avocado seeds was investigated using thermogravimetric analysis (TGA), Shimadzu DTA 60AH instrument. The sample was preconditioned in a nitrogen gas flow for 15 minutes at 35°C, then heated from 35 to 555°C at a rate 5°C per minute. The trace was recorded as weight loss versus time for TGA and temperature difference versus time for differential thermal analysis (DTA). The results obtained depicts that the percentage of highly volatile compounds as zero. Medium volatile compounds and sooth are 25.03% and 13.38% respectively while organic matter constitute was found to be the major constituent representing 61.14%.

**Keywords:** avocado seed, thermogravimetric analysis, volatile compounds, organic matter

**DETERMINATION OF SOME PHYSICOCHEMICAL PARAMETERS IN RAINWATER: A  
CASE STUDY OF SELECTED LOCATIONS IN KATSINA, NIGERIA**

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**ABSTRACT**

In this study, rainwater samples from three different areas in Katsina metropolis were sampled (August - September, 2019) and subjected to analyses. Procedurally, the pH, electrical conductivity and turbidity were determined using pH meter, conductivity meter and turbidity meter, respectively. The chloride, total hardness, and nitrate were determined using titration method. The total dissolved solid was determined by gravimetric method. Sulphate content was determined by turbidimetry method. The results of the analyses showed the range values as pH (6.39 - 6.43), electrical conductivity (305.25 – 629.25  $\mu\text{S/L}$ ), total suspended solid (3.00 – 6.01 mg/L), total solids (3.27 – 6.08 mg/L), total dissolved solids (0.08 – 0.27 mg/L), chloride (119.85 – 153.55 mg/L), turbidity (2.2 – 2.5 NTU), nitrate (6.66 – 8.41 mg/L), sulphate (0.01 - 0.03 mg/L) and total hardness (50.70 - 65.30 mg/L). Therefore, the rainwater samples of Katsina metropolis analyzed could be suitably used for domestic activities.

**Keywords:** Total dissolved solid, gravimetric method, rainwater, physicochemical

(A- 008)

**COMPARATIVE DETERMINATION OF HEAVY METALS (Pb, Cu, Fe and Zn) LOAD IN LOCAL AND BROILER CHICKEN ORGANS (Heart, Gizzard and Liver)**

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**ABSTRACT**

This study was conducted to assess heavy metals (Pb, Cu, Fe and Zn) in two breeds of chicken (*Gallus spp*) local and broiler chicken organs (heart, gizzard and liver). Sampling was carried out in two different places in Sabon Gari Zaria. Wet digestion method was used in digesting the sample. The concentration of Cu in gizzard (22.56mg/kg) of local chicken and broiler gizzard (9.46 mg/kg), heart of local chicken (6.94mg/kg) and broiler (10.68mg/kg) and liver of local chicken (12.94mg/kg), liver of broiler (18.85mg/kg). The results indicate that copper concentration is within the permissible limit in both species according to WHO (40mg/kg). Iron level in local gizzard (14.98mg/kg), broiler gizzard (30.38mg/kg), local heart (31.35mg/kg), broiler heart (810.80mg/kg) and local liver (10.36mg/kg), broiler liver (20.91mg/kg) shows that broiler heart exceeds the WHO limit (30-150mg/kg). Lead concentration- local gizzard (3.34mg/kg), broiler gizzard (3.86mg/kg), local heart (3.74mg/kg), broiler heart (3.61mg/kg) and local liver (1.75mg/kg), broiler liver (1.85mg/kg). Concentrations in broiler and local chickens liver were within the WHO limit (2.91mg/kg). The study indicates that the level of zinc in liver of both species is within the permissible limit (10-50mg/kg) by WHO. Environmental practices should be encouraged to minimize exposure of chicken to toxic metals.

**Keywords:** Heavy metals, Local chickens, Broiler chickens

(A- 009)

PHYTOREMEDIATION OF SOME SELECTED HEAVY METALS USING *CASSIA OCCIDENTALIS*

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**ABSTRACT**

The potential of *Cassia occidentalis* to remediate the heavy metals: Pb, Cd, Zn, Ni, Cu and Co in polluted soil was studied. The seedlings of the plant, *Cassia occidentalis* were obtained and planted in eight pots which were spiked with aqueous solution of each metal. Results revealed uptake of the metals through the roots, stem and leaves of the plant. *Cassia occidentalis* grown in the polluted soil showed relatively higher values for the uptake of the analysed metals as compared to those grown on the control soil. The order of metal accumulation in the parts of the plant are: Pb, leaves (56.09±12.22mg/kg) > root (36.92±1.20mg/kg) > stem (10.51±2.09mg/kg); Cd, roots (58.77±22.10mg/kg) > leaves (31.55±11.20mg/kg) > stem (19.95±7.90mg/kg); Zn, roots (80.36±20.11mg/kg) > leaves (57.61±9.31mg/kg) > stem (20.69±5.97mg/kg); Cr, roots (49.71±13.90mg/kg) > leaves (28.96±8.11mg/kg) > stem (16.60±6.07mg/kg); Ni, roots (69.45±11.30mg/kg) > leaves (31.66±9.31mg/kg) > stem (16.07±4.92mg/kg); Cu, leaves (80.22±6.92mg/kg) > roots (57.03±8.22mg/kg) > stem (13.61±3.87mg/kg) and Co, roots (36.07±12.01mg/kg) > leaves (29.33±8.23mg/kg) > stem (15.19±9.55mg/kg). The Translocation Factor (TF) revealed that Pb (1.52) and Cu (1.41) are highly accumulated in the leaves of the plant. The high remediation potential observed in this study as occasioned by the Bioconcentration Factor (BCF) value recorded indicates that *Cassia occidentalis* has vital characteristics that can make it to be used for phytoextraction of the analysed metals.

**Key words:** Phytoextraction, Translocation Factor, Bioconcentration Factor, Pollution.

(A- 010)

**AN ASSESSMENT OF ALL THE SACHET WATER BRANDS CONSUMED IN OJU LOCAL GOVERNMENT AREA OF BENUE STATE: PUBLIC IMPLICATIONS**

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**ABSTRACT**

The physic-chemical and bacteriological analyses of all the five sachet water brands consumed in Oju Local Government Area were examined. The samples were bought from the market and labelled A, B, C, D and E. The physic-chemical parameters were determined using standard analytical techniques. The bacteriological quality of the water samples were examined by serial dilution method. The results obtained for each of the samples were compared with the World Health Organization (WHO) standards for potable water. The results of the analyses were: pH (6.9–8.4), turbidity (0.13–0.33NTU), conductivity (39.6–316  $\mu\text{s}/\text{cm}$ ), total dissolved solids (19.8–158), NaCl (0.1–0.6 mg/L), nitrate (0.01–0.37 mg/L), zinc (0.00–0.08 mg/L), free chlorine (0.01–0.07 mg/L), sulphate was below detection limit (BDL) and coliform count (6-16 cfu/L). The bacteria strains isolated from the water samples were identified as: *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis* and *Klebsiella species*. The results showed that all the physico-chemical parameters analysed did not exceed the maximum limits set by WHO standards for portable water. However, the presence bacteria strains in the samples violated the WHO standard and therefore made the water brands unsafe for consumption.

**Key words:** Sachet water, quality, portable water, Oju, coliforms

**PHYTOCHEMISTRY OF AFRICAN HERBAL MEDICINES IN THE MANAGEMENT OF  
HUMAN IMMUNODEFICIENCY VIRUS (HIV) –  
A MINI REVIEW**

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**ABSTRACT**

Human Immunodeficiency Virus (HIV), the virus that caused AIDs (Acquired Immunodeficiency Syndrome) is among the world's leading public health problems. According to 2018 global statistic on HIV, there are approximately 37.9 million people confirmed positive with HIV. However, 36.2 million of this population are adults while the remaining 1.7 million are children (<15 years). While 57% of HIV infected persons are in Eastern and Southern African nations, 13% of those confirmed positive with HIV are in Western & Central African countries. Herbal Medicines (HMs) in Africa are well known to be use as primary treatment for HIV/AIDS and its related problems. The notable African herbal plants commonly used for HIV/AIDS therapy are *Hypoxishemerocallidea* (African potato) and *Sutherlandiamicrophylla*(cancer bush), *Allium sativum* (Garlic) and *Hypericum perforatum*(St John's Wort). This mini review paper reports the local preparations, phytochemical constituents and their local/scientific applications of these herbal medicinal plants in the treatment of HIV/AIDS & other opportunistic infections. Therefore, the authors are hereby suggesting, more research study should be carryout to ascertain the efficacy, pharmacology, pharmacokinetic and toxicology of these medicinal plants.

**Keywords:** African herbal medicines, HIV, *Hypoxishemerocallidea*, *Sutherlandiamicrophylla*, *Allium sativum*, *Hypericumperforatum*

(A- 012)

**EVALUATION OF DRINKING WATER QUALITY FROM THREE DIFFERENT SOURCES  
IN BARNAWA, KADUNA SOUTH LOCAL GOVERNMENT,  
KADUNA STATE**

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**ABSTRACT**

The status of drinking water quality in Barnawa, Kaduna was assessed from three different water sources (bore-hole, river and well). Physicochemical parameters such as; pH, electrical conductivity, turbidity, hardness, dissolved oxygen, biochemical oxygen demand and five heavy metals (Cd, Cr, Fe, Pb, Zn) were analyzed comparing the results with WHO permissible limits. Physicochemical parameters of all the samples were within the permissible limits of 6.54-7.54 pH, 1200 $\mu$ S/cm for conductivity, 5NTU for turbidity, 500mg/L for hardness, 7.5mg/L for dissolved oxygen and 7.5mg/L for biochemical oxygen demand except for river and well water with turbidity values of 14.86NTU and 12.41NTU respectively exceeding that of WHO permissible value. Only one heavy metal (Fe) was found to be above the permissible limits with other heavy metals below the WHO detection limits.

**Keywords:** Heavy Metals; Drinking Water, Well, Borehole, River, Barnawa, Kaduna State.



(A- 013)

**DETERMINATION OF LEAD AND CADMIUM CONTENT IN WATER BASED PAINTS  
SOLD IN ZARIA**

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**ABSTRACT**

In this work, the concentration levels of cadmium (Cd) and lead (Pb) were determined in ten samples of water-based paints sold in Zaria. The paint samples were digested and concentration of the heavy metals is determined using Atomic Absorption Spectroscopy. The level of cadmium in the whole sample is found to be below the permissible limit of 70ppm while four of the samples contain lead concentration higher than the permissible limit of 90ppm. It was also found that cream color paint has higher concentration of the heavy metals than green color paints.

**Keywords:** Heavy Metals; Water Based Paints; Atomic Absorption Spectroscopy; Zaria.

(A- 014)

**EVALUATION OF THE ELEMENTAL COMPOSITION AND LEVEL OF SOME ESSENTIAL AND NON-ESSENTIAL METALS IN TWO VARIETIES OF POTASH**

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**ABSTRACT**

This work was carried out to investigate the chemical compositions and level of essential and non-essential elements in two variety of potash. Samples were collected at Zaria market, prepared and analyzed using X-ray fluorescent (XRF) and atomic absorption spectrophotometer (AAS). The results of the elemental composition reveal that potash is enriched in sodium and sulphur: 35.82% Na and 50.38% S was recorded in red potash while 25.47% Na and 15.50% S in white potash. The level of impurity was high (39.37%) in white potash. Eight elements were analyzed for their concentrations; five were essential (Ca, Mg, Fe, Zn, and Mn), while three were non-essential (Ni, Cd and Pb). The concentration of Fe was found in the range of 13.87 mg/L to 24.46 mg/L, Zn was 0.93 mg/L to 1.35 mg/L, Mn was 0.52 mg/L to 1.74 mg/L, Ca was 3.27mg/L to 47.67 mg/L, Mg was 5.46 mg/L to 6.49 mg/L, Ni was 0.17 mg/L to 0.28 mg/L, Pb was 2.239 mg/L to 2.49 mg/L, Cd was not detected in all the samples. This results falls within the permissible limits, with the exception of iron and lead. Consumption of too much potash can pose serious health implication if not properly refined and standardized.

**Key words:** Potash, essential and non-essential, elements.

(A- 015)

**ASSESSMENT OF HEAVY METALS FROM SELECTED BOREHOLE AND WELL  
WATERS IN UMAISHA, TOTO LGA, NASARAWA STATE**

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**ABSTRACT**

Water quality is an important aspect of health and well-being of people especially at the rural areas where streams, wells or boreholes are drinking water sources. In this study, atomic absorption spectrophotometry (AAS) was applied to determine the concentration of heavy metals (Fe, Pb, Ni, Zn, Mn, and Cd) in water samples from selected boreholes and wells from Umaisha town in Toto Local Government of Nasarawa State. Samples were obtained from BakinKasuwa, Kudiri, Main Market and UngwanGareji with physicochemical parameters determined and their toxicity levels ascertained based on the WHO maximum acceptable limit of heavy metals in water. Fe was found above the WHO maximum permissible limit in borehole water samples from UngwanGareji and Main Market with Cd below the permissible limit in all water samples from borehole while all water samples from well were found to be above the set standard. The concentrations of remaining heavy metals (Pb, Zn, Ni and Mn) fluctuates from one sample to another. Heavy metals (Fe, Pb, Mn, and Cd) were present in water samples and found to be above the maximum acceptable limit set by the WHO. A year-round monitoring is recommended to evaluate the seasonal variation in the physicochemical properties and heavy metals concentration in water, crops, soil, livestock and human samples for the health and safety of people in the area.

**Keywords:** Heavy metals, well water, borehole water, AAS, Umaisha, Nasarawa State

(A- 016)

**SPECTROPHOTOMETRIC DETERMINATION OF NITRATE ION CONCENTRATIONS  
IN DRINKING WATER WITHIN NIGERIA POLICE ACADEMY (POLAC), WUDIL, KANO**

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**ABSTRACT**

Five drinking water samples from boreholes (P, F, Sand C) and a table water (A) were collected from different locations within Nigeria Police Academy, Wudil (POLAC) using polythene plastic bottles and were analyzed for the concentrations of nitrate ion using UV/VIS spectrophotometer jenway (UV6405). From the results, it was found that all the samples had nitrate ion concentrations below the World Health Organization maximum contaminant level of 50mg/L and also below the IOWA in USA; natural nitrate level of 10mg/L. The highest mean nitrate ion concentration in this study is  $6.00 \pm 0.138$ mg/L from location S (bore hole drinking water from senate building) and the least nitrate ion concentration of  $1.00 \pm 1.082$ mg/L from location C (bore hole drinking water from cadet's hostel). The other two drinking water samples; A (table water from commandant market, Polac) and F (borehole water from Polac fire services) have the same nitrate ion concentrations of 4.00mg/L. This showed that both the drinking water analyzed were safe for human consumption in the Academy and their neighbours.

**Keywords:**UV Spectrophotometer ,Nitrate ion concentrations , Five drinking water.

(A- 017)

**DETERMINATION OF SELECTED PHYSICO-CHEMICAL PROPERTIES AND HEAVY METAL CONTENTS OF SELECTED PETROLEUM PRODUCTS SOLD IN WUSHISHI AND ZUNGERU METROPOLIS, NIGER STATE, NIGERIA**

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**ABSTRACT**

The cadmium, lead, zinc, chromium and copper contents, along with the physicochemical analysis of samples of gasoline, kerosene and diesel from petrol stations and 'black markets' in Zungeru and Wushishi Metropolis were determined using atomic absorption spectrophotometer model AA 240 FF. The results obtained for the heavy metals composition were interpreted using analysis of variance which revealed significant differences at  $p \leq 0.05$ . The values obtained for gasoline samples ranged from  $1.27 \pm 0.15$  to  $54.87 \pm 0.35 \text{ mg kg}^{-1}$  while values recorded for kerosene and diesel samples ranged from  $1.70 \pm 0.12$  to  $99.00 \pm 2.85 \text{ mg kg}^{-1}$  and  $4.03 \pm 0.64$  to  $134.10 \pm 4.79 \text{ mg kg}^{-1}$  respectively. In addition, the values obtained for viscosity, flash point, density and specific gravity for gasoline ranged from 0.2 to 0.4 cP, 34 to 37 °C, 0.72 to 0.72  $\text{g l}^{-1}$  and 0.50 to 0.65 respectively. For kerosene the ranges of values for viscosity, flash point, density and specific gravity were 0.60 to 0.75 cP, 39 to 41 °C, 0.64 to 0.66  $\text{g l}^{-1}$  and 0.56 to 0.60 respectively, while that of diesel fuel were found to range from 1.00 to 1.20 cP, 93 to 96 °C, 0.67 to 0.69  $\text{g l}^{-1}$  and 0.86 to 0.90 respectively. These values revealed that these samples were not adulterated for any financial gains from both petrol stations marketers and 'black marketers' since the results of the analysis is within the ASTM (American Society for Testing and Materials) specifications.

**Keywords:** Petroleum products, heavy metals, petrol stations, 'black markets', Metropolis gasoline, kerosene, diesel.

**SPECTROPHOTOMETRIC DETERMINATION OF HEAVY METALS IN SELECTED  
COSMETIC PRODUCTS SOLD IN KAZAURE MARKET,  
KAZAURE JIGAWA STATE**

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**ABSTRACT**

Cosmetics is a substance used in contact with various parts of the human body such as epidermis, hair, nails, lips, and genital organs (external part) or applied to the teeth or mucous membranes of the oral cavity with the purpose of healing, perfuming, protection, changing body parts outlook, suppressing body odours and keeping the surface in good condition. The present study employed the spectrophotometric determinations of heavy metals in some selected cosmetics sold in Kazaure market. The cosmetic items considered include face powder, face foundation and lipstick products of various prices (higher, medium and lower prices). Each sample was digested and analyzed for heavy metals namely chromium, cadmium, lead and copper using atomic absorption spectrophotometer. The results uncovered the range of the concentration of Cr Cd Pb and Cu across all varying prices of the sampled cosmetics obtained in Kazaure market as (0.00 – 0.17) mg kg<sup>-1</sup>, (0.00 – 0.96) mg kg<sup>-1</sup>, (0.02 – 0.44) mg kg<sup>-1</sup>, (2.01 – 7.63) mg kg<sup>-1</sup> respectively. The implication of the present finding is that the cosmetics quality control section should double checked during the course of production so as to curtail unnecessary extras of the heavy metals in the products. Metals like Cu and Cr are quite above the recommended limit.

**Keywords:** Heavy Metals, Cosmetics, Spectrophotometry, Body Parts, Side Effects, Organs.

(A- 019)

**DETERMINATION OF IODINE CONTENT IN DIFFERENT BRANDS OF TABLE SALT SOLD IN GURI MARKET**

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**ABSTRACT**

Iodine deficiency disorders (IDD) are recognized as a major global public health problem. It is possible to root out this problem by universal salt iodization. The study was designed to determine iodine content in different branded salt purchased from Guri Market. All samples were analyzed in the laboratory of science laboratory technology complex, HussainiAdamu Federal Polytechnic kazaure. Concentration of iodine in salt was determined by iodometric titration method. The level of iodine in the three brands of salt analyzed ranges from 66.22. – 19.04 mg/Kg. Results of this study showed that, all the three salts brand have iodine content in varying amounts with determined iodine level in the acceptable range. It can be decided from the result that most of the people of our country are now using iodized salt. It is evidence now that most of the salts are iodized.

**Keywords:** Iodine, Concentration, Titration, Salt, Iodometry, Disorders

**NUTRITIONAL AND ELEMENTAL COMPOSITIONS OF  
*Chrysophyllum albidum* (AFRICAN STAR APPLE) FRUIT**

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**ABSTRACT**

In our continuing research to determine the food values of local edible fruits in Nigeria, *Chrysophyllum albidum* (African Star Apple) fruit was analyzed for nutritional compositions and mineral elements using standard procedures. The results of nutritional factors were high in crude fibre (18.34 %), crude protein (0.42 %) and soluble carbohydrate (28.58 %) on the fruit peel, including vitamin C (6.10 mg/100g). However, the ash content (3.00 %), lipids (8.50 2%) and moisture (64.00 %) were high on the pulp. The energy values were found to be 663.12 KJ/100g and 715.01 KJ/100g for the whole seed and pulp respectively. Similarly, the elemental contents in fruit peel were higher in K (370.00 mg/100g), Na (53.33 mg/100g), P (2.36 mg/100g) and Zn (0.39 mg/100g). Meanwhile, the pulp was found to contain high Ca (61.67 mg/100g), Cu (0.94 mg/100g) and Fe (3.46 mg/100g). It was observed that Mg (33.33mg/100g) in both the pulp and peel was about the same content. Heavy metals such as Pb and Cr were only detected in the pulp with 0.09 mg/100g and 6.83 mg/100g respectively. The results showed that *C. albidum* fruits contained essential nutrients and mineral elements of high nutritional value with low toxic metals concentration.

**Keywords:** *Chrysophyllum albidum*, African star apple, nutritional composition, elemental composition.



(A- 021)

**EFFECT OF SUNLIGHT ON SACHET WATER WITHIN KATSINA METROPOLIS,  
KATSINA STATE, NIGERIA**

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**ABSTRACT**

This study was carried out to investigate the effect of sunlight on sachet water consumed by the inhabitants of Katsina metropolis in Katsina State, Nigeria. Three brands of sachet water were randomly selected at their site of production which were not previously exposed to sunlight from three different parts of the town. The samples (both the fresh and exposed samples) were examined for both the physicochemical and bacteriological parameters, of using standard analytical methods. The results show that the physicochemical parameters of both the fresh and exposed samples were within the WHO standard. But for the analysis of heavy metals, level of chromium falls below the WHO standard (0.370mg/L) while lead, iron and manganese exceeded the WHO standard. The bacteriological analysis shows that all brands contain coliform bacteria, though in a low concentration. Finally, the results of the experiment indicated that all brands of sachet water analyses met the WHO guideline limit for drinking. Good handling of potable water samples from the production to consumption chain is essential for public health reasons.

**Keywords:** Water Quality, Sachet Water, Storage, E. coli

**ASSESSMENT OF SOME PHYSICO-CHEMICAL  
PARAMETERS IN REFINERY EFFLUENTS**

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**ABSTRACT**

The continuous contamination of the water bodies by the discharged effluents from various industries has become a serious problem in the world. This is due to the rapid increased in global industrialization. However, Nigeria is not in exception where many industries discharge their liquid waste indiscriminately without proper treatment which leads to water pollution and environmental degradation. This study was carried out to ascertain the level of treatment of the effluents discharged by the Kaduna refining and petrochemical company. Both the treated and the untreated water samples were analyzed using standard procedures in-order to establish the level of some physico-chemical parameters which include: COD, BOD, DO, turbidity, conductivity, pH, temperature, alkalinity, hardness, nitrate and sulphate. The result of the analyses was compared with the WHO Standards. All the parameters are within the permissible limits with the exception of the untreated sample's COD, DO and turbidity levels which were above the WHO standard. It can be concluded that the physico-chemical parameters of the treated effluents were within the recommended levels stipulated by WHO.

**Keywords:** Effluents, COD, BOD, DO, pH and TDS

**PHYSICOCHEMICAL AND MICROBIAL ACTIVITY OF WASTE WATER OBTAINED FROM KWANAR-ARE DAM, RIMI LOCAL GOVERNMENT AREA KATSINA STATE**

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**ABSTRACT**

This study investigated the contamination level of wastewater in kwanar -Are Dam. The Dam supplies water for consumption, irrigation, fishing and other domestic activities for the neighboring villages. The samples was collected during wet and dry seasons. Determination of both *Faecal coliform* and the *Escherichia coli* counts were performed using standard membrane filtration and multiple tube techniques, while parameters such as pH, Electrical conductivity, Biochemical Oxygen Demand, Nitrate, Sulphate, Carbonate, bicarbonate and chloride were evaluated using standard methods of analysis. The results obtained for the bacteriological analysis during the dry season ranged between 33 cfu/100ml to 13 cfu/100mls while that of wet season dropped to 5.5 cfu/100mls to 2.0cfu/100mls. The bacterial isolate recovered from the water samples were *Escherichia coli* and *Entrobacter aerogenes*. Prevalence showed that both *Escherichia coli* and *Entrobacter aerogenes* isolated from 5 different samples labeled as A, B C,D and E. *Escherichia coli* was recovered in sample A,B and C while *Entrobacter aerogenes* was found in sample D and E. This study showed that all the result was above WHO limits. This is an indication that the water samples are contaminated. The results obtained for pH was 7.19 and 8.68 for wet and dry seasons respectively. The pH results for wet season fall within the (6.5-8.5) standard value of WHO limits for drinking water, while pH value for dry season was higher than the standard value of WHO. Other parameters were also obtained.

**Keywords:** Wastewater, *feacal coliform*, *E. coli*, *E.aerogenes*, *BOD*, *pH*, *Electrical Conductivity*.

(A- 024)

**REMOVAL OF Pb, Mn and Cu, FROM WASTEWATER OBTAINED FROM TUDUN KADIR, DAM RIMI LOCAL GOVERNMENT AREA, KATSINA STATE**

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**ABSTRACT**

This work is aimed to remove heavy metals of (Pb, Mn and Cu) from Tudun-Kadir Dam waste water by Column adsorption technique using Activated carbon obtained from camel bone charcoal. The charcoal was prepared by calcinations and characterized using scanning electron microscopy (SEM) and infrared spectroscopy (FT-IR) for both before and after adsorption. The results obtained from SEM shows the texture of the carbonaceous material obtained, indicated the presence of many pores on the surface of the adsorbent (Charcoal) before adsorption and shows little porosity after adsorption. The presences of functional groups of OH, C-H, C=O and phosphate ion were shown by FT-IR. The charcoal shows maximum % removal of Pb at 70.05%, Mn 74.4%, and Cu 70.03%. The equilibrium data for both metals fit well to the Langmuir isotherm model as evidence by higher regression coefficient values ( $R^2$ ) 0.999 for each metal.

**Keywords:** Activated Carbon, Camel bone, Column Adsorption, Carbonization, Characterization

(A- 025)

**DETERMINATION OF HEAVY METALS IN SOIL NEAR ELECTRONIC WASTES  
DISASSEMBLING SIDE IN CHARANCI MARKET, KATSINA STATE**

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**ABSTRACT**

Electronic devices and products contain an array of heavy metals. These heavy metals have negative health effects on human beings and animals. The study determined the levels of Fe, Ni, Cu, Zn, Cd and Pb in soil obtained from disassembling side of electronic wastes in 'Yan- Gongoni part of Charanci market. The soil samples obtained from the side were prepared, digested and analysed using atomic absorption spectrometer (AAS). The concentrations of heavy metals at depth of 0-15 cm are higher than concentrations at 15-30 cm. The concentrations of Fe, Ni, Cu, Zn, Cd and Pb range from  $49.9112 \pm 0.00025$  to  $193.0426 \pm 0.0003$  mg/kg,  $0.1134 \pm 0.00026$  to  $0.4813 \pm 0.00032$  mg/kg,  $1.8793 \pm 0.00038$  to  $5.7043 \pm 0.00416$  mg/kg,  $0.2994 \pm 0.0004$  to  $4.0355 \pm 0.00035$  mg/kg,  $0.0135 \pm 0.0004$  to  $0.3004 \pm 0.00026$  mg/kg,  $8.4163 \pm 0.00036$  to  $20.0005 \pm 0.00036$  mg/kg respectively. The result shows that the soil in the disassembling site is polluted with heavy metals and not safe for use.

**Key words:** Electronic wastes, soil, heavy metals, disassembling site

(A- 026)

**EVALUATION OF SOME HEAVY METALS IN FOUR BRANDS OF NIGERIAN  
PORTLAND CEMENTS COLLECTED FROM SAMARU MARKET, ZARIA**

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**ABSTRACT**

The negative impact of heavy metals in the environment is obvious. Human being are exposed to this metals through the consumption of fruits, vegetables, animal food, water and air pollution as a result of industrial activities. This study investigates the potential negative impact of metals in the ecosystem by Portland cement as it is widely use in Nigeria. Four samples of cement A, B, C and D, were collected. The samples were analyzed for some selected heavy metals, Cadmium, Cupper, Iron, Lead, Zinc, Nickel, Neon, and Cobalt (Cd, Cu, Fe, Pb, Zn, Ni, Nn and Co). Acid (aqua -regia) was use to digest the samples. Atomic Absorption Spectrophotometric method was use for the determination of the metals. Fe was observed to have the highest concentration in all the samples, while Zn gave the lowest concentration value. The concentration of the heavy metals was ranked in the following orders. Cd: B> C > D > A; Cu ranked B > C > D > A; Fe: C > B > D > A; Pb: B >C > D > A; Zn ranked C > D > A>B; Ni ranked C> D > B> A; Mn ranked D>C > B > A and Co ranked C> D > B > A. Cd in all the samples was found to be above World Health Organization (WHO) and National Environmental Standards and Regulations Enforcement Agency(NESREA) permissible limits for the environment. Absorption of Cu was observed to be within the standard in all the samples. The value recorded for Pb.was above WHO permissible limit in all samples but within NESREA Standard. Zn, and Mn were found to be within the established limits according to WHO standard. Co was also within the WHO and NESREA limits.

**Key words:** Heavy metals, Portland cement and environment

**STUDY OF THE CORROSION INHIBITION POTENTIAL OF *KHAYA GRANDIFOLIA* GUM EXUDATES ON STAINLESS STEEL ARCH BAR IN ACIDIC MEDIUM**

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**ABSTRACT:**

The corrosion inhibition potential of Khaya grandifolia gum exudates on corrosion of stainless steel arch bar (an implant used for maxillo-mandibular fixation in dentistry) in  $1.00 \times 10^{-4}$  mol dm<sup>-3</sup> HCl solution of pH 4.0 was studied using weight loss method. The corrosion rate decreases and the inhibition efficiency increases with time, the inhibition efficiency was highest at week 6 with value 6.27% in the corrodent inhibited with 1.0g/L Khaya grandifolia gum; and is corrosion dependent. Experimental results revealed that Khaya grandifolia gum exudates act as a good corrosion inhibitor. The use of eco-friendly, bio-compatible and readily available corrosion inhibitors on metallic implants will increase life expectancy.

**Keywords:** Inhibition, gum exudates, stainless steel, inhibition efficiency, implants

**INVESTIGATION OF AFLATOXIN B<sub>1</sub> CONTENT OF SOME BAGGED RICE BRANDS  
SOLD AT SAMARU MARKET ZARIA**

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**ABSTRACT**

Aflatoxin B<sub>1</sub> (AFB<sub>1</sub>) are secondary metabolites produced by the fungi *Aspergillus flavus* and *Aspergillus parasiticus* contaminants in stored foods and responsible for causing cancer. This study aimed to investigate the Aflatoxin B<sub>1</sub> content from bagged rice. Five samples (Am, MR, Ki, Or and Tm) of bagged rice were collected from Samaru market Zaria, Kaduna state. The enzyme-linked immunosorbent assay (ELISA) method was used to investigate Aflatoxin B<sub>1</sub> (AFB<sub>1</sub>) content on all samples analyzed in triplicate. The results were computed as a mean±deviation. AFB<sub>1</sub> was recorded highest in Tm (5.80 ±0.01 µg/kg), which is above the EU and EAC regulatory limit (2.0 µg/kg and 5.00 µg/kg); the lowest value was recorded for Ki (0.41±0.01µg/kg). However, the limit for EAC was exceeded in only one of the samples, while 2 samples documented values above the EU and EAC limits. Concentration of AFB<sub>1</sub> in the samples follows the order; Tm (5.80 ±0.01 µg/kg) > Am (3.41±0.01 µg/kg) >Or (1.21 ±0.01 µg/kg) > MR (0.62±0.02 µg/k K (0.41±0.01 µg/kg). Statistical analysis (one-way ANOVA and Tukey's test) proved there was a significant difference between samples (p > 0.05; 0.0001). Our results indicate that the bagged rice sold in Samaru market has a statistically significant level of Aflatoxin B<sub>1</sub> toxicity and safer measures are required to prevent fungal growth that produces the toxins.

**Keywords:**Aflatoxin B<sub>1</sub>, bagged rice, fungal growth, toxins



(A- 029)

**HUMAN HEALTH RISK ASSESSMENT OF PESTICIDE RESIDUES IN *SOLANUM LYCOPERSICUM* FRUIT SOLD IN LAGOS METROPOLIS, SOUTH-WEST NIGERIA**

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**ABSTRACT**

Tomato is a vegetable that is eaten all over the world including Nigeria and in order to infestated by pests, most tomato farmers use pesticides that may impart harmful effects on humans. Consequently, this study was designed to assess pesticide residues and associated health risks in tomatoes sold in Lagos state. The results obtained indicated the presence of alpha and delta lindane, heptachlor, heptachlor epoxide, endrin, endosulfan, endosulfan sulphate and ether. Mean concentrations (mg/kg) and estimated daily intake (EDI) (mg/kg/day) of the pesticide residues were in the range of 0.0042 to 0.336 mg/kg and 7.5E- 6 to 2.3E-4 mg/kg/day respectively. The hazard quotient (HQ) ranged from 0.00024 to 17.77, while the hazard indices range from 1.00 to 18.92. The incremental lifetime cancer risk (ILCR) for the pesticide residues ranged from 5E- 5 to 2.1E- 3. The mean concentration of most of the pesticide residues in the tomato samples were above their maximum residue limit (MRL) while some had estimated daily intake (EDI) above their established acceptable daily intake (ADI) and hazard quotients (HQ) above their safe values. The hazard indices (HI) and Incremental lifetime cancer risk (ILCR) for the pesticide residues were above their safe values. The results and findings of the study indicate that there is need for continuous monitoring of pesticides residues in tomatoes and education of farmers on the uses of pesticides.

**Keywords:** Tomato, hazard indices, pesticides residues, education

(A- 030)

**ADSORPTION OF CHROMIUM (III) IONS FROM TANNERY EFFLUENT BY ACTIVATED CARBON DEVELOPED FROM COCONUT (*COCOS NUCIFERA*) HUSK**

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**ABSTRACT**

The presence of chromium in the environment due to discharge of tannery effluents remain a major pollution issue for the tanning industries. The aim of this study was to prepare an activated carbon from *Cocos nucifera* husk as adsorbent for the removal of Cr (III) ions in tannery effluent. The preparation of activated carbon was achieved using carbonation method and subsequently subjected to analysis by Fourier transform infrared (FTIR) spectroscopy. The adsorption study was carried out using batch sorption processes under optimized experimental conditions of pH, metal ions concentration, adsorbent dosage and contact time. The results obtained indicate the maximum adsorption of Cr (III) by *Cocos nucifera* husk activated carbon at pH of 6.0 as about 89.8% of metal ions were adsorbed within 60 min at initial metal ions concentration of 6 mg/L. The efficiency of adsorption (sorption percentage) was found to increase from 59.2% to 86.7% as the metal ions concentration increase from 2 mg/L to 6 mg/L, but the sorption percentage decreases to 66.7% as the metal ions concentration increases from 6 mg/L to 10 mg/L. The sorption percentage was found to increase with increase in adsorbent dosage and contact time. The equilibrium data fit better with Freundlich isotherm than Langmuir isotherm, due to high correlation coefficient in the Freundlich isotherm plot ( $R^2=0.342$ ) than the Langmuir plot ( $R^2=0.0364$ ). The equilibrium data also fit better with the *pseudo* second-order kinetic model ( $R^2=0.957$ ) indicating that the adsorption process was chemisorption. The FT-IR has indicated the carbonyl (-C=O), hydroxyl (-OH), alkene (-C=C-), alkyne (-C≡C-) and alkyl (-R) functional groups to be present in the activated coconut husk adsorbent which were responsible for chromium binding.

**Keywords:** Activated carbon, Adsorption, chromium and tannery effluent.

(A- 031)

**CHARACTERIZATION AND QUANTITATIVE ANALYSIS OF SOME SELECTED  
ROOFING SHEETS SOLD WITHIN KADUNA METROPOLIS**

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**ABSTRACT**

XRF technique was used to determine the percentage composition of the roofing sheet and was cut into pieces for analysis and they were analyzed for alloy zinc, metanappo, coloured alloy zinc and long span roofing sheets sold in Kaduna metropolis. Prior to analysis, the samples of roofing sheets were washed with detergent and rinsed with distilled water. The roofing sheets were analyzed for alloy zinc (between 0.0 and 44%), metanappo Aluminium (between 0.00 and 44.0%), coloured zinc (between 0.0 and 44%), long span Aluminium (between 0.00 and 88%). The result indicates the presence of some toxic metals in some of the roofing sheets which in turn may be harmful to human inhabitants. This research is conducted for few roofing sheets as percentage composition other researchers can conduct on bitumen, polyvinyl, plastisol roofing sheet etc.

**Key Words:** X-Ray Florescence, Composition of Roofing Sheets, Characterization, Kaduna Metropolis.

(A- 032)

**A COMPARATIVE STUDY ON APPARENT DENSITY AND THERMAL STABILITY ON GOAT SKIN OF THREE DIFFERENT AGE BRACKET ON CHROME AND SEMI CHROME TAN LEATHERS**

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**ABSTRACT**

Hydrothermal stability and apparent density of leathers were compared when three goat skins of different age bracket: 0-6months, 6month -12months and 12months to 18months named as, Sample A, Sample B, and Sample C respectively were tanned. Each of the three goat skin was divided in two halves to avoid stratigraphical and topographical variations. One part was tanned with semi chrome and the other was tanned with chrome re-tan. It was seen from the table of result (Table 4.1) below that the apparent density of the goat skin was found to be highest at  $0.057\text{g/cm}^3$  of the Sample C of semi chrome. Hydrothermal stability of chrome re-tan skin increases as the age of the goat also increases, it has the highest value of  $104^\circ\text{C}$  which indicates that it depends on the tanning reagent used, while that of semi chrome is lower ( $70^\circ\text{C}$ ). This implies that an older goat skin that is chrome re-tanned would have a better hydrothermal stability.

**Key words:** Hydrothermal stability, apparent density and leathers.

(A- 033)

**STUDIES OF CORROSION INHIBITION OF MILD STEEL BY TURMERIC (*CURCUMA LONGA L.*) EXTRACT IN ACIDIC MEDIUM**

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**ABSTRACT**

Extracts from the rhizome of Turmeric (*Curcuma longa L.*) was used in this work as green corrosion inhibitor to inhibit corrosion of metal mild steel in acidic media using weight loss method. The effects of temperature, immersion time and inhibition concentration on corrosion rate were investigated. The highest corrosion inhibition efficiency was 92.96% at immersion time of 96 hours. The adsorption of the extract on metal surface was in accordance with Langmuir isotherm, having the correlation coefficient of 0.800. The value of ( $\Delta G_{ads}$ ) for the inhibitor on the surface of metal mild steel was given as  $-1.724\text{kJmol}^{-1}$ .

**Keywords:** Turmeric, corrosion inhibitor, adsorption, isotherm

(A- 034)

**Heavy Metal Concentration and Histopathological Analyses of *Tilapia Zilli* in Shika, Kaduna State**

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**ABSTRACT**

The assessment of *Tilapia zilli* found in Shika was conducted. The samples were bought from the local fishermen around the sampling area. They were examined for heavy metal contamination using Atomic Absorption Spectrophotometer (AAS). Fe had the highest concentration of 111.3mg/kg and Ni had the lowest concentration of 0.866mg/kg. The variation of the concentration of the heavy metals in the *Tilapia zilli* was in this order: Fe>Cd>Mn>Co>Pb>Cr>Ni. The histopathology of the gills and the liver of *Tilapia zilli* did not show any alterations related to heavy metal bioaccumulation. This study shows that the heavy metals may not have reached its threshold beyond which it causes damage to the organs of the fish.

**Key Words:** Heavy metals, Histopathology, Fish

(A- 035)

**Organic and Bacteriological Analyses of Selected Surface and Ground Water Sources around a Hospital Waste Treatment Plant**

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**ABSTRACT**

The assessment of the surface and ground water sources within the vicinity of Ahmadu Bello University Teaching Hospital liquid waste treatment plant was conducted. A total of sixty-six (66) water samples were collected from eight sites (S1, S2, S3, S4, U1, U2, U3 and U4) from the study area. These samples were examined organic contamination using Gas Chromatography Mass Spectrometer (GCMS) and bacteriological contamination. Xylene, ethylbenzene, butylated hydroxytoluene and toluene were identified in the samples using GCMS. The bacteriological analysis showed that the total coliform count ranged from  $2 \times 10^4$  (Cfu/ml) to  $31 \times 10^4$  (Cfu/ml) which is an indication of faecal contamination. This study showed that hospital effluent and other human activities have a negating influence on water quality. Strict compliance to government policies on waste disposal and management is therefore recommended for Ahmadu Bello University Teaching Hospital liquid wastes.

**Key Words:** Hospital, Water, Effluents

(A- 036)

**Assessment of Some Heavy metal (Cadmium, Chromium, Lead and Zinc) in  
Commonly Consumed Herbal Preparation in Kwangila, Zaria**

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**Abstract**

This study was conducted to evaluate some heavy metals in herbal preparations sold in Kwangila, Zaria. The samples were collected randomly, digested and subjected to Atomic Absorption Spectroscopy. The findings showed that sample A contain a higher amount of chromium, zinc and lead than sample B. The metals detected were within standard limit concentration by WHO (1992) Cr 0.2 ppm, Pb 10 ppm, Cd 1 ppm and Zn 20 ppm. The study showed that the herbal products available to consumers in the study area contains acceptable levels of heavy metal but in order to benefit from the use of these product, there is need to ensure that the person involved with the production and distribution have adequate knowledge. There is an urgent need to implement proper herbal medicines monitoring and quality control for producer and the products. Subjection of raw materials for herbal medicines to preservatives may increase the risk of heavy metal contamination. These need to be put into consideration in order to keep the products within standard specification, and providing safe medicines to the users. Therefore, both samples studied are thus recommended for consumption.

**Keywords:** Herbal medicine preparation, Heavy metals, Safety, Chromium, Contamination



(O- 001)

**A SIMPLE AND RAPID TECHNIQUE FOR THE LARGE-SCALE ISOLATION OF 5-METHYLCOUMARIN-4B-GLUCOSIDE FROM *VERNONIA GLABERRIMA* LEAVES**

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**ABSTRACT**

*Vernonia glaberrima* is a plant which is used in traditional medicine for the treatment of psoriasis, dysmenorrhea, diabetes and skin cancer. The leaves of this plant contain large quantity of 5-methylcoumarin-4 $\beta$ -glucoside, a natural product that possesses significant anticancer properties. In view of its pharmacological relevance and abundance in the plant, a simple and rapid method is developed for the large-scale isolation and purification of 5-methyl coumarin-4- $\beta$ -glucoside from *Vernonia glaberrima*. Crude methanolic extract of leaves was suspended in water and sequentially extracted with hexane, chloroform and butanol. The remaining aqueous portion contains insoluble material which was filtered and the residue was dried. The dried residue was subjected to crystallization in chloroform/ethanol (1:1) to yield white needle-like crystals of 5-methyl coumarin-4- $\beta$ -glucoside. The structure of the compound was confirmed by <sup>1</sup>H-NMR and <sup>13</sup>C-NMR spectroscopic analysis.

**Key words:** *Vernonia glaberrima*, 5-methylcoumarin-4 $\beta$ -glucoside, isolation, technique

(O- 002)

**EFFECT OF TEMPERATURE IN THE HYDROGENATION OF BUTANOIC ACID USING TITANIA SUPPORTED Pt-Re CATALYST**

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**ABSTRACT**

This study was aimed at investigating the effect of temperature in the hydrogenation of butanoic acid using 4%Pt-4%Re/TiO<sub>2</sub> catalyst. The study was carried out under a reaction time of 2 hr, hydrogen pressure of 40 bar, stirring speed of 1000 rpm and temperature range of 145 to 200 °C in an autoclave batch reactor. The titania supported Pt-Re catalyst was prepared by the wetness incipient method and characterized using Scanning Electron Microscopy (SEM). Catalyst stability of the prepared catalyst was investigated using catalyst reusability test. It was found that butanol and butylbutyrate were the primary products obtained from the hydrogenation of butanoic acid. As temperature increases from 145 to 200 °C, butanol selectivity slightly decreased from 98 to 94.3% while butyle butyrate selectivity slightly increased from 2 to 5.7%. The higher butanol selectivity even at higher temperatures was linked to lower adsorption strength of butanol on the catalyst surface which in turn enhances the formation butanol. The effect of Re also showed that butanoic acid conversion and butanol yield were linearly improved upon increasing Re from 1 to 4 wt% on 4%Pt/TiO<sub>2</sub> catalyst. Catalyst stability suggests that 4% Pt-4%Re/TiO<sub>2</sub> showed a minimal drop in performance over fresh and three reuse cycles, which was attributed to agglomeration of catalyst particles as evident from SEM. Overall, 4%Pt-4%Re/TiO<sub>2</sub> was found to be highly stable and highly selective towards butanol for the hydrogenation of butanoic acid.

**Keywords:** Hydrogenation, Butanoic acid, catalyst stability.

(O- 003)

**CHEMICAL COMPOSITION OF WHEAT-ROASTED BAMBARA GROUNDNUT GRITS  
COMPOSITE BLENDS AND THEIR PRODUCT (CAKE)**

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**ABSTRACT**

The chemical composition of wheat-roasted Bambara groundnut composite blends and their product (cake) was investigated. The wheat-roasted Bambara groundnut composite blends and cakes was formulated by the replacement of part of the refined wheat flour (RWF) with roasted bambara groundnut grits (RBG) with particle size  $\leq 6300\mu\text{m}$  in the ratio of 100:0 (control), 90:10, 80:20, 70:30, 60:40 and 50:50 respectively. The wheat-roasted bambara groundnut composite blends were evaluated for proximate composition and functional properties while the product (cake) was evaluated for proximate composition. The moisture (8.95-10.67%), ash (0.44-2.01%), crude fat (0.10-0.50%), crude fiber (0.49-2.43%), crude protein (11.09-19.90%), carbohydrate (66.41-77.61%) and energy (347.62-359.21Kcal/100g) contents of the composite blends differed significantly while the bulk density (BD), water absorption capacity (WAC), oil absorption capacity (OAC) and swelling power (SP) ranged from 0.64- 0.81g/cm<sup>3</sup>, 0.67- 1.89g/g, 0.72- 1.82g/g and 0.61- 1.70g/g respectively. The protein (12.90-22.95%), ash (0.92 – 2.27%) and crude fiber (0.45-2.09%) contents of cake increased with increase in RBG substitution while the moisture (20.08-15.05%) and carbohydrate (61.71-54.58%) contents of the cake decreased with increase in RBG substitution. The chemical composition of composite blends and product were affected by the increase in roasted bambara groundnut grits inclusion.

**Keywords:** Blends, Cake, Composite, Grits, Roasted bambara groundnut, Wheat.

EVALUATION OF THE ANTIPILEPTIC ACTIVITY OF ETHANOL LEAF EXTRACT OF  
*CLERODENDRUM CAPITATUM*(VERBENACEAE)  
IN MICE AND CHICKS

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**ABSTRACT**

*Clerodendrum capitatum* is used in traditional folk medicine to manage a plethora of diseases including tuberculosis, epilepsy, fever, obesity, diabetes mellitus, diarrhea, asthma, hypertension, and erectile dysfunction. The main objective of this study was to evaluate the antiepileptic activity of the ethanol leaf extract of *Clerodendrum capitatum*. Preliminary phytochemical screening and acute toxicity studies were conducted. Antiepileptic activity was evaluated in mice and chicks using pentylenetetrazole, strychnine and maximal electroshock-induced seizure models at doses of 100, 200 and 400 mg/kg. The oral median lethal dose of the plant was estimated to be greater than 2,000 mg/kg. The ethanol leaf extract of *Clerodendrum capitatum* at all tested doses significantly ( $p < 0.05$ ) delayed the onset of pentylenetetrazole-induced seizures in mice providing percentage protection of 33.33% at the 100 and 200 mg/kg doses respectively. In the strychnine-induced seizure model, the extract significantly ( $p < 0.05$ ) increased the mean onset of seizures at 200 and 400 mg/kg doses, however only the 400 mg/kg dose produced 16.67% protection against seizures. The extract at all doses did not protect the chicks from maximal electroshock-induced seizures. Phytochemical screening of the ethanol leaf extract of *Clerodendrum capitatum* revealed the presence of phytochemical constituents including alkaloids, flavonoids, tannins, carbohydrates, cardiac glycosides, anthraquinones and steroids. The results obtained from this study suggests that the plant possesses antiepileptic activity validating its traditional use in the management of epilepsy.

**Key words:** Acute toxicity, Anticonvulsant, *Clerodendrum capitatum*, Epilepsy

(O- 005)

**EVALUATION OF THE PROXIMATE AND VITAMIN COMPOSITION OF SOME  
COMMON GREEN LEAFY VEGETABLES SOLD IN SABON GARI- ZARIA MARKET,  
KADUNA STATE, NIGERIA**

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**ABSTRACT**

The present study was conducted to evaluate the nutritional content of some traditional green edible vegetables sold in Sabon Gari- Zaria market in Kaduna State..The nutritive value and vitamin composition of *Lepidium sativum* (Garden cress), *Spinacia Oleracea* (Spinach), *Talinum triangulare* (Waterleaf), *Ocimumgratissimum*(Scent leaf) and *Vernonia amygdalina* (Bitter leaf) were determined. Proximate analysis revealed high amount of carbohydrate ranging from 29.29 – 47.64%. Moisture content was found to be highest in *Vernonia amygdalina* (13.50%) while protein was higher in *Lepidium sativum* (38.47%) Ash content was relatively less in *Ocimumgratissimum*and *Vernonia amygdalina*.Fibre content of the vegetables ranged from 10.40 - 31.78%. These vegetables were found to be rich sources of vitamins except Vitamin C. Vitamin B2 was the most abundant Vitamin ranging from 1.75 – 6.69mg/100ml, followed by Vitamin A, Vitamin B6 and Vitamin B1. The results demonstrated that these five selected underutilized vegetables plants have great nutritional significance.So dieticians can recommend these vegetables for enhanced nutritional benefits.

**Keywords:** Proximate analysis, Green vegetables, Vitamins, Trace elements

(O- 006)

**PRODUCTION OF BIODIESEL FROM PINE OIL  
AND STUDIES ON THE EFFECT OF CATALYST CONCENTRATION ON YIELD**

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**ABSTRACT**

Biodiesel has become an important fuel due to its prospect as an alternative to fossil fuels. It can be produced through different ways, but the triglyceride transesterification is one of the most used processes. Hence, an investigation on the effect of catalyst concentration on the yield of biodiesel produced from pine oil using methanolic potassium hydroxide was carried out in this research work. The amount of the catalyst was varied within the range of 0.5-1.0wt% and at fixed reaction conditions of 5:1 methanol: oil ratio, a reaction temperature of 60°C and reaction time of 90 minutes. The biodiesel yields obtained ranged between 86.10% - 58.10% and the optimum condition of the catalyst (KOH) for biodiesel production from pine oil was determined. Physicochemical analysis of both pine oil and that of the biodiesel were carried out. The result obtained from the transesterification shows that pine oil can serve as a very good feedstock for biodiesel production.

**Keywords:** Pine oil, Biodiesel, Catalyst, Transesterification, Concentration.

PHYTOCHEMICAL SCREENING, ANTIBACTERIAL ACTIVITY AND FLAVONOID  
CONTENT OF *BALANITES AEGYPTIACA* LEAVES

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**ABSTRACT**

The n-hexane, ethanol and aqueous extracts of the leaves of *Balanites aegyptiaca* were obtained by maceration. Phytochemical screening of the extracts revealed the presence of carbohydrate, anthraquinones, terpenoids and cardiac glycosides. Furthermore, both the aqueous and ethanol extracts appeared to contained flavonoids, saponins, tannins and phenols, while the n-hexane extract was found to contain resins and steroids. The zones of inhibition of the extracts were determined against some human pathogenic bacteria, namely *Staphylococcus aureus*, *Escherichia coli* and *Salmonella typhi* using the agar well diffusion methods. And the result showed that the crude ethanol and aqueous extracts demonstrated a significant broad-spectrum activities with the highest zone of inhibition of 18 mm against *S. aureus* while the n-hexane extract was only sensitive towards *S. aureus* with a maximum zone of inhibition of 9 mm. The total flavonoids contents of the aqueous and ethanol extracts were found to be 371±5.20 and 206 ±3.52 mg of Rutin equivalents/g.

**Keywords:** *Balanites aegyptiaca*, Phytochemicals, Flavonoids, Antibacterial activity, Crude extracts

**GC-MS PROFILE, ANTI-INFLAMMATORY AND ANALGESIC PROPERTY OF THE METHANOL LEAF EXTRACT OF *Cassia siamea* (FABACEAE)**

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**ABSTRACT**

The anti-inflammatory, analgesic effects, and the GC-MS profile of the methanol extract of *Cassia siamea* leaf were investigated. The extract was administered orally as suspension in 0.5% Tween 80 at graded doses of 50, 100, and 200 mg/kg body weight. Carrageenan induced rat paw edema and Eddy's hot plate method were used to evaluate the anti-inflammatory and analgesic activities using indomethacin (5 mg/kg body weight) and aspirin (25 mg/kg body weight) as the positive reference drugs respectively. Both studies employed 0.9% normal saline solution as the negative control. The active constituents of the extract were determined via GC-MS screening. The results showed that *Cassia siamea* leaves offered significant percentage reduction (42.57, 66.67, and 72.98%) in inflammation in a dose-dependent manner but lower than the standard drug, indomethacin, which was 91.79%. Analgesic activity was recorded by the extract but the best activity was recorded by the standard drug aspirin at all concentrations analyzed. The previously reported phytochemical screening coupled with the GC-MS analysis confirmed the occurrence of prominent phytocompounds established to possess anti-inflammatory and analgesic effects. These effects could be attributed to the use of *Cassia siamea* leaf in the management of inflammation and painful conditions.

*Keywords:* Anti-inflammatory, Analgesic, Aspirin, *Cassia siamea*, Indomethacin,



(O- 009)

**ANTIOXIDANT ACTIVITIES OF THE LEAF EXTRACT AND FRACTIONS OF  
*Cassia siamea* (FABACEAE) COULD BE ATTRIBUTED TO THE ABUNDANCE OF  
POLYPHENOL COMPOUNDS**

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**ABSTRACT**

*Cassia siamea* is being used traditionally in the treatment and management of free radical implicated disease conditions. This study aim to evaluate the antioxidant activity, total phenolic, and flavonoids content of the extract and fractions with a view to validate its folkloric usage. The crude extract and its fractions were evaluated for in vitro antioxidant activities using 1, 1-diphenyl-2-picrylhydrazyl (DPPH) with ascorbic acid as control. Total phenol and flavonoid contents of the various extracts were determined using gallic acid and quercetin as positive controls. While the standard antioxidant (ascorbic acid) had superior DPPH antioxidant capacity, the inhibition percent of the chloroform extract was significantly higher (with the lowest IC<sub>50</sub> value of 45.72 µg/ml) compared to the other extracts. Using the gallic acid and quercetin equivalent plots, the chloroform extract contained a significantly higher concentration of total phenols and flavonoids in comparison with the other extracts. There was a significant correlation between the DPPH antioxidant activity and the phenolic and flavonoid contents in the extracts. The results of this study showed that the leaf extracts of *C. siamea* possess significant antioxidant property hence laying scientific credence to its ethnomedicinal applications in treating free radical implicated illnesses.

*Keywords:* Antioxidant, *Cassia siamea*, DPPH, Polyphenol

(0- 010)

**Phytochemical Screening and GC-MS Analysis of Ethanol Leaf Extract of *Ficus carica* (Linn)**

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**ABSTRACT**

The aim of this work was to carry out the phytochemical screening and GC-MS profiling of the *Ficus carica* ethanol leaf extract with a view to investigate various compound that could be present. The results obtained revealed that alkaloids, cardiac glycoside, steroids, flavonoids and tannins were present, while terpenoids were absent in the extract. This indicate that *Ficus carica* possess diverse compound that could have medicinal values. The GC-MS profiling of the crude ethanol extract reveal the presence of eighty (80) compounds among which are 1,3-Benzenediol (15.37%), 9,12-Octadecadienoic acid (27.38%) 3-O-Methyl-d-glucose (8.79%) 3-Methylmannoside (8.79%), Methyl hexofuranoside(8.79%), alpha.-Methyl mannofuranoside (9.50%), beta.-d-Mannofuranoside (9.50%), Methyl hexofuranoside (9.50%), n-Hexadecanoic acid (5.19%). These compounds have been proven to have some medicinal properties.

**Keywords:** *Ficus carica*, GC-MS, Analysis, Leaf, Extract, Medicinal, Plant

## SYNTHESIS AND CHARACTERISATION OF SOME SULPHUR- CONTAINING TRICYCLIC HETEROCYCLES WITH PHYSIOLOGICAL ACTIVITIES

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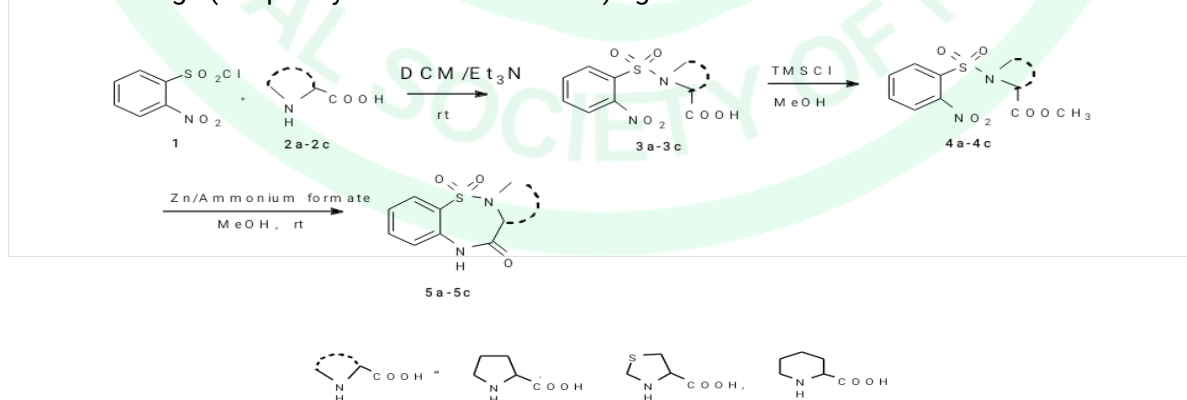
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### Abstract

Resistance of bacteria to current antibacterial drugs is a major health problem around the world especially in the developing countries and this has posed a challenge in the treatment of many infectious diseases. This led to the search for more heterocyclic compounds which could be screened for antibacterial activities. Sulphur-containing tricyclic heterocycles such as tricyclic benzothiadiazepinones have attracted attention of researchers in the field of medicinal and pharmaceutical chemistry. This group of compounds containing sulphur has been reported to possess anti-proliferate activity and has potential for treating several diseases. The aim of the current study was to synthesize some sulphur-containing heterocycles and characterize them using spectroscopic techniques and also evaluate their antibacterial activities. Tricyclic benzothiadiazepinones **5a-5c** were synthesised *via* condensation reaction between 2-Nitrobenzenesulphonyl chloride, **1** and Cyclic aminoacids **2a-2c** in dichloromethane and triethylamine to form the 2-Nitrobenzenesulphonylcycloamino acid (acid adducts, **3a-3c**), which were activated and esterified with trimethylchlorosilane and methanol to afford 2-nitrophenyl sulphonyl cycloamino esters (**4a-4c**). The 2-nitrophenyl cycloamino esters were cyclised to give the target molecules. The reductive cyclisation of the esters took place *via* catalytic transfer hydrogenation, with anhydrous Ammonium formate and Zinc powder in methanol, at ambient temperature (scheme 1). The synthesised compounds were characterised using FT-IR, <sup>1</sup>H, <sup>13</sup>C-NMR spectroscopy and mass spectrometry. The antibacterial activity of the synthesised compounds were evaluated against five Gram-positive and five Gram-negative bacteria. All the synthesised compounds showed moderate to good activities against all the microorganism under investigation. Compounds **5a-5c** were more potent than the standard antibiotic drugs (streptomycin and nalidixic acid) against some of the bacterial tested.



Scheme 1: Synthesis of Benzothiadiazepinones **5a-5c**

**Keywords:** Antibacterial, Benzothiadiazepinone, condensation, hydrogenation, reductive cyclisation.

### Acknowledgement

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(O- 012)

## EXTRACTION OF OIL FROM *Butryospermum paradoxum* KERNEL NUT AND ITS CHARACTERIZATION

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### ABSTRACT

In this era of technological advancement rapid demand for oil in our domain for domestic and industrial purposes is increasing, hence, *Butryospermum paradoxum* (shea butter) can be a good source of oil. The shea kernel nut was extracted using n-hexane which resulted to brownish or yellowish colour oil with percent yield of 36.41% (w/w). The oil was characterized using standard methods with the saponification value (196.96 mgKOH/g), iodine value (6.923 mgKOH/g), acidic value (4.2 mgKOH/g), specific density (0.84) and specific gravity (1.127g). The results from this analysis have indicated the potential application of the oil in many areas such as soap making, skin pomade, cosmetics, medicinal or therapeutic agents and in the food industries. This may enhance the local entrepreneurship development for sustainable economic growth of the society and the National large.

**Keywords:** *Butryospermum paradoxum*, shea kernel nut oil, extraction, n-hexane, characterization.

**PHYTOCHEMICAL SCREENING, ANTIMICROBIAL STUDIES AND ANTIOXIDANT PROPERTIES OF THE STEM BARK EXTRACT OF *Parkia biglobosa***

(African locust beans tree)

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**ABSTRACT**

The constant utilization of plant parts for food and medicinal functions has necessitated the exploration of the role of commonly consumed plant parts. This study qualitatively investigated the phytochemicals, antimicrobial potential and *in vitro* antioxidant properties of the crude ethanolic extract of the stem bark of *Parkia biglobosa*. Preliminary phytochemical screening indicated the presence of secondary metabolites, including; steroids, tannins, saponins, flavonoids, terpenoids, cardiac glycosides, glycosides and carotenoids. While, the crude ethanolic extract of the stem bark of *Parkia biglobosa* exhibited 1, 1- diphenyl-2-picrylhydrazyl (DPPH) scavenging activity, which occurred at a concentration dependent manner. Also, the antimicrobial study showed antibacterial potency, but the extract does not show antifungal activity at the concentrations investigated. The Minimum Inhibitory Concentration (MIC) of the ethanolic stem bark extract was found to be 12.80 mg/ml for *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Enterococcus faecalis* and 25.60 mg/ml for *Escherichia coli*, which is the same value obtained for the Minimum Bactericidal Concentration (MBC). These results have shown the potential therapeutic application of the crude ethanolic extract of the stem bark of *Parkia biglobosa*.

**Keywords:** *Parkia biglobosa*, stem bark, antioxidant, phytochemical, bacteria, fungi, antimicrobial.

**PHYTOCHEMICALS, PROXIMATE ANALYSIS AND ANTIBACTERIAL ACTIVITY OF  
*MOMORDICA CHARANTIA***

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**ABSTRACT**

*Momordica charantia* is a medicinal plant used widely across northern Nigerian traditional medicine probably due to its nutritional and pharmacological properties. The aim of this study was to determine the phytochemical composition, proximate and antibacterial potentials of *M. charantia* extracts. The qualitative and quantitative phytochemical screening revealed the presence of alkaloids (7-31%), saponins (3-8%), tannins (5-12%), flavonoids (3-15%) and terpenoids (1.6-10%). The proximate compositions have indicated the abundance of lipid (18-27%), protein (22-23%), fibre (8-14%) and carbohydrate (28-31%). However, *in vitro* antibacterial activity using disc diffusion on aqueous and methanol fruit and leaf extracts showed effective growth inhibition on *S. aureus* (18 mm, MIC 120 mg/ml) and *E. coli* (17 mm, MIC 120 mg/ml) by the methanol leaf extract. Furthermore, the fruit methanol extract exhibited activity on *S. aureus* (16 mm, MIC 120 mg/ml). Our findings have shown the therapeutic properties of leaf and fruit methanol extracts as effective antibacterial agents especially against *S. aureus*. The plant can serve as source of nutrition as well as adjunct phytomedicine in home remedies when properly standardized.

**Keywords:** *Momordica charantia*, phytochemicals, proximate analysis, antibacterial activity

**BIOREMEDIATION OF TANNERY EFFLUENT USING *BACILLUS SPECIES* ISOLATED FROM THE EFFLUENT**

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**ABSTRACT**

Environmental pollution is one of the major problems of the world and it is increasing day by day due to urbanization and industrialization. Industrial effluents are the most important sources of toxic contaminants in any environment and tannery effluent wastes are ranked as high pollutant among all other industrial wastes. The study aimed to investigate the bioremediation potential of some bacterial isolates on industrial tannery effluent. Seven Pure Bacterial Isolates (PBI) were isolated from the effluent and characterized. Their bioremediation potential on the effluent analyzed by incubating a mixture of tannery effluent and minimal media together with the test organism in an orbit shaker at 30 °C for 72 hours. All the seven PBIs were found to be cylindrical rods and positive to Gram's reaction, as such were classified as *Bacillus species*. All the seven isolates were able to significantly ( $p < 0.5$ ) decrease the concentration of four heavy metals (Cr, Cd, Mn and Pb) and other pollution parameters such as pH, Total Dissolved Solids (TDS), Dissolved Oxygen (DO), conductivity and salinity that were analysed. The result of this research demonstrated the efficiency of the isolated microbes in the biotreatment of the tannery effluent. This therefore suggests that bioremediation process could be used as an alternative and/or supplement to chemical/physical remediation techniques.

**Key Words:** Bioremediation, Tannery effluent, Pollution, Heavy metals, Physical parameters.

(O- 016)

**STUDIES ON GRAFT COPOLYMERIZATION OF ACETYLATED CELLULOSE DRIVED  
FROM MAIZE COB WITH ACRYLIC ACID**

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**ABSTRACT**

Acrylic acid was grafted onto cellulose acetate by using ceric ammonium nitrate (CAN) initiator in aqueous medium at 30, 40, 50, 60, 70 and 80<sup>0</sup>C during reaction period of 120 to 306 mins. Different grafting parameters like grafting yield (GY), grafting efficiency (GE) and total conversion of monomer to polymer (TC) are evaluated at different reaction condition such as temperature, time, monomer and initiator concentration. The grafted copolymer and homopolymer were isolated from the reaction mixture by extraction of homopolymer, poly (acrylic acid) (PAA) with acetone from the graft copolymer. It was observed that grafted Cellulose acetate poly acrylic acid produced at 70<sup>0</sup>C after 3hours had highest GY of 85%). The products are characterized by FTIR, SEM and XRD analyses.

**Keywords:** Acrylic acid, copolymer, homopolymer, characterized



(O- 017)

## A SURVEY OF TRITERPENOID ANTIMALARIALS ISOLATED FROM PLANTS

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### ABSTRACT

Malaria is a major parasitic disease in many tropical and subtropical regions of Africa and some parts of the world. It is responsible for more than 1 million deaths each year in Africa. The rapid spread of resistance encourages the search for new active compounds. Nature and particularly plants used in traditional medicine are a potential source of new antimalarial drugs as they contain molecules with great variety of potency and pharmacological activities. A large number of antimalarial compounds with different structures have been isolated from medicinal plants and can play important roles in the development of new antimalarial drugs. Ethnopharmacological approaches appear to be a promising way to find plant metabolites that could be used as templates for designing new derivatives with improved properties. This review focuses on triterpenoids and their derivatives based antimalarial agents sourced from medicinal plants which are used in the treatment of malaria in Africa and other parts of the world. Their activity against malaria parasites in vitro and in vivo (using experimentally infected mice) shows a mild to moderate antiplasmodial activities. The search for new drugs based on medicinal plants is important due to the emergence and widespread of chloroquine-resistant and multiple drug-resistant malaria parasites with ACT which hitherto requires the development of new antimalarials. The use of plants as antimalarials may be a springboard for new phytotherapies that could be affordable and accessible in treating malaria, especially among the less privileged people living in endemic areas of the tropics which are vulnerable and at risk of this devastating disease.

Keywords: Antimalarials, Triterpenes, Medicinal plants and Malaria.

(O- 018)

**ASSESSMENT OF ANTIBACTERIAL ACTIVITY OF CHLOROFORM, ETHYL ACETATE AND ACETONE FRACTIONS FROM THE CRUDE ETHANOL EXTRACT OF *FICUS BENJAMINA* L. (MORACEAE) FRUITS**

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**ABSTRACT**

The extracts and fractions of the plant *Ficus benjamina*s significantly rich in antioxidants and exhibited potent antimicrobial activity, it is used in herbal medicine for the treatment of skin disorders, inflammation, piles, vomiting, leprosy, malaria, etc. The aim of this research was to assess the antibacterial efficacies of fruit extracts of the plant. The dried fruit sample was subjected to extraction by percolation using ethanol for two weeks. The crude ethanol extract was subsequently fractionated by maceration with chloroform, ethyl acetate and acetone with percentage extract yields of 55.99%, 10.17% and 13.70% respectively. The solvent fractions and crude ethanol extract were evaluated for antibacterial activity using disc diffusion techniques. It was observed that the ethanol extract possessed the most effective antibacterial agents with high zone of growth inhibition (23 mm) on *Streptococcus pyogenes* at 250 mg/ml concentration. This efficacy was followed by the ethyl acetate fraction (20 mm) and acetone fraction (19 mm) on the same test organism. However, *Pseudomonas aeruginosa* was resistant to all the fractions and ethanol extract. It can be concluded that *Ficus benjamina*fruit extracts have effective antibacterial potential especially against the test organisms.

**Keywords:** *Ficus benjamina*, extracts, zone of inhibition, antibacterial activity

(O- 019)

**PROXIMATE AND ESSENTIAL MINERALS COMPOSITIONS OF TWO VARIETIES OF  
*CITRILLUS LANATUS* (WATER MELON) SEEDS**

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**ABSTRACT**

Plant materials are constantly utilized for medicinal and nutritional purposes; this has necessitated the exploration of different plant parts in order to quantify these materials. Present study investigated the proximate and essential minerals composition of two different varieties of *Citrullus lanatus* (watermelon) seeds (coarse and smooth). The seeds were dried at room temperature and their proximate compositions determined using standard analytical techniques. The analysis was carried out using the Association of Official Analytical Chemists (AOAC) methods, where crude fibre, ash, lipid and protein contents were determined. The results have indicated high moisture content, crude protein, crude fat (lipid), crude fibre and ash content from the coarse watermelon seeds has compared to smooth watermelon seeds. In addition, the coarse seeds showed Fe (8.40 mg/100g) in high amount than the smooth seeds (5.370 mg/100g). Conversely, K (2.95 mg/100g) content in smooth seeds was more abundant than in the coarse seeds (0.245 mg/100g). Our findings have shown the nutritional benefit of watermelon seeds that can further be explored as viable source of food supplement for both humans and animals.

**Keywords:** *Citrullus lanatus*, watermelon seed, ash, lipid, moisture, crude fibre.

**EVALUATION OF ANTIOXIDANT ACTIVITY OF *Erythrophleum africanum*  
(Welw. Ex Benth) HarmsSTEM BARK EXTRACT**

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**ABSTRACT**

Evaluation of antioxidant activity of *Erythrophleum africanum* stem bark extract was studied for its free radical scavenging property using H<sub>2</sub>O<sub>2</sub> scavenging assay. The acetone, methanol and water extract showed good dose dependant free radical scavenging property in the H<sub>2</sub>O<sub>2</sub> scavenging assay. The result of evaluation of antioxidant activity of *Erythrophleum africanum* stem bark extract shows the presence of antioxidant which is even more higher than the ascorbic acid used as standard except for water extract which is less than the standard; (Ascorbic acid, acetone, Methanol and water: 1.851, 2.412, 2,888 and 1.289 respectively), as the concentration of the hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) decreases while the concentration of the extract increases. This suggests that *Erythrophleum africanum* is a promising agent of antioxidant activity.

**Keywords:** Antioxidant, *Erythrophleum africanum*, Hydrogen Peroxide, Free radicals

(O- 021)

**ASSESSMENT OF *IN VITRO* ANTITRYPANOSOMAL EFFECTS OF *TERMINALIA CATAPPA* LEAF EXTRACT AND FRACTIONS ON *TRYPANOSOMA BRUCEI BRUCEI***

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**ABSTRACT**

Due to the high cost of conventional drugs used in the treatment of trypanosomosis, the drive towards ethnomedicine has become necessary. This study aimed to assess the *in vitro* antitrypanosomal effects of *Terminalia catappa* leaf extract and fractions on *Trypanosoma brucei brucei*. The extract and fractions of *T. catappa* leaves were prepared using standard laboratory methods. The culture of *T. brucei brucei* was done using a 96-well microtiter plate in triplicates and maintained at 37<sup>o</sup>C. About 20-25 parasites were dosed with 0.4, 2, and 4mg/ml of leaf extract and fractions (n-hexane and ethyl acetate) and control without extract followed by incubation in Eppendorf tubes. Results revealed parasites' survival over 4 hours in control well. There was a complete cessation of parasite motility within 60 minutes by diminazene aceturate and ethyl acetate fraction (EAF) at 4 and 2 mg/ml. The crude extract and n-hexane fractions (HF) produced a significant decrease in parasites motility after 15 and 10 minutes respectively at 4 mg/ml: after 20 and 15 minutes respectively at 2 mg/ml. At 0.4 mg/ml, parasites' motility was significantly decreased by only EAF within 60 minutes. The leaves of *T. catappa* possess *in vitro* antitrypanosomal activity with the EAF being most effective at the lowest concentration.

**Keywords:** *in vitro*, antitrypanosomal, *Terminalia catappa*, extract, fraction, motility

(O- 022)

**PHYTOCHEMICAL SCREENING OF CRUDE EXTRACT AND FRACTIONS OF  
*TERMINALIA CATAPPA* LEAVES IN ZARIA, NIGERIA**

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**ABSTRACT**

Herbal medicine in Africa, despite the recorded excellent outcome, is faced with numerous limitations regarding commercial patency and worldwide use due to poor regulations and standardization. This study was aimed to screen for phytochemical constituents in extract and fractions of *Terminalia catappa* leaves in Zaria, Nigeria. The fresh leaves were collected, and crude extract and fractions (n-hexane and ethyl acetate) were prepared using standard laboratory techniques. The extract and fractions were analyzed using standard techniques for qualitative analysis. Results revealed the presence of alkaloid, saponins, tannins and flavonoids in crude extract; alkaloids, saponins, tannins, steroids, glycosides and flavonoids in the n-hexane fraction; and alkaloids, steroids, terpenoids, glycosides and flavonoids in the ethyl acetate fraction. This study, therefore, confirms the presence of these phytochemical constituents in the leaves of *T.catappa* in Zaria, Nigeria and thus suggesting a strong potential application of the plant in ethnopharmacology.

**Keywords:** Phytochemical, *Terminalia catappa*, extract, fraction, qualitative analysis, Zaria

(O- 023)

**ANTIMALARIAL AND ANTIMICROBIAL ACTIVITY OF BOVINE BILE FROM  
NORTHERN NIGERIA**

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**ABSTRACT**

The aim of this study was to determine the *in vitro* antimicrobial and antimalarial activity of fractions purified from the crude bile extract. The *in vitro* antimalarial activity was carried out on the *Plasmodium falciparum* using Trager and Jensen method with slight modifications. Antimicrobial activity was carried out on selected microorganisms such as *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Salmonella typhi*, *Streptococcus pneumonia*, *Escherichia coli*, and *Candida albicans* using the disc diffusion test. Purification of the crude bile extract was carried out using conventional column chromatography leading to fractions A, B, C, D. the antimalarial activity of the crude bile extract and four fractions showed IC<sub>50</sub> values of 16.16µg/ml, 32.09µg/ml, 37.26µg/ml, 43µg/ml, and 64.61µg/ml respectively. Antimicrobial activity of the crude bile extract and purified bile fractions range between 12-25 mm. The result of the minimum inhibitory concentration (MIC) of the extract and purified fractions was as low as 12.5 mg/ml. Our results reveal that bovine bile extract and purified fractions contain bioactive chemical substances which could be good therapeutic agents against malarial and bacterial infections.

**Keywords:** Bile, Anti-microbial, Anti-malarial, Plasmodium falciparum

(O- 024)

**EXTRACTION, COMPOSITIONAL ANALYSIS  
AND TRYPANOCIDAL ACTIVITIES OF ESSENTIAL OILS OF FOUR AROMATIC  
PLANTS OBTAINED FROM NORTH-EASTERN NIGERIA**

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**ABSTRACT**

The advantage of having in abundance aromatic plants in the North-eastern part of Nigeria was again utilized with the sole aim of harnessing their composition into useful discovery in the aromatic chemistry. To achieve this aim, the stem bark of *Bosweilliadalzielii*, the leaves of *Ocimum americanus*, *Hyptisspicigera* and *Hyptissuaveolens* were subjected to steam distillation for possible extraction of essential oils. The oils obtained were then analyzed using Gas Chromatography Mass Spectroscopy (GC-MS) technique. The results showed that 55 components were identified in the essential oil of *Bosweilliadalzielii* with  $\alpha$ -pinene (18.515 %), isophthaldehyde (10.695 %) and  $\beta$ -pinene (5.641 %) as the major components of the essential oil. The essential oil of *Ocimum americanus* has a total 45 components in which terpinene-4-ol (14.507), copaene (7.438 %) and terpinene (6.178 %) are the predominant components. On the other hand  $\alpha$ -pinene (30.536 %),  $\beta$ -pinene (15.840 %) and eucalyptol are the lead components in the essential oil of *Hyptisspicigera* out of 30 components identified. The GC-MS result for the essential oil of *Hyptissuaveolens* revealed that out of the 31 components identified carryophyllene (20.643 %), sabinene (16.711 %) and terpinolene (8.490 %) are the lead components. The various essential oils were tested for trypanacidal activities using *trypanasomacongoles* and the result obtained shows that essential oil of *Hyptisspicigera* inhibited the motility of the parasites in 60 and 30 minutes after the start of experiment, at concentrations of 25 and 50  $\mu$ L/ml respectively. However complete inhibition of the motility of the parasites was noticed 90 minutes after the start of the experiment at same concentrations above when essential oils of *Ocimum americanus* and *Hyptissuaveolens* were introduced into the test tubes containing blood infested with *trypanasomacongoles*. The essential oil of *Bosweilliadalzielii* exhibited least trypanacidal activity having inhibition on the motility of the parasites at 120 minutes of the start of the experiment.

**Keywords:** Essential oil, Trypanacidal, Components, Steam distillation



(O- 025)

**PHYSIOLOGICAL PROPERTIES AND ANTIMICROBIAL SCREENING OF SOAP  
PREPARED USING *ZIZIPHUS JUJUBE* LEAVES EXTRACT**

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**ABSTRACT**

The study was carried out to produce a moisturized antimicrobial soap using Jujube leaves extract as antimicrobial source, determine its physicochemical properties, antimicrobial property and to compare it with other antimicrobial soap in the market. pH test( mean value =  $7.52 \pm 0.02$ ), corrosiveness test( mean value = 0.55%), solubility test( $0.80 \pm 0.03$ ), foamability test( $6.50 \pm 0.03$ ) were conducted and the result obtained was not higher than that required by WHO/SO/N which makes the produced soap skin friendly. The phytochemicals (Alkaloids, flavonoids, saponins and tannins) were also detected in the leaves extracts. Antimicrobial susceptibility test was conducted using a gram positive bacteria *Staphylococcus Lantus* and zones of inhibition were seen at various concentration(12mm at 500mg/ml, 10mm at 250mg/ml, 10mm at 125mg/ml and 6mm at 62.5mg/ml), and on gram negative bacteria *Staphylococcus aureus* (18mm at 500mg/ml, 15mm at 250mg/ml, 12mm at 125mg/ml and 10mm at 62.5mg/ml) as well as on two fungi species *Candida Albican* (12mm at 500mg/ml, 10mm at 250mg/ml, 8mm at 125mg/ml and 6mm at 62.5mg/ml) and *Aspergillus nigar* (15mm at 500mg/ml, 12mm at 250mg/ml, 10mm at 125mg/ml and 8mm at 62.5mg/ml) and the result obtained show that the soap is active on the tested microorganism and can inhibit their growth, having much activity on the gram negative bacteria.

**Key words:** Antimicrobial susceptibility test, Zones of inhibition, *Staphylococcus Lantus*, *Staphylococcus aureus*, *Candida Albican*, *Aspergillus nigar*

**SYNTHESIS AND CHARACTERIZATION OF 1-PHENYL-1H-PYRROLE-2, 5-DIONE AND SOME OF ITS DERIVATIVES**

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**ABSTRACT**

1-phenyl-1H-pyrrole-2, 5-dione and seven of its derivatives were synthesised by dehydrating cyclization of (2Z)-4-anilino-4-oxobut-2-enoic acid in the presence of anhydride and tertiary amine. Thus (2Z)-4-anilino-4-oxobut-2-enoic acid was treated with acetic anhydride in presence of anhydrous sodium acetate as catalyst at 80°C. This simple two step reaction of first, a condensation of the corresponding primary amine with maleic anhydride and the second step; the condensation product imidization reaction and dehydration yielding the corresponding pyrroles. All the products were filtered off and recrystallized in dimethylformamide with the yield between 43-84%, melting points are sharp indicating purity of the products (Table 2), Mass, IR, <sup>1</sup>H and <sup>13</sup>C NMR spectroscopy (Tables 3 and 4) were also used to ascertain character of the products.

**Keywords;** 1-phenyl-1H-pyrrole-2, 5-dione, condensation, primary amine, maleic anhydride, dimethylformamide

(O- 027)

**EXTRACTION AND CHARACTERIZATION OF PECTIN FROM BANANA PEEL AND  
*GMELINA ARBOREA***

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**ABSTRACT**

This work aims to obtain a value-added product called pectin from solid waste of fruit (unripe Banana peels) and a wild fruit (*Gmelina Arborea*) by solvent extraction process under varying conditions. Pectin is widely used as a gelling agent, thickener, emulsifier and stabilizer in different food processing operations. Pectin was extracted from unripe banana peel powder and *Gmelina arborea* powder using hydrochloric acid at  $90\pm 5^\circ\text{C}$  at constant pH. The pectin yields varied from 7% to 13%, the best extraction condition using hydrochloric acid was temperature at  $90^\circ\text{C}$ , pH 2 and extraction time of 4 hours with a pectin yield of 13%. The structure of the product is confirmed by Fourier transform infrared spectroscopy (FTIR) analysis and compared with standard pectin. Extracted pectin was characterized by estimating the moisture (6.0% for banana peel; 10.0% for *Gmelina*) ash content (9.0% for banana peel; 5.0% for *Gmelina*), solubility test (70% for banana peel and 57% for *Gmelina*) and oil holding capacity (2.0g for banana peel; 1.4g for *Gmelina*). So, products from wastes can be turned to wealth and so serve as foreign exchange earnings.

**Keywords:** *Gmelina Arborea*, solvent extraction, pectin, banana peel, wealth

(O- 028)

**ANTITUSSIVE COMPOUNDS PRESENT IN STEM BARK OF *COMBRETUM GLUTINOSUM***

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**ABSTRACT**

The powdered stem bark of *Combretum glutinosum* was extracted with 80% methanol and water by maceration method. The methanol extract was further partitioned with ethylacetate and butanol. Phytochemical screening, thin layer chromatography, column chromatography, GC-MS analysis and examination of antitussive activity using selected microorganisms were carried out on the extract and its partitioned fractions. Phytochemical screening revealed the presence of saponins, tannins, flavonoids, alkaloids and steroids. GC-MS analysis showed Dodecane, 2,6,10-trimethyl, pentadecanoic acid, 4-piperidinone, 2,2,6,6-tetramethyl, Benzaldehyde, 3-hydroxy-4-methoxy- and Ethanol, 2,2'-(dodecylimino)bis-. The antimicrobial compounds of *Combretum glutinosum* on selected organisms were *Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumonia* were susceptible to (control) amoxicillin and clavunate potassium, the *C. glutinosum* extract and its partitioned fractions.

**Keywords:** *Combretum glutinosum*, methanol extract, Phytochemical screening

**EFFECT OF ACETYLATION ON CRYSTALLINE AND THERMOGRAVIMETRIC PROPERTIES OF FIBERS EXTRACTED FROM *BRIDELIA FERRUGINEA***

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**ABSTRACT**

Cellulose and lignin are two of the most abundant natural linear polysaccharide and cross-linked phenolic polymers respectively and can be extracted from plants. Lignocellulosic fibers were extracted from *Bridelia ferruginea* (BF), a shrub which can be found in sub-Saharan Africa with a view to probing the potential application of the fibers. The purpose of this work therefore is to study the properties of BF which have been chemically modified by acetylation in order to evaluate potential applications of the fiber.

The plant fibers were subjected to alkali treatment, bleaching using hypochlorite and then acetylated with acetic anhydride. The unacetylated and acetylated fibers were characterized using Fourier Transform Infrared Spectroscopy (FTIR), X-Ray Diffraction (XRD) and Thermogravimetric analysis (TGA) to compare thermal and crystallographic properties after acetylation over different lengths of time. The appearance of peaks at wavelengths of  $1250\text{ cm}^{-1}$  and  $1371\text{ cm}^{-1}$  confirmed that acetylation had occurred. The fibers possessed high crystallinity index of 75% which reduced as time of acetylation increased.

**Keywords:** Cellulose, lignin, acetylation, fiber, crystallinity index

(O- 030)

**PRELIMINARY STUDIES OF THE ACETYLATION OF OIL PALM MESOCARP FIBRE  
FOR CRUDE OIL SORPTION**

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**ABSTRACT**

Crude oil spill is one of the most serious disasters, threatening the marine and terrestrial ecosystem, leading to severe environmental issues and concerns. The use of agro based waste as sorbent materials has been explored in recent times due to their biodegradability, low cost, renewability and minimal secondary effects. The present work focuses on the use of Oil Palm Mesocarp Fibre (OPMF) as a promising sorbent material. The fibre was modified using acetylation process to improve its sorption capacity. The acetylation process was carried out using the Regular Two-Level Factorial design of experiment. The acetylation was achieved using acetic anhydride with N-bromo succinimide (NBS) as a catalyst. The extent of acetylation was calculated in terms of weight per cent gain (WPG). The optimum time, temperature, fibre weight and catalyst concentration were 60 minutes, 130 °C, 2.0 g and 4.0% respectively. These parameters could achieve a 16.32% increase in WPG. The implication of these results will be discussed.

**Key words:** Oil spill; Acetylation; Sorption Capacity; Oil palm mesocarp fibre

(O- 031)

**SYNTHESIS AND APPLICATION OF AZO ACID DYES DERIVED FROM P-NITROANILINE ON SEMI- CHROME AND VEGETABLE TANNED LEATHER**

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**ABSTRACT**

P-nitro aniline dye was synthesized by coupling reaction of diazonium salt with 2-amino-8-naphthol Sulphuric acid (J-acid) and 8-amino-1-naphthol 3-6 disulphuric acid (H-acid). Scheme (1) showed the reaction of p-nitro aniline with sodium nitrite in the presence of hydrochloric acid for the production of dye intermediate. Scheme (2) showed the reaction between the dye intermediate and J.acid to generate dye A. Scheme (3) showed the reaction between the dye intermediate and H.acid to yield dye B. Ultra- violet Spectroscopy's result showed that the sample A has maximum absorption of 498.00 nm with absorbance of 0.78. While sample B show the minimum absorption of 465.00 nm with absorbance of 0.88. The FTIR spectroscopy of the dye samples showed that the wave frequency  $\text{cm}^{-1}$  depicts the functional group that represents each wavelength of absorption. The broad peak observed at  $3500\text{-}3400\text{cm}^{-1}$  is OH stretching typically of alcohols and phenol compounds, the peak at  $3000\text{-}2900\text{cm}^{-1}$  is C-OOH stretching typically of alkanes, the peak at  $1700\text{-}1650$  is C=C stretching typically in alkynes and also the peak at  $1200\text{-}1150$  is wag(swinging) C-H typically on alkyl halides deforming respectively. Fastness properties to light and wash fastness rating of both substrate were (4-5) generally indicating very good to excellent which is attributed to proper penetration, levelness and solubility was achieved. The good shades observed may be due to better substantivity, affinity as well as good solubility of the dyes on semi-chrome and vegetable tanned leather.

**Key words:** P-nitro aniline, diazotization, coupling, J-acid and H-acid.

(O- 032)

**ANTIBACTERIAL, COMPOSITIONAL AND PHYSICOCHEMICAL PROPERTIES  
OF *GUIZOTIA SCABRA* (VIS.) CHIOV. SEED OIL FOUND ON  
JOS-PLATEAU-NIGERIA**

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**ABSTRACT**

The oil extract of *Guizotia. scabra* seeds was analyzed for its antibacterial, chemical and physical properties. Physical and chemical properties analyzed included moisture content (0.91%), acid value (13.65%), iodine value (132.27), peroxide value (18.58), saponification value (191.03), free fatty acids (6.86%) and density (0.87g/cm<sup>3</sup>). The oil was found to inhibit the growth of *Staphylococcus aureus* (SA), *Escherichia coli* (EC) and *Salmonella typhi* (ST) at an MIC of 50%. However, there was no effect on *Shigellasonnei* (SS). The fatty acid composition of the extracted oil was revealed using the Gas chromatography Mass spectrometry (GC-MS) method. A total of 18 (Fig. 1) components of the oil were identified. Oleic acid (27.07%), 10-undecenoic acid (19.99%), palmitic acid (10.56%) and stearic acid (6.22%) were detected as the dominant fatty acids in the *G. scabra* seed oil.

**Keywords:** *Aspilia Africana*, seeds, bacteria, fatty acid



(O- 033)

**Phytochemical Screening and *In Vitro* Antioxidant Activity of the Chloroform Leaf Extract of *Cassia singueana* (Fabaceae)**

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**ABSTRACT**

*Cassia singueana* is an under shrub that belongs to the Fabaceae family and used as herbal recipe across Sokoto state, Nigeria for treatment of diseases and ailments. It is commonly called 'funhu' in Hausa language across northern Nigeria. The leaf sample was extracted with chloroform using cold macerated for 24 hr. The chloroform extract was subjected to phytochemical screening using standard procedures and evaluated for *in-vitro* antioxidant activity using the thin layer chromatography (TLC) followed by DPPH (2, 2-diphenyl-1-picrylhydrazyl) spray technique. The phytochemical analysis revealed the presence of pharmaceutically active secondary metabolites such as alkaloid, steroids, tannins and flavonoid among others. The TLC analysis using n-hexane and ethylacetate with a ratio of 2:1 solvent systems resolved the separation of six compounds with retention factors ( $R_f$ ) for **1** (0.228), **2** (0.421), **3** (0.667), **4** (0.737), **5** (0.877) and **6** (0.965). However, three other components separated using solvent system of n-hexane and ethylacetate with  $R_f$  for **1** (0.200), **2** (0.833) and **3** (0.917) showed strong antioxidant activity by yellow coloration, indicating reactions with the DPPH. This research holds great promise to explore active secondary metabolites with antioxidant properties. The isolation and characterization of the active metabolites will be an important endeavor.

**Keywords:** *Cassia singueana*, DPPH, phytochemical, TLC bioautography.

**KINETICS AND MECHANISM OF THE REDOX REACTION OF ORANGE II WITH THIOSULPHATE ION IN ACIDIC MEDIUM**

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**ABSTRACT**

The kinetics of the redox reaction of orange II with thiosulphate ion has been studied spectrophotometrically at constant ionic strength,  $I = 0.50 \text{ mol dm}^{-3}$  (NaCl),  $[\text{H}^+] = 5.0 \times 10^{-2} \text{ mol dm}^{-3}$  (HCl) and  $T = 26 \pm 1^\circ\text{C}$ . The rate of the reaction increases with increase in acid concentration and in the ionic strength of reaction medium. The reaction shows a first order dependence on [oxidant] and [reductant]. The rate equation for the reaction is:

$$-\frac{d[\text{OR}]}{dt} = (a + b[\text{H}^+])[\text{OR}][\text{S}_2\text{O}_3^{2-}]$$

Added cations and anions inhibited the rate of the reaction. Michaelis – Menten's plot of  $1/k_1$  versus  $1/\text{S}_2\text{O}_3^{2-}$  and spectrophotometric test suggest absence of an intermediate in the rate determining step. Free radical test did not yield gel formation. Based on the results obtained, this reaction is probably operating through the outersphere mechanism.

**Key Words:** Thiosulphate; outersphere; kinetics; intermediate

**KINETICS AND MECHANISM OF THE REDOX REACTION OF ORANGE II WITH  
PERIODATE ION IN AQUEOUS ACID**

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**ABSTRACT**

The kinetics of the oxidation of orange II (here and thereafter referred to as OR<sup>-</sup>) by periodate ion in acidic solution has been studied spectrophotometrically ( $\lambda = 484$  nm) at  $T = 23 \pm 1^\circ\text{C}$  in the acid range  $(2.0 - 10.0) \times 10^{-2} \text{ mol dm}^{-3}$ , ionic strength  $2.0 - 8.0 \text{ mol dm}^{-3}$  (NaCl). The reaction shows a first order dependence on [oxidant] and [reductant]. The rate of the reaction increases with increase in  $[\text{H}^+]$ . Plot of  $k_1$  versus  $\log[\text{H}^+]$  gave a slope of one showing that the reaction is first order with respect to hydrogen ion concentration. The stoichiometry of the reaction is 1:1 (OR<sup>-</sup> : IO<sub>4</sub><sup>-</sup>). Added cations decrease the rate of the reaction. The results of spectroscopic investigation indicate that no intermediate complex is probably formed in the course of this reaction. The reaction is probably operated through the outersphere mechanism.

**Key words:** Kinetics, Periodate, Stoichiometry, Orange II

(I- 003)

**SYNTHESIS AND STRUCTURAL STUDIES OF BENZIMIDAZOLIUM SALT AND ITS RESPECTIVE SILVER (I) *N*-HETEROCYCLIC CARBENE COMPLEX**

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**ABSTRACT**

New designed Ag(I)-*N*-heterocyclic carbene (NHC) complex bearing asymmetrically substituted NHC ligand have been synthesized via *in situ* deprotonation technique, starting from the corresponding aliphatic nitrile functionalized benzimidazolium salt. The salt is accessible in two steps by *N*-alkyl reaction of benzimidazole. The resulting compound was subsequently deprotonated with the basic metal source Ag<sub>2</sub>O by *in situ* deprotonation technique to obtain a mononuclear Ag(I)-NHC complex. These compounds were characterized by spectroscopy techniques (FTIR, <sup>1</sup>H and <sup>13</sup>C-NMR) and elemental analyses. Single crystal structural studies for complex revealed that the molecule exhibit perfect linear C-Ag-C coordination of bis-NHC units with linear geometry and quasi-parallel pairs of aromatic benzimidazole planes.

**Keywords:** *N*-Heterocyclic carbenes; Ag(I)-NHC; Benzimidazolium salts; aliphatic nitrile; X-ray crystallography.

(I- 004)

**PREPARATION AND PHOTOCATALYTIC PERFORMANCE OF ZnFe<sub>2</sub>O<sub>4</sub>/ACTIVATED CARBON PHOTOCATALYST FOR THE DEGRADATION OF ORGANIC DYES EFFLUENTS UNDER VISIBLE LIGHT IRRADIATION**

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**ABSTRACT**

This research work was aimed at the development of ZnFe<sub>2</sub>O<sub>4</sub>/Activated carbon photocatalyst for the degradation of dye pigment using visible light irradiation. Pure ZnFe<sub>2</sub>O<sub>4</sub>, 1:1 and 1:2 ZnFe<sub>2</sub>O<sub>4</sub>/Activated carbon photocatalyst were synthesized via co-precipitation route followed by calcination at 900 °C. The synthesized photocatalyst were characterized using Scanning electron microscopy (SEM) and Fourier transformed infrared (FT-IR). Analysis of the photocatalytic activity for the degradation of methyl orange using the pure ZnFe<sub>2</sub>O<sub>4</sub>, and ZnFe<sub>2</sub>O<sub>4</sub>/Activated carbon in 1:1 and 1:2 ratios were assessed. The results have shown that, the 1:1 ZnFe<sub>2</sub>O<sub>4</sub>/Activated carbon composite exhibited the higher photocatalytic activity in which about 86.8% degradation was achieved. However, the methyl orange degradations of 66.2% and 67.5% were recorded due to pure Znfe<sub>2</sub>O<sub>4</sub>, and 1:2 Znfe<sub>2</sub>O<sub>4</sub>/Activated carbon photocatalysts respectively, which signifies the enhanced photocatalytic activities of the photocatalysts composites.

**Key words:** Photocatalyst, Photocatalysis, visible light, ZnFe<sub>2</sub>O<sub>4</sub>/Activated carbon and Methyl orange.

**KINETICS AND MECHANISM OF OXIDATION OF CATECHOL  
BY OXYGENATED  $[\text{Co}_2(\text{O}_2)(\text{NH}_3)_{10}]^{5+}$  COMPLEX**

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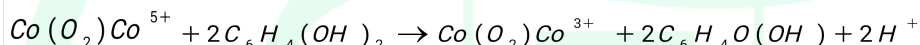
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**ABSTRACT**

The kinetics and mechanisms of the electron transfer reactions of Catechol and  $\mu$ -superoxo-bis[pentaamminecobalt(III)] pentachloride monohydrate,  $[(\text{NH}_3)_5\text{Co}(\text{O}_2)\text{Co}(\text{NH}_3)_5]\text{Cl}_5 \cdot \text{H}_2\text{O}$ , hereafter represented as  $\text{Co}(\text{O}_2)\text{Co}^{5+}$  have been studied in aqueous perchloric acid at  $[\text{H}^+] = 0.02 \text{ mol dm}^{-3}$ ,  $\mu = 0.35 \text{ C}^2 \text{ moldm}^{-3}$  ( $\text{NaClO}_4$ ), and  $T = 27.0 \pm 1.0^\circ\text{C}$ , the reaction conforms to an overall equation:



The experimental data are consistent with a second-order rate law:

$$-d \frac{[\text{Co}(\text{O}_2)\text{Co}^{5+}]}{dt} = k_2 [\text{Co}(\text{O}_2)\text{Co}^{5+}] [\text{C}_6\text{H}_4(\text{OH})_2]$$

with  $k_2 = (0.87 \pm 0.022) \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ . Added  $\text{SO}_4^{2-}$  and  $\text{Zn}^{2+}$  inhibit the reaction. The rate of reaction was dependent on variation in the ionic strength of the reaction medium in the range  $0.2 \leq \mu \leq 0.5 \text{ C}^2 \text{ mol dm}^{-3}$  and decreases with increase in  $[\text{H}^+]$  in the acid range  $0.08 \leq [\text{H}^+] \leq 0.2 \text{ mol dm}^{-3}$ . There is no evidence for the formation of an intermediate complex of significant stability but free radicals were detected in the reaction. Experimental data obtained showed that the reaction proceeded through outer-sphere mechanism. This deduction is further supported by a linear graph of zero intercept obtained in the Michaelis–Menten plots of  $1/k_{\text{obs}}$  versus  $1/[\text{C}_6\text{H}_4(\text{OH})_2]$

**Key words:** Kinetics, mechanism, oxidation, dioxygen complex, observed rate constant ( $k_{\text{obs}}$ ), Catechol ( $\text{C}_6\text{H}_4(\text{OH})_2$ ), Ionic strength ( $\mu$ )

**REDUCTION OF N,N'-PHENYLENEBIS-(SALICYLIDENEIMINATO)MANGANESE(III) BY THIOCYANATE ION IN MIXED AQUEOUS MEDIUM**

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**ABSTRACT**

The kinetics of the reduction reaction of N,N'-phenylenebis-(salicylideneiminato)manganese(III), [MnSalphen]<sup>+</sup>, by thiocyanate ion was studied in mixed aqueous medium (DMSO:H<sub>2</sub>O; 1:4 v/v) under pseudo-first order conditions at 28 ± 1°C, μ = 0.6 C<sup>2</sup> mol dm<sup>-3</sup> (NaCl) and λ<sub>max</sub> = 450 nm. The reaction was second order overall, acid independent and displayed negative Brønsted-Debye salt effect. Free radicals were detected during the reaction but there was no evidence for the formation of an intermediate complex. The reaction obeys the rate law:

$$\frac{d[\text{MnSalphen}^+]}{dt} = k_2[\text{MnSalphen}^+][\text{SCN}^-]$$

Keywords: N,N'-phenylenebis-(salicylideneiminato)manganese(III), thiocyanate ion, pseudo-first order, kinetics, mixed aqueous medium.

**SYNTHESIS, CHARACTERIZATION AND ANTIBACTERIAL ACTIVITY OF SILVER NANOPARTICLES FROM EXTRACTS OF *COCHLOSPERMUM TINCTORIUM*, *GUIERA SENEGALENSIS* AND *ZIZIPHUSABSSINICA***

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**ABSTRACT**

Plant mediated synthesis of nanoparticles is an emerging green methodology with potential medicinal applications as therapeutic agents. This work reports the green synthesis and characterization of silver nanoparticles (AgNPs) using three herbal plants and evaluation of their antibacterial activity on selected bacteria using disc diffusion technique. *Cochlospermum tinctorium* (CT), *Guiera senegalensis* (GS) and *Ziziphus abssinica* (ZA) are well-established herbal recipes for treatment of various infectious diseases in Nigerian traditional medicine. The green synthesis was carried out on aqueous leaf extract of each plant, and production of AgNPs was monitored using UV-vis spectrophotometer (300-600 nm) at 30 min intervals. The synthesized AgNPs from CT, GS, and ZA were characterized by using Scanning Electron Microscopy (SEM) and Fourier Transform infrared (FT-IR) techniques. It was observed from the SEM that AgNPs were uniformly distributed and hence well stabilized in the plant extract. The FT-IR analysis showed no absorption bands for Ag bonded to oxygen (Ag-O-Ag) which indicate complete bio-reduction of Ag<sup>+</sup>-Ag<sup>0</sup>. The antimicrobial activity of the AgNPs at 2mM demonstrated effective inhibition of bacterial growth for CT (28 mm) on *S. typhi*, GS (28 mm) on *E. coli* and ZA (29 mm) on *S. aureus*. Our findings have shown the efficacy of the AgNPs as antibacterial agents and could provide novel therapeutic applications against human pathogenic bacteria.

**Keywords:** Green synthesis, silver nanoparticles, antimicrobial activity, *Cochlospermum tinctorium*, *Guiera senegalensis*, *Ziziphus abssinica*



**SYNTHESIS AND CHARACTERIZATION OF COBALT(II) AND COPPER(II)  
COMPLEXES WITH SCHIFF BASE DERIVED FROM 2-HYDROXY-1-  
NAPHTHALDEHYDE AND 3-AMINO BENZOIC ACID**

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**ABSTRACT**

The Schiff base was synthesized by condensation of 2-hydroxy-1-naphthaldehyde with 3-aminobenzoic acid in a 1:1 molar ratio. The Schiff base ligand formed complexes with Cobalt(II) and Copper(II) acetate via mechanochemical synthesis. The synthesized compounds were characterized by solubility test, melting point/decomposition temperature, FT-IR, molar conductance measurement, magnetic susceptibility and elemental analysis. The Schiff base has a melting point of 190 °C. The decomposition temperature of complexes was found to be in the range 289 – 302 °C. The Schiff base and its metal(II) complexes were soluble in DMF, DMSO and sparingly soluble in acetonitrile, chloroform, diethyl ether and insoluble in n-hexane which indicate the polar nature of the synthesized compounds. The IR spectral analysis of the free Schiff shows a band at 1622 cm<sup>-1</sup>, assigned to  $\nu(\text{C}=\text{N})$  stretching vibrations. This band was shifted in the spectra of complexes (1610 – 1633 cm<sup>-1</sup>), indicating coordination of the Schiff base to the metal ion through the azomethine group. The molar conductance of complexes determined are in the range 9.2 – 16.49 Ohm<sup>-1</sup>cm<sup>2</sup>mol<sup>-1</sup> which indicate the non-electrolytic nature. Magnetic susceptibility measurements of Co(II) and Cu(II) complexes exhibit a magnetic moment in the range 1.25 – 5.62 BM. The values correspond to square-planar geometry. The elemental analysis of the complexes for C, H and N determined showed that the observed and the calculated percentages of the elements are in good agreement.

**Keywords:** Schiff base, square-planar geometry, 2-hydroxy-1-naphthaldehyde, 3-aminobenzoic acid, elemental analysis,

(I- 009)

**STUDIES ON THE DISSOCIATION AND STABILITY CONSTANTS OF N,N-bis(4-methoxybenzylidene) ethane and 2,2-(ethane-1,2 diylbis(aznylidene)) dicyclohexaneschiff bases with Cr (II), Ni (II), and Cu (II) IN SOLUTION**

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**ABSTRACT**

The proton-ligand and stepwise stability constant values of N1,N2-bis(4-methoxybenzylidene)ethane [M4BE] and 2',2'-(ethane-1,2 diylbis(aznylidene)) dicyclohexane [EYAC] and Cr(II), Ni(II) and Cu(II) have been studied using pH metric measurements with ionic strength of NaNO<sub>3</sub>. The values of proton-ligand stability constants and metal ligand stability constants (Pka and LogK) are calculated using MATLAB Programming. The overall values of the dissociation constant were found to be 13.68 and 12.29 for the two ligands, and the overall stability constant (Logβ) were found to be 10.39, 13.55, 11.16 and 12.21, 14.41, 10.24 for metal ions to the respective ligands. The ligand N1,N2-bis(4-methoxybenzylidene) ethane [M4BE] L1 has been synthesized by freshly condensation with 1,2-cyclohexanedione and ethylenediamine and [EYAC] L2 with 4-methoxybezaldehyde with the same ammine group in an ethanolic solution.

**Key words:** Schiff base, dissociation constant, stability constant, PH-metric method.

(I- 010)

**ADSORPTION OF METHYLENE BLUE DYE FROM AQUEOUS SOLUTION ON Fe<sub>3</sub>O<sub>4</sub> MODIFIED MONTMORILLONITE USING RESPONSE SURFACE METHODOLOGY: OPTIMIZATION AND KINETICS STUDY**

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**ABSTRACT**

Fe<sub>3</sub>O<sub>4</sub>/montmorillonite nanocomposite (Fe<sub>3</sub>O<sub>4</sub>/MMT-NC) was synthesized for removal of Methylene Blue from aqueous systems. The nano adsorbent was characterized by X-ray diffraction; Scanning electron microscopy and Fourier transform infrared Spectroscopy; The SEM image shows that the Fe<sub>3</sub>O<sub>4</sub>/MMT-NC exhibits a compact arrangement of nanoparticles with uneven shape and its structure and identity were verified by XRD, and the FT-IR spectra of pure MMT and the synthesized Fe<sub>3</sub>O<sub>4</sub>/MMT-NC was taken; both showed absorption bands with varying intensities and the bands were assigned to their respective functional groups. The experiments were designed by response surface methodology and quadratic model was used for prediction of the variables. The adsorption parameters of adsorbent dosage, removal time, and initial Methylene Blue concentration were used as the independent variables and their effects were investigated on the Methylene Blue removal. Variance analysis was utilized to judge the adequacy of the chosen model. Optimum conditions with initial Methylene Blue concentration of 96.63mg/L, 115.34 minutes of removal time and 0.52 g/0.1 L were predicted to give about 100% removal efficiency. Prediction of the model was in good agreement with experimental results. Fe<sub>3</sub>O<sub>4</sub>/MMT-NC was found successful in removing Methylene Blue from aqueous solution.

**Key words:** Adsorption, Kinetic study, Response Surface Methodology

**SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL ACTIVITY OF SOME SCHIFF BASES DERIVED FROM VANILLIN AND SOME AMINO ACIDS, AND THEIR CORRESPONDING METAL (II) COMPLEXES**

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**ABSTRACT**

This research focused on syntheses, characterization and determination of biological activities of some new Fe (II), Ni (II) and Co (II) complexes of some newly synthesized Schiff bases. The Schiff bases were synthesized by condensation reactions between o-vanillin and L-leucine,  $\beta$ -alanine and tryptophan amino acids, respectively. The Schiff bases and their corresponding transition metal (II) complexes were characterized by elemental analyses, molar electrical conductivity, infrared spectra, and thermogravimetric analyses. The purity of the Schiff bases and their corresponding transition metal (II) complexes were checked by thin-layer chromatography (TLC) and their melting points were also established using electrically heating melting point apparatus. Elemental analyses were determined using CHN and the Fourier Transform Infrared spectra were performed with FTIR-spectrophotometer. <sup>1</sup>H, <sup>13</sup>C NMR spectra and magnetic susceptibility were measured. The thermogravimetric analysis (TGA and DTG) was carried out to determine the thermal stability of the complexes with a heating rate of 10 °C min<sup>-1</sup>. The solubilities of the complexes were checked in some polar and nonpolar solvents. The results obtained revealed that the synthesized Schiff bases are bidentate and linked to the metal ions through the *O* and *N* donor atoms derived from the imino nitrogen, and phenolic (hydroxyl) oxygen and also the corresponding complexes are nonelectrolytes that showed a wide range of biological activities.

**Keywords:** Schiff bases, Complexes, FT-IR Spectra, Characterization, Biological activities, Vanillin & Mole ration.

(I- 012)

**REDOX REACTION OF COBALT(III)SALOPHEN COMPLEX AND THIOGLYCOL IN DMSO-WATER MEDIUM**

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**ABSTRACT**

The redox reaction of Cobalt(III)Salophen (Salophen= (bis(salicylidene)phenylenediamine) and thioglycol (RSH) was studied by pseudo-first order method under the resulting conditions,  $[H^+] = 1.4 \times 10^{-3} \text{ mol dm}^{-3}$ ,  $\mu = 0.1 \text{ mol dm}^{-3}$  (NaCl),  $\lambda_{\text{max}} = 470 \text{ nm}$  and  $T = 27 \pm 1^\circ\text{C}$  in DMSO: H<sub>2</sub>O; 1:4 v: v medium. The electron transfer reaction showed first order in both the complex and the reductant, with second order overall. Effect of  $[H^+]$  indicated that both the protonated (HRS<sup>+</sup>) and deprotonated (RSH) form of the reductant are active at the rate-determine step. Ionic strength effect revealed the participation of like charges at the rate-determine step and free radicals were present during the course of the reaction. No evidence was observed for the presence of stable and detectable intermediate complex. From the result, the mechanism is rationalized in terms of outer-sphere pathway.

**Keywords:** Redox reaction, Salophen, Thioglycol, DMSO-Water, Outersphere Pathway.

(P- 001)

**MOLECULAR DOCKING INVESTIGATION OF SOME BIS-INDOLYMETHANES AS  
POTENT  $\beta$ -GLUCURONIDASE INHIBITORS**

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**ABSTRACT**

Molecular docking investigation on thirty two (32) bis-indolymethanes derivatives as potent  $\beta$ -glucuronidase inhibitors was performed to elucidate the mode of binding interactions between the studied compounds and their target protein (human  $\beta$ -glucuronidase, pdb ID: 1bhg). The most stable geometry of the compounds were obtained adopting DFT method at B3LYP/6-31G\* level of theory. Molecular docking simulation revealed that amino acid such as ALA49, SER52, ASP53, PHE51, VAL96, LEU92, TYR188, TYR199 and PHE200 might be responsible for the most promised binding affinity of the reported docked ligands. The molecular docking results showed that the reported compounds were better than the standard  $\beta$ -glucuronidase inhibitors. The results of this findings paved way for designing novel  $\beta$ -glucuronidase inhibitors.

**Key words:** Molecular, Docking, Simulation, bis-indolymethanes,  $\beta$ -glucuronidase.

(P- 002)

**QSAR MODELING OF SOME  $\beta$ -GLUCURONIDASE INHIBITORS USING GENETIC FUNCTION ALGORITHM-MULTILINEAR REGRESSION (GFA-MLR) METHOD**

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**ABSTRACT**

A model with a very high predictive ability on thirty two (32) bis-indolymethanes derivatives as  $\beta$ -glucuronidase inhibitors was built using QSAR technique. Density Functional Theory method at B3LYP/6-311G\* level of theory was used to identify the optimum conformation of the compounds under investigation. A Multi-linear regression Genetic Function Algorithm method (MLR-GFA) was used to build the five models. Model 1 among others was selected and reported since it has passed the requirements for good model validation with resulting parameters:  $R^2_{\text{trng}}=0.907233$ ,  $R^2_{\text{adj}}=0.881465$ ,  $Q_{\text{cv}}^2=0.833795$ , and  $R^2_{\text{test}}=0.609841$ . Variation Inflation factor was adopted to determine multicollinearity in the physicochemical parameters (descriptors) in the selected model and were found to be orthogonal. Model 1 was moreover subjected to applicability domain and found to be significant.

**Keywords:** QSAR; Modeling;  $\beta$ -glucuronidase; Genetic Function Algorithm.

(P- 003)

## INVESTIGATION OF INFLUENCE OF RHENIUM PROMOTED CATALYSTS ON ACETIC ACID HYDRODEOXYGENATION REACTION IN ETHANOL PRODUCTION

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**ABSTRACT:**The use of bio-oil in its unprocessed form as fuel is limited due to the presence of highly reactive carboxylic acids. The production of drop-in fuels such as ethanol have received increased attention as an alternative means of utilizing bio-oils. This mainly occurs via the use of heterogeneous catalysts in the hydrodeoxygenation of these carboxylic acids. In this study, Pt on TiO<sub>2</sub> catalyst was modified using Rhenium (Re) as a promoter targeted at the selective production of ethanol. The rhenium promoted catalyst was prepared by the wetness incipient method and characterized using NH<sub>3</sub>-Temperature Programmed Desorption (NH<sub>3</sub>-TPD) and X-ray diffraction (XRD) techniques. In addition, catalyst activity was studied using a 100 mL batch reactor for the hydrogenation of acetic acid at 185 °C and 40 bar, and was found that 4% Pt-4% Re/TiO<sub>2</sub> and unmodified 4% Pt/TiO<sub>2</sub> were selective towards ethanol (68%) and ethyl acetate (32%) respectively. NH<sub>3</sub>-TPD analysis revealed the catalyst acidity which shows that 4% Pt/TiO<sub>2</sub> and 4% Pt-4%Re/TiO<sub>2</sub> had 0.48 mmol g<sup>-1</sup> and 0.42 mmol g<sup>-1</sup> respectively. The XRD peaks present in 4% Pt/TiO<sub>2</sub> and 4% Pt-4%Re/TiO<sub>2</sub> were found to be rutile and anatase phases of TiO<sub>2</sub> only. The addition of Re into Pt-TiO<sub>2</sub> occupied more rutile than anatase phases of TiO<sub>2</sub> which resulted in increased rutile phase fraction. In conclusion, NH<sub>3</sub>-TPD and XRD analysis revealed that moderate acidity and higher rutile phase fraction are required to achieve higher ethanol selectivity.

**Keywords:** Hydrogenation, Acetic acid, Ethanol, NH<sub>3</sub>-TPD, XRD.



**SILICA SUPPORTED ALUMINIUM ADSORBENT PREPARED THROUGH SOL-GEL METHOD AND ITS APPLICATION IN THE ADSORPTION OF PROCION BLUE (Mx-R DYE) FROM AQUEOUS SOLUTIONS**

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**ABSTRACT**

Silica extracted from guinea corn husk was incorporated with Aluminium and applied for the removal of Procion-Blue dye from aqueous solutions, the adsorption process was studied at different contact time, temperature, adsorbent dose and initial dye concentration. Adsorption techniques are widely used to remove certain classes of pollutants from waters, especially those that are not easily biodegradable. Dyes represent one of the problematic groups. Box–Behnken design matrix Software was used to optimise the parameters. The software found 86.67 % as the optimum and that adsorption of Procion-Blue (Mx-R dye) from aqueous solutions can be achieved at the optimized values of the initial dye concentration of 41.60mg/L, Adsorbent dosage of 0.28g/L, Temperature of 81.70<sup>0</sup>C and Contact time of 19.05min. Modelling of experimental adsorption isotherm data and kinetics data were vital techniques for predicting the mechanisms of adsorption, which will lead to a perfection in the area of adsorption science. Here, we employed two isotherms model, namely: Langmuir and Freundlich. Linear regression analysis was used to estimate and to define the best fit isotherm model; the correlation coefficient ( $R^2$ ) was used to evaluate the data. The modelling results showed that linear Freundlich model could fit the data better than Langmuir model, with relatively higher  $R^2$  values. The kinetics model of adsorbents was tested by the pseudo-first order kinetics and pseudo-second order kinetics models. The result showed that the adsorption of the adsorbate on adsorbent strongly followed pseudo-second order kinetics model which yielded the best fit to the experimental equilibrium adsorption data with a correlation coefficient ( $R^2$ ) of 0.9991. Thus, the results showed that, the material can be successfully applied as adsorbent for removal of Procion-Blue (Mx-R) dye and in wastewater treatment processes.

**Keywords:** Silica, guinea corn husk, Procion-Blue dye, dsorbents, wastewater treatment

(P- 005)

**COMPUTATIONAL STUDY OF (E)-N'-BENZYLIDENEISONICOTINOHYDRAZIDE  
DERIVATIVES AGAINST LIPOATE PROTEIN B (LIPB) RECEPTOR**

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**ABSTRACT**

Tuberculosis is an infectious airborne disease caused by a bacterial infection that affects the lungs and other parts of the body. The existing first line drugs such as isoniazid and ethambutol shows only profound binding affinity with this target protein. Therefore, new or modified drugs with better docking approach that exhibit a closer and stronger binding affinity is essential. Lipoate biosynthesis protein B (LipB) is found to play vital role in the lipoylation process in *Mycobacterium tuberculosis* and thus making it a very promising drug target. This current study opens up a novel approach towards (E)-N'-benzylideneisonicotinohydrazide derivative which have been reported as better anti-tuberculosis agents. In this article, a computational approach was employed to understand the binding interaction between the inhibitor compounds and LipB protein of *M. tuberculosis*. The Molecular docking analysis showed that compound 2 has highest binding affinity of (-10.5kcal/mol) which was greater than the binding affinity of isoniazid (-8.1kcal/mol) and ethambutol (-7.8kcal/mol), the commercially sold anti-tuberculosis drug. Our findings could be helpful for the design of new more potent anti-*mycobacterium tuberculosis* analogs.

**Keywords:** Tuberculosis, (E)-N'-benzylideneisonicotinohydrazide derivative, Molecular docking analysis

(P- 006)

**NOVEL QSAR MODEL FOR CIPROFLOXACIN DERIVATIVES AS POTENTIAL ANTI-PROSTATE CANCER**

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**ABSTRACT**

A dataset of ciprofloxacin derivatives as potent anti-prostate cancer has been investigated utilizing Quantitative Structure-Activity Relationship (QSAR) techniques. Genetic Function Algorithm (GFA) and Multiple Linear Regression Analysis (MLRA) were used to select the descriptors and to generate the correlation QSAR models that relate the activity values against *Mycobacterium tuberculosis* with the molecular structures of the active molecules. The models were validated and the best model selected has squared correlation coefficient ( $R^2$ ) of 0.990531, adjusted squared correlation coefficient ( $R_{adj}$ ) of 0.95962 and Leave one out (LOO) cross validation coefficient ( $Q_{cv}^2$ ) value of 0.942963. The external validation set used for confirming the predictive power of the model has  $R^2_{pred}$  of 0.8486. The stability and robustness of the model obtained by the validation test indicated that the model can be used to design and synthesis other ciprofloxacin derivatives with improved anti-prostate cancer activity.

**Keywords:** Ciprofloxacin, Model, Prostate cancer, QSAR,

(P- 007)

**KINETIC AND THERMODYNAMIC APPROACH FOR ADSORPTION AND CORROSION PROPERTIES OF MITRACARPUS SCABER LEAVES EXTRACT FOR MILD STEEL IN 0.1M HCl**

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**ABSTRACT**

Kinetic and thermodynamic study of adsorption and corrosion properties of *Mitracarpus scaber* leaves extract for mild steel in 0.1M HCl was studied using gravimetric method. The results obtained showed that the ethanol extract of *Mitracarpus scaber* is a good adsorption inhibitor of mild steel in 0.1M HCl. The inhibition efficiency was found to increase with increase in the concentration of the extract but decreased as the temperature increased. The inhibition efficiency increased up to a maximum of 91%. The kinetic study was found to follow pseudo first order reaction with high correlation. Thermodynamic consideration revealed that adsorption of ethanol extract of *Mitracarpus scaber* leaves on mild steel surface is exothermic, spontaneous and fitted the Langmuir adsorption isotherm. The value of activation energy and Gibb's free energy obtained were within the range of limits expected for the mechanism of physical adsorption.

**Keywords:** Kinetic, thermodynamic, inhibition efficiency, *Mitracarpus scaber*

(E- 001)

## SYNTHESIS OF ALUM AND NATURAL COAGULANT AND THEIR PERFORMANCE IN WATER TREATMENT

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### ABSTRACT

This work aimed at synthesizing natural coagulant from watermelon seed and alum from aluminum cans, and to compare their performance in water treatment. The coagulant was extracted using 150g of the watermelon seed with 500cm<sup>3</sup> of n-hexane in soxhlet extractor for 6 hr. The alum was synthesized by adding 50cm<sup>3</sup> of 1.4M KOH to 1g of aluminum can, the solution was heated, cooled and filtered, 20cm<sup>3</sup> of 9.0M H<sub>2</sub>SO<sub>4</sub> was added to the solution and stirred gently, crystals of alum was formed upon placement in an ice bath. The phytochemical screening of the coagulant showed the presence of saponin, tannins, flavonoid, alkaloid and anthracene. The two different synthesized coagulant and alum were used in jar test analysis. The result obtained showed a good elimination of turbidity and suspended solid particles. The pH of the natural coagulant of the treated water falls within a range of 6.9 to 7.2. The result from the research showed that both the natural coagulant synthesized from watermelon seed and the one from aluminum cans could be used as good flocculant in surface water treatment.

**Keywords:** Coagulant, Alum, Jar test analysis, Soxhlet extractor

(E- 002)

**GASOMETRIC STUDIES ON THE POTENTIALS OF GLUTAMIC ACID AS AN ALUMINIUM CORROSION INHIBITOR IN ACID MEDIA**

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**ABSTRACT**

The corrosion inhibitive effect of glutamic acid for Aluminium in HCl (0.3M, 0.4M and 0.5M) solution was studied at 40<sup>0</sup>C and 50<sup>0</sup>C using the hydrogen evolution (gasometric) technique. The results indicate that the glutamic acid acts as a good inhibitor in acidic medium. The inhibition efficiency increased with an increase in the concentration of the glutamic acid (0.2 g/L, 0.4 g/L, and 0.6 g/L) and decreased with increasing temperature and HCl concentration. Inhibition is therefore, attributed to the adsorption of the inhibitor on the surface of aluminium thereby eliminating sites for the corrosion. The experimental data fit into the Frumkin adsorption isotherm. Thermodynamics parameters such as the activation energy and heat of adsorption were equally determined.

**Keywords:** Aluminium, Corrosion, Glutamic acid, Inhibition, Physical adsorption.

(E- 003)

**NATURAL SOAP MAKING - PROMOTING LOCAL TRADE AND ECONOMIC DEVELOPMENT**

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**ABSTRACT**

All over the world there is a push for reduced dependence on the use of products which contain large quantities of chemicals. This has been observed especially in the area of body care and cosmetics. This is as a result of adverse effects such as cancer, kidney failure and other ailments which have occurred due to prolonged exposure to some of these chemicals. The use of natural soaps is gaining universality as a means of circumventing these adverse effects. The cold process method is a widely accepted means of producing natural soaps. It involves saponification by the combination of natural oils and sodium hydroxide; with the addition of other natural products to increase the efficacy of soaps. This paper, reviews the methodology involved in cold process method and how local entrepreneurs without a background in chemistry (or sciences) have embraced the technology. It also reviews the entrepreneurial possibilities available from the production of natural soap and how it can lead to income generation and economic development.

**Keywords:** saponification, cold process soap, curing, additives, entrepreneurship, local trade

(E- 004)

**PRODUCTION OF SHOE POLISH FROM WASTE MATERIALS**

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**ABSTRACT**

The emergence of polish technology engineering is apparent offshoot of complexities resulting from the induction of substances that produce desired gloss and provides a protective coating for the surfaces of materials changing it to dry adherent film. In this research project, paraffin wax, turpentine, paraffin oil, vegetable oil, battery pigment, charcoal powder, spent lubricating oil and methanol were used to produce shoe polish. The shoe polish produced was subjected to mechanical tests such as solidification point, melting point, density and specific density. Physical tests were also carried out on the shoe polish produced. The produced shoe polishes were compared with a control (commercial polish bought from the open market). Polish produced from spent lubricating oil and paraffin oil compared favourably with the control.

**Keywords:** Properties of Shoe Polish, Charcoal, Battery Pigment, Spent Lubricating Oil



(E- 005)

**PHYTOEXTRACTION OF HEAVY METALS FROM SOILS CONTAMINATED BY  
INDISCRIMINATE BURNING OF WASTE MATERIALS BESIDE FCE KATSINA**

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**ABSTRACT**

The study was carried out to evaluate the heavy metals accumulation in the stems, leaves and roots of *Lactuca sativa* (Lettuce) and *Spinacia oleracea* (Spinach). Pot experiment was conducted to examine phytoextraction ability of these plants for some heavy metals (Cd, Cu, Fe, Pb and Zn) in contaminated soils obtained from an area where indiscriminate burning of waste materials is being carried out beside FCE Katsina. The results show that mean concentrations of metals in the polluted and control soils ranged from 0.03±0.02 to 61.85±0.98 mg/kg. The amount of Fe (61.85±0.98 mg/kg) detected was highest while Cd (0.42±0.03 mg/kg) displayed the least amount. However, the concentration of Cd, Fe, Pb and Zn in polluted soil were found to exceed the recommended limits stipulated by WHO/FAO. The mean levels of metals accumulation evaluated in *Lactuca sativa* also show higher amount of Fe (47.97 mg/Kg) with lowest amount of Pb (0.83 mg/kg) detected, which follows the order Fe>Zn>Cu>Cd>Pb. Similarly, *Spinacia oleracea* followed the trend where higher amount of Fe(24.13 mg/kg) with lower Cd (0.46 mg/kg) content were detected, which follows Fe>Zn>Cu> Pb>Cd. The bioaccumulation factors (BCF) were found to be greater than one in most cases, thus signifying that the plants have ability for metal uptake, and indicates the possibility of using them for phytoextraction.

**Keywords:** Heavy metals, contaminated soil, phytoextraction, bioaccumulation factor

**LABORATORY CHEMICAL WASTES AND ITS MANAGEMENT**

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**ABSTRACT**

Chemical waste is a waste which is generated laboratories either from research institutes/colleges/universities which may be classified as harmful or hazardous waste. Hazardous chemical waste may be solid, liquid, or gaseous substances. Generation of chemical waste from the laboratories has been another source of pollution which has also become a global issue too. These wastes are ignitable, corrosive, reactive, and toxic in the environment. Hazardous wastes are categorized based its identity, constituents, and hazards, so that it may be safely handled and managed. Provision and consultation of Material Safety Data Sheet (MSDS) helps in managing all types of chemical waste. Knowing the type of chemical waste to be generated helps in providing the appropriate container which is compatible. Management of chemical wastes is perfectly done with proper labeling during disposal, which also safe the waste management personnel, campus and the entire environment at large.

**Keywords:** chemical waste, waste management, safety, hazarduos



(E- 007)

## IMPACT OF HEAVY METALS CONTAMINATION OF AGRICULTURAL LANDS ON FOOD SAFETY

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### ABSTRACT

Environmental pollution has been attributed to the presence of persistence pollutants such as greenhouse gases, heavy metals, and flooding among others. This study investigated the prevalence of heavy metals pollution and related health risks associated with the vegetables grown at a particular irrigation land. This was achieved by collecting irrigation soil, water and vegetables (onion, spinach and lettuce) from Danbatta, Kano State, which were subsequently assayed for several heavy metals such as; Pb, Mn, Cu, Fe, Zn and Co using atomic absorption spectrophotometry (AAS). The results obtained show the concentrations of Pb, Cu, Fe and Zn in water samples to be 0.033, 0.8, and 0.89 mg/ml, respectively, while Mn and Co were not detected. Even though concentrations of these metals in water are within FAO/WHO limits, the soil was found to be contaminated with Cu (12.17mg/kg), Fe (152.29mg/kg) and Zn (55.75mg/kg). Furthermore, both spinach, lettuce and onion were contaminated with Pb, and Mn. However, only lettuce and spinach were contaminated with Cu, Fe and Zn. Health risk assessment of both adults and children show that Pb, Mn, Co and Cu, posed a significant health risk to the population as their health risk index (HRI) is greater than one. The result obtained shows that wrong agricultural practices could be responsible for contaminating the soil with heavy metals, which eventually gets accumulated in the edible parts of the plants and posed a great risk to its consumers. Impacts of heavy metals pollution is on the rise across the globe. As such, it becomes necessary to monitor our environment, checkmate the threat of these contaminants, and implement a reliable strategy and stable treatment of the pollution to ensure food safety.

**Keywords:** Pollution, Danbatta, health risk index, heavy metals

(E- 008)

**REMOVAL OF DIVALENT METAL IONS; Zn, Ni, Cu, Pb AND Fe IONS FROM WASTE LUBRICATING OIL USING ACTIVATED CARBON DERIVED FROM HYPHAENE THEBAICA AND BENTONITE CLAY**

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**ABSTRACT**

This research work investigates the removal of Zn, Ni, Cu, Pb and Fe ions from waste lubricating oil with Nitric acid and Sodium hydroxide followed by adsorption with activated charcoal and bentonite clay. Quality of lubricating oil before and after treatment was carried out using Atomic Absorption Spectrophotometer (AAS). The results of the analyses indicate that both adsorbents are suitable for the removal of metal ions from waste lubricating oil. However the effectiveness of activated carbon and bentonite clay for the selective removal of metal ions occur at varying degrees of efficiencies.

**Keywords:** Waste engine oil, Charcoal, Bentonite Clay, Alkali, Acid.

(E- 009)  
**RECYCLING OF WASTE ENGINE OIL USING COMBINED ACID AND ALKALI CLAY-  
CARBON TREATMENT PROCESS**

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**Abstract**

This paper investigates the recycling of 3 different brands of waste engine oils using combined acid (nitric acid) and alkali (sodium Hydroxide) followed by adsorption with activated bentonite clay, activated charcoal and activated bentonite clay/charcoal. The effect of these treatments on the properties of the treated used oil was studied. The parameters tested using ASTM standards includes: Kinematic Viscosity at 40 and 100°C, respectively, Viscosity Index, Flash Point, Pour Point, Total Base Number, Specific Gravity, Ash Content and Moisture Content. The results obtained with bentonite clay were ; Viscosity index (119, 132, 124), flash point (235, 235, 235 °C), pour point (-14, -15 and -15 °C), TBN (5.3, 5.9, 6.2 mg/KOH/g), Moisture (0.3933, 0.2502 and 0.2843 %), Ash (0.3566, 0.2565 and 0.3376 %) while that of charcoal was ; Viscosity index (120, 124 and 123), flash point (240, 245 and 240 °C), pour point (-15, -16 and -15 °C), TBN (6.3, 6.3 and 6.4 mg/KOH/g), Moisture (0.3663, 0.2240 and 0.2464 %), Ash (0.3886, 0.2525 and 0.3367 %). The result from bentonite clay/charcoal analysis was; Viscosity index (118, 126 and 121), flash point (235, 240 and 242 °C), pour point (-14, -13 and -12 °C), TBN (4.7, 5.0 and 6.9 mg/KOH/g), Moisture (0.4100, 0.3000 and 0.3122 %), Ash (0.4065, 0.3026 and 0.4067 %). The above analysis was for three engine oil brands A, B and C respectively. The refining using activated charcoal treatment gave the highest oil yield of about 70, 73.5 and 72 % compared to activated bentonite clay; 60, 67.5 and 65 and activated bentonite clay/charcoal; 69, 71 and 70% for lubricating oil brands A, B and C respectively. The results shows that both the recycling methods used removed contaminants from the used lubricating oil and returned the oil to a quality and reusable form and the activated charcoal treatment proves to be most effective.

**Keywords**

Waste engine oil, Acid, Alkali, Charcoal, Bentonite clay.



**SOIL WASHING AS A REMEDIATION TECHNIQUE  
FOR CONTAMINANTS IN EDIBLE 'NZU' CLAY**

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**ABSTRACT**

The work reports the use of surfactant solution (Sodium Dodecyl Sulphate – SDS and Triton X100), 0.1M HCl, 0.1M CaCl<sub>2</sub> and water to mechanically wash off some heavy metals, radionuclides and microbes that are implicated as contaminants of edible 'Nzu' clay. The pH of the clay purchased from Zaria-Nigeria increased following remediation, except with HCl. The surfactant solution with removal efficiency of 49% was the best extractant for As, HCl with removal efficiency of 52% was the best for extraction of chromium and H<sub>2</sub>O with removal efficiency of 82% was the best for removal of lead. The extraction resulted to significant reduction of Cr and Pb in the clay. CaCl<sub>2</sub> was best for extraction of <sup>228</sup>Ra and <sup>232</sup>Th with removal efficiencies of 17% and 31% respectively, while H<sub>2</sub>O with removal efficiency of 29% was the best extractant of <sup>238</sup>U. All the clay samples were contaminated with bacteria of the family Micrococcaceae. 'Nzu' clay collected from the deposit at Ozanogogo, Delta State, Nigeria was more contaminated than the one purchased. Therefore, consumption of remediated clay can serve the medical purposes and avert the acclaimed health implications of its ingestion.

**Keywords:** soil washing, contaminants, heavy metals, edible clay, 'Nzu', remediation

(E- 011)

**WATER QUALITY CHARACTERISTICS OF  
JABI LAKE IN ABUJA, NIGERIA**

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**ABSTRACT**

Surface water may constitute public health issues if the water is contaminated. Consequent upon this assertion, the physicochemical parameters and trace metal concentration of Jabi Lake surface water were analysed and compared with WHO standards. Sixteen water samples were taken for analysis from Jabi Lake within Abuja in Nigeria. Official Methods of Analysis of the Association of Official Analytical Chemists (AOAC) were adopted in the analysis of the physicochemical parameters while heavy metal ions determination was performed using Atomic Absorption Spectrophotometer. The results obtained revealed marked differences in the levels of some physicochemical properties and trace metal ion concentration in the surface water samples when compared with WHO standards. Though most physicochemical parameters were within acceptable and safe limits, but with nitrate having higher concentrations. The concentrations of manganese, iron, cobalt, lead and chromium were well above the WHO maximum permissible limits for surface water. The pollution index of manganese, iron, cobalt, lead and chromium were above unity (1.0), indicating very high level of pollution. The results of the physicochemical and trace metal analysis when compared with WHO suggest that the water samples from Jabi Lake was not suitable for drinking while the concentrations of the metal ions were found decreasing in this order: Pb > Fe > Cr > Mn > Co > Zn.

**Keywords:** Jabi Lake, surface water, trace metal, concentration, physicochemical properties.



(L- 001)  
**PECTIN: A POLYMER WITH THICKENING PROPERTY  
AND HEALTH POTENTIAL (A REVIEW)**

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**ABSTRACT**

This review is aimed to present recent research trends and prospects on the use of pectin, with special emphasis on its usage as thickening agent and for health. Pectin is a polymer which is of interest as a thickener, food additive and health promoting substance. It is used as a stabilizing or thickening agent in products such as yoghurt drinks, fruity milk drinks and ice cream. Pectin utilized by most food industries originates from citrus and apple peels. Recent findings have also proven the extensive application of pectin as a reliever for certain health related issues, such as treatment of diarrhea and in promoting the protection of intestinal mucosa. Structurally, pectin is regarded as hetero-polysaccharide predominantly containing galacturonic acid residues, in which varying proportions of the acid groups are present as methoxyl esters. Other neutral sugars may be present as side chains. Certain parameters such ultraviolet light, pH and temperature are reported to decline its thickening property which in turn affects the quality of food products containing pectin as a thickening agent. Therefore care needs to be taken during processing, transportation and during the shelf life of foods with pectin to optimize its potentials.

**Keywords:** Pectin, Mucosa, Temperature, Ultraviolet light, pH

(L- 002)

## BIODEGRADABLE PLASTIC PRODUCTION FROM MILLET HUSK

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### ABSTRACT

Bioplastics are produced from renewable resources, efforts are being made by researchers to investigate a proper alternative to petroleum based plastics. The need for bioplastics is now more than ever as the non-biodegradable plastics caused many health and environmental problem. Therefore, to improve healthy life and environment, production of biodegradable plastic became of great interest. In this research, Millet husk bioplastic was produced via sulfuric acid catalytic process using glycerol as plasticizer and acetic acid as formation agent. Physical properties such as functional groups and crystalline characteristics were analyzed using Fourier transform infrared (FTIR), and X- ray diffraction (XRD). The FTIR spectra of the product displayed the presence of O-H, C-H, C=O and C-O absorption peaks, which indicate the formation of bioplastic. When compared the XRD diffractogram of the prepared bioplastic with commercial cellulose acetate bioplastic and that from fresh Millet husk, the result obtained suggested the formation to be bioplastic. This indicated that millet husk could be used to generate bioplastic.

**Keyword:** Bioplastic, Plasticizer, crystalline characteristics, Biodegradable, Formation agent, Absorption peaks.

(L- 003)

## STUDY ON ACRYLOYLATION AND SUPERABSORBENCY OF STARCH COPOLYMERS

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### ABSTRACT

A copolymer of starch with remarkable superabsorbency has been prepared first by acryloylation of starch to produce the starch ester; the acryloylated starch was then polymerized using Fenton's initiation system to produce the copolymer. Starch copolymers with varying degree of substitution (DS) were formed. Properties such as solubility, water, saline and solvent's uptake have improved impressively. A copolymer containing a DS of 0.8 exhibited highest water absorbency (102 g/g) in this experiment. It has been observed that at higher DS more cross-linking reactions occur between the modified starch molecules; these make the samples to exhibit high rigidity, brittleness and poor water dispersibility. Fourier transform infra-red (FTIR) spectroscopy, thermogravimetric (TGA), scanning electron microscopy (SEM) analyses were used to characterize the samples.

**Keywords-** Absorbency; Acryloylated starch; Copolymerization; Degree of substitution

(L- 004)

**THERMAL STABILITY OF BIODEGRADABLE PLASTIC FILMS PRODUCED USING CLAY FROM PYATA, NIGER STATE**

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**ABSTRACT**

The development of biodegradable polymers from renewable resources to replace synthetic plastic products provides opportunities for reducing waste through biological recycling to the biosystem. Starch-based biodegradable composite (plastic) films of varied compositions were prepared using casting techniques. The composite films were characterized for thermal properties using both Thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). The TGA results showed that the sample with 17.50 wt. % glycerol, 70.00 wt. % starch and 12.50 wt. % clay relative to dried starch was the most thermally stable film, having an onset degradation temperature of 245.68°C and a maximum degradation temperature of 277.96°C. The DSC of the films revealed that the sample also has the highest melting temperature of 119.47°C and a corresponding enthalpy of 163.64 J/g. The films produced can be used for packaging.

**Keywords:** Cassava starch, clay, glycerol, composite films, biodegradable

(E- 001)

**THE EFFECTIVENESS OF INSTRUCTIONAL STRATEGY OF INQUIRY - BASED LEARNING  
ON ACHIEVEMENT IN CHEMISTRY**

**BY**

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**ABSTRACT**

This experimental study was designed to investigate the effectiveness of instructional strategy of inquiry – based learning on secondary school learners achievement in chemistry in Ajaokuta Local Government Area. The study is aimed to find out the relative effects of inquiry–based learning as instrumental strategy on the academic achievement in Chemistry of ASCL Staff Comprehensive Secondary School 1, Senior Secondary School II (S.S.S II) students. A simple random sampling technique was used to select Sixty (60) learners. Thirty (30) learners from S.S.S IIA and 30 from S.S.S IIB. The data obtained was analysed by applying t-test. The findings show the supremacy of inquiry – based learning. The results showed that students who were instructed through instructional strategy of inquiry– based learning achieved higher score than the ones which were instructed through the traditional method. The inquiry–based learning enhanced academic performance in Chemistry. In Chemistry of students exposed to the method during the learning activity of both students and the teacher. Therefore, the inquiry-base learning method is better in the Chemistry classroom teaching activities compared to the traditional method (rote learning).

**Keywords** – Experimentation, Achievement, Inquiry–based learning, Chemistry, Education.

(E- 002)

**THE EFFECTS OF E-LEARNING AND ITS APPLICATIONS IN TEACHING AND LEARNING ORGANIC CHEMISTRY OF LIVING ORGANISMS. A CASE STUDY OF SOME SELECTED PUBLIC SCHOOLS IN ZARIA METROPOLIS, KADUNA STATE, NIGERIA**

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**ABSTRACT**

This study was carried out to investigate the application of e-learning and its effects in teaching and learning of organic Chemistry. One hundred (100) students were randomly selected from Sabon-Gari Local Government and Zaria Local Government Areas of Kaduna State, Nigeria. The instrument used for the study was an organic Chemistry comparison Test (OCCT) which provides necessary data for the study. The data collected were analyzed using t-test. The study revealed a positive and significant difference between the scores obtained by those students taught with e-learning and those students taught without e-learning. Also the study shows that the assimilation and understanding of organic Chemistry concepts through e-learning was not gender biased. It was concluded that the use of e-learning will become meaningful where there are facilities on ground, e.g electricity and human resource personnel which acts as drivers for e-learning. Based on the result of the study, the following recommendations were made: provisions of e-learning facilities, like Computer, palmtop, internet etc are needed for e-learning visa-a-vis the provision of other modern infrastructures that will enhance the use of e-learning.

**Key Words:** E-learning, Organic chemistry, Public Schools and Kaduna State.

(D- 001)

**DEVELOPMENT AND CHARACTERISATION OF MESOPOROUS METAKAOLIN AS A POTENTIAL HETEROGENOUS CATALYST FOR BIODIESEL PRODUCTION**

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**ABSTRACT**

This study is aimed at developing and characterising metakaolin from natural kaolin to serve as a potential heterogenous catalyst for biodiesel production. The mesoporous catalyst was prepared from natural kaolin via beneficiation, calcination at 650 °C for 90 minutes and subsequently, by KOH-activation hydrothermally at 90 °C for 3 hours. The obtained catalytic material was characterized using XRD, SEM, XRF and BET analysis. The catalyst shows a high surface area and pore size within the mesoporous range. The study revealed that metakaolin produced can serve as a good catalyst for transesterification of vegetable oils to produce biodiesel.

**Keywords:** Biodiesel, catalyst, characterisation, kaolin, metakaolin, mesoporous,

(D- 002)

**THERMAL AND GEOCHEMICAL CHARACTERIZATION OF OIL SHALE FROM THE BIDA BASIN, NIGERIA**

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**ABSTRACT**

The earth contains large amounts of hydrocarbons that are not contained in what might be called conventional hydrocarbons. With increasing demand for energy both domestically and industrially, a major challenge facing the world, the society is driven to search for alternative energy sources. In this work, oil shale samples were collected from the Bida formation of the Bida Basin, Niger state, Nigeria. Analytical tools such as Rock Eval Pyrolysis, Total Organic Carbon (TOC) and Thermogravimetric Analysis (TGA) were used to characterize the sample. From the Pyrolysis results, the Hydrogen Index (HI) was 45.71 mgHC/gTOC, the Production Index (PI), 0.42 and the T<sub>max</sub>, 342 °C. The TOC was 1.40 wt%. From the TGA results, the activation energy of the oil shale was calculated using the Arrhenius equation and found to be 48.40 KJ/Mol, while the pre-exponential factor was 884.025 min<sup>-1</sup>. Consequently, the oil shale is gas-prone and contains migratory hydrocarbons. Also, the content of organic matter in the sample is good.

**Keywords:** Oil shale, TOC, Rock Eval Pyrolysis, TGA, Hydrocarbons.



(D- 003)

## THERMAL TREATMENT OF PHOSPHOGYPSUM WITH THE INTEGRATION OF BENTONITE CLAY FOR PORTLAND CEMENT PRODUCTION

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### ABSTRACT

In this study, the effects of raw phosphogypsum and treated phosphogypsum on the hydration of Portland cement were investigated by measuring setting time, compressive strengths, heat of hydration, chemical analysis as well as the microstructural observation of the raw and treated PG. The result obtained shows that the sulphite content of phosphogypsum was 42.42%, which translates to a purity of 91.20 %. The clinker parameter is good for high quality Portland cement, and the free lime content of 1.35 % indicates that there was proper reaction of lime with the oxides to form the mineral compounds. The phosphorous content reduced appreciably from 1.05 to 0.38 for the raw and treated PG respectively. The setting time and compressive strength was found to be higher in the treated condition than the untreated condition. pH analysis of the phosphogypsum saturated solution samples showed an increase in pH value, as a result of the heated product. In conclusion, thermal treatment of phosphogypsum with the integration of bentonite clay significantly removed the impurities present successfully, thereby making it serve as a substitute for natural gypsum in Portland cement production.

**Keywords:** Phosphogypsum, Bentonite Clay, Portland Cement, Setting Time, Compressive Strength

(D- 004)

**PORE-LEVEL COMPUTATIONAL FLUID DYNAMICS INVESTIGATION OF THE PERMEABILITY AND FORM DRAG OF "STRUCTURAL - ADAPTED" POROUS METALS**

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**ABSTRACT**

The transport of fluid in porous metallic structures is of considerable interest due to their unique and combined characteristics of high surface area and large pore volume, enabling their suitability as energy and impact loading material. This work presents a combined utilization of image processing and pore-level computational fluid dynamics modeling and simulation of fluid flow across "real" and geometrically - adapted commercial foams. Pore-structure related and flow properties of the porous structure were obtained using the combined techniques with reasonable correlation of experimentally derived values. This work tends to study the behavior of fluid dynamics in structural adapted high porous metals by dilating the skeletal phases. Real samples of porous metals were dilated and the porosity ( $\epsilon$ ) in % were as follows: for Inconel 450 $\mu$ m Real the porosity was 83.54% it was dilated twice and the results obtained were: DL1-70.54%, DL-2 57.50%. RCM-NCX1116 real the porosity was 89.81% with dilated porosities of DL1-79.97%, DL2-71.64%, DL3-62.85%. Porvair7PPI real was 89.69% the dilated results were: DL1-85.83%, DL2-82.03%, DL3-78.05% respectively. The modelling approach used herein could assist in the design of efficient porous metal foams for fluid transport application.

**Keywords:** Metal foam. CFD. Pore-level. Permeability.

(D- 005)

**EFFECT OF WELDING SPEED ON WELD SEAM, MICROSTRUCTURE AND  
MICROHARDNESS IN LASER WELDING OF CARBON STEEL**

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**ABSTRACT**

The present study is concerned with the effects of welding speed on the weld seam, microstructure and microhardness profile in laser welding of carbon steel using IPG YLS -3000W Fiber Laser with Robot. The effects of laser power (2000W) and welding speed (0.005 m/s - 0.015 m/s) on weld width, penetration depth, microstructure and microhardness were investigated. After laser welding of the sample, the welded sample was cut for grinding and scanning. The grinding was done using 180#, 240#, 320#, 400#, 500# and 600# grits of sandpapers. Al<sub>2</sub>O<sub>3</sub> polishing solution was used to polish the sample, 4% nitric acid solution was used in etching the sample, and then finally dried. The microstructure of the welded sample was observed under metallographic microscope. The results showed that both weld bead width and penetration depth increase with increase in laser power and decrease in laser speed. For both laser power and speed the hardness value is normally distributed, and the weld hardness value is maximum in the heat affected zone and minimum in the matrix.

**Keywords:** Laser Welding, Fiber Laser, Welding Speed, Microstructure, Microhardness

(D- 006)

**METAL CHLORIDES SUPPORTED ON SAPO-5 AS REUSABLE AND SUPERIOR CATALYSTS FOR ACYLATION OF 2-METHYLFURAN UNDER NON-MICROWAVE INSTANT HEATING**

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**ABSTRACT**

The facile preparation and catalytic study of highly active metal chlorides supported SAPO-5, *viz.* ZnCl<sub>x</sub>/SAPO-5, CuCl<sub>x</sub>/SAPO-5, CoCl<sub>x</sub>/SAPO-5, SnCl<sub>x</sub>/SAPO-5 and FeCl<sub>x</sub>/SAPO-5, are reported. The catalysts were prepared using facile wet impregnation followed by thermochemical activation approach. Microscopy and XRD analyses revealed the homogeneous distribution of metal chloride species on the surface of SAPO-5 where elemental microanalysis and TG/DTG confirmed the formation of Si-O-M covalent bonds (M = Zn, Sn or Fe) in ZnCl<sub>x</sub>/SAPO-5, SnCl<sub>x</sub>/SAPO-5 and FeCl<sub>x</sub>/SAPO-5. The pyridine adsorption analysis showed that ZnCl<sub>x</sub>/SAPO-5 had the highest amount of acidity (Lewis and Brönsted), followed by FeCl<sub>x</sub>/SAPO-5, SnCl<sub>x</sub>/SAPO-5, CoCl<sub>x</sub>/SAPO-5, CuCl<sub>x</sub>/SAPO-5 and SAPO-5. Among the catalysts prepared, ZnCl<sub>x</sub>/SAPO-5 appeared to be the most active catalyst in acylation of 2-methyl furan, giving 94.5% conversion with 100% selective to 2-acetyl-5-methyl furan at 110°C in just 20 min under novel non-microwave instant heating conditions. The catalysts were highly reusable without significant loss of catalytic activity, providing a promising alternative to the environment-unfriendly and hazardous homogeneous catalysts for Friedel-Crafts acylation reactions.

**Keywords:** catalytic study, facile wet impregnation, thermochemical activation approach, pyridine adsorption

(D- 007)

**SYNTHESIS AND CHARACTERIZATION OF CELLULOSE NANOCRYSTALS-MULTI-WALLED CARBON NANOTUBES (CNCs-MWCNTS) COMPOSITES AS A POTENTIAL ADSORBENT FOR INDUSTRIAL POLLUTANTS**

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**ABSTRACT**

In this study, Cellulose nanocrystals (CNCs) and multi-walled carbon nanotubes (CNTs) are used to prepare CNCs-MWCNTs composite via an environmentally friendly and facile route without the need for chemical functionalization or adding surfactants with the purpose of studying potential synergistic effects between the MWCNTs and the CNCs in hybrid nanoparticle networks. XRD analysis revealed that the CNCs were crystalline (52.65%) with a characteristic (200) plane corresponding to type I cellulose. A slight decrease in crystallinity to 49.86% on the formation of CNCs-MWCNTs composite, the occurrence in the XRD analysis was also confirmed by the SAED analysis. Surface chemical characteristics were investigated using High Resolution Transmission Spectroscopy (HRTEM-SAED), and High Resolution Scanning Electron Microscope (HRSEM-EDS). These analyses confirmed defined tubular morphology for MWCNTs, sheet-like structure with a smooth surface for CNCs, and combination of both morphology in CNCs-MWCNTs. The hybrid films show CNCs-MWCNTs possessed better-defined ridges, wrinkles, micro and nano-pores throughout the entire surface, which are believed to be due to the synergistic effects between CNCs and MWCNTs in the nanocomposite. The developed MWCNTs-CNCs is shown to possess a promising potential characteristics adsorbent for the sequestration of heavy metals and dyes from industrial effluents.

**Keywords:** Cellulose nanocrystals, multi-walled carbon nanotubes, composite, sequestration, industrial effluents

(D- 008)

## PRODUCTION OF BLACK SHOE POLISH FROM CARBON BLACK USING WASTE CAR TYRE

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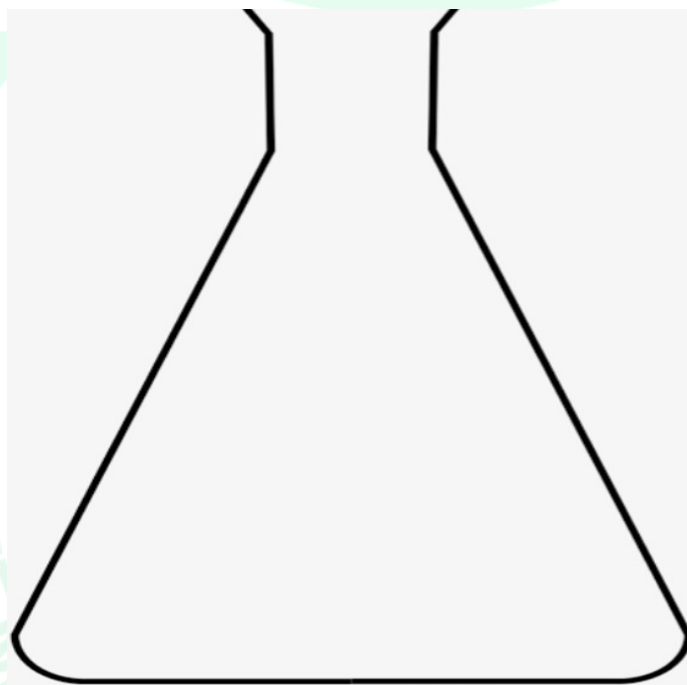
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### ABSTRACT

The main emphasis of this study is the production of black shoe polish using carbon black from waste car tyre. Waste car tyre was pyrolysed in a hot muffle furnace made up of stainless steel in a temperature range of 450-600 °C at a heating rate of 20°C/min with size range of 2-4cm long. The maximum carbon black yield was obtained at lower temperature of 450 °C, due to the incomplete devolatilization of used tyre. The obtained pyrolytic carbon black residues were studied to investigate their characteristics such as ash content, moisture content, bulk density, pore volume, porosity, TGA, SEM, BET and FTIR. Characterizations were used to investigate the features of pyrolytic carbon black. It was treated with acid for demineralization. Adsorption capacities for methylene blue by raw and acid treated carbon black were compared, and the results show that the acid treated carbon black had the highest adsorption capacity. Thermogravimetric analysis was used to determine the kinetic behaviors of the waste car tyre carbon black and standard carbon black and the effect of heating rate on the mass loss of waste car tyre, SEM image indicated that carbon black has variety of pores. Surface area on produced carbon black and demineralized carbon black were compared and the results show that the demineralized carbon black had the larger surface area than the produced carbon black. FTIR was used to observed the functional group of the carbon black and finally black shoe polish was manufactured.

**Key words:** Black shoe polish, Carbon black, Demineralize, Pyrolytic, Waste car tyre.

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